DEVELOPMENT OF A FLASH-BASED MOBILE LEARNING SYSTEM FOR ENGLISH AS SECOND LANGUAGE

Firouz B. Anaraki

A Dissertation Submitted in Partial Fulfillment of the Requirements for the Degree of Doctor of Philosophy in eLearning Methodology

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Development of a Flash-Based Mobile Learning System for English as Second Language

By

Firouz Baradaran Anaraki

A Dissertation

Submitted to the Graduate Degree Program in eLearning Methodology, College of Internet Distance Education of Assumption University of Thailand in partial fulfillment of the requirements for the degree of Doctor of Philosophy

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ABSTRACT

The objectives of this study were (1) to identify components needed for effective mLearning system, (2) to develop a Flash-based Mobile Learning system for English as a second language (FML4ESL), (3) to try out the FML4ESL in a simulated situation, and (4) to evaluate the effectiveness of the developed FML4ESL.

In developing the FML4ESL plan, based on Adobe Flash-based multimedia mobile learning system where multimedia (text and sound) features of the mobile devices are utilized for learning English language as second language, A) a need assessment survey was conducted to evaluate the need for mobile learning in general and mobile English learning in particular; B) consultation with experts in mobile technology and ESL lecturers, a prototype system (FML4ESL) was designed, developed, and tested; C) volunteers among Assumption University students were used as sample to try out the developed system in order to explore and to evaluate its usefulness and effectiveness; D) ANOVA was utilized to compare the scores of pretests and posttests of participants in this research for evaluating its effectiveness and usefulness; and finally F) pre-surveys and post-surveys were utilized to evaluate the learners’ satisfactions and effectiveness of FML4ESL.

In designing and developing the FML4ESL plan, the researcher followed seven steps: (1) review of documents, (2) survey of need for the system, (3) design conceptual framework for mLearning model, (4) survey of expert opinion, (5) a prototype for FML4ESL, (6) system verification, (7) finalize the FML4ESL. The prototype system was developed and tested.

The results of pretest and posttests showed a statistically significant (p < 0.05) improvement in the scores of English proficiency tests after trying out the FML4ESL. The results of the surveys showed that Flash-based mobile learning for English as second language was effective in improving students’ English proficiency especially in the area of pronunciation, listening, and reading comprehension. Participants in this research expressed the convenience and just-in-time learning of mobile learning as the positive and important aspects of learning English using their mobile devices. Participants expressed their desire to have access to more mobile English lessons and integration of FML4ESL to their existing English classes as supplements.
ACKNOWLEDGEMENTS

The pursuit of my Ph.D. has been an exceptional and unforgettable journey that I had only dreamed of, the one filled with challenges and excitement. I came to know Prof. Dr. Srisakdi Charmonman as one of my professors while studying for my master degree at the Asian Institute of Technology. Some years later when I joined Assumption University to work as a lecturer, I was fortunate to meet him again as Vice President for Information Technology of the university, then little I knew how much he would influence me throughout my life. I have been lucky working for Prof. Dr. Srisakdi under various positions. I happily accepted his offer to join the College of Internet Distance Education after he decided to set up the College. Through his encouragement, I could receive a scholarship to pursue my Ph.D. studies. I am deeply indebted to him for all he has done for me.

I am also deeply indebted to my dissertation advisor and the Ph.D. Program Director, Prof. Dr. Chaiyong Brahmemong, for his consistent encouragement, mentoring, and research support during my studies for my Ph.D. at the College of Internet Distance Education. His kind and cool temper has always helped me to reconsider various options. This research would not have been completed without his advising. I would also like to thank my co-advisor, Dr. Poonsri Vate-U-Lan, for providing me with many valuable advice and constant encouragement to go through this journey. I have constantly knocked her office door to seek her guidance and she always accepted me and with patience provided much advice to me. She has been a good friend and colleague whom I had the pleasure of working with. I am very fortunate to have Assoc. Prof. Dr. Chitapa Ketavan as a member of the Ph.D. committee from whom I learned a lot on how to proceed with my research. I appreciate her constant encouragement, advice, and friendship. She has been a source of inspiration for me. I would also like to thank Assoc. Prof. Dr. Farhad Daneshgar and Dr. Satha Pongsatha for providing me with invaluable advice on various aspects of my research work. I am also very much thankful to Assoc. Professor Somchai Thayarnnyong acting as a member of my examining committee representing Ministry of Education.

I would also like to thank Mr. Frank Mausley, Mrs. Sammira Nagratnam, Dr. Peter Smith, and Ajarn Srinath Ramnath who assisted me as Technology Experts and ESL advisors to this project.

Last but not least I would like to thank my wife who profoundly impacted my studies towards a Ph.D. She has given me invaluable moral support, assistance, and encouragement throughout the years. I truly appreciate her patience and tolerance while I was engaged in my studies.
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CHAPTER I

INTRODUCTION

Learning and the lifelong pursuit of knowledge have become the most essential activities in the current knowledge-based economy, which is characterized by industrial change, globalization, knowledge sharing and transfer, and information and communication technology revolution. Globalization requires new methods of knowledge acquisition and to convey new skills and tools (Adam et al., 1997).

The traditional context of learning is experiencing a radical change. There are many situations in which people want to learn exactly what they are interested in, without time and location limits. Growing demand among learners for improved accessibility and convenience, lower costs, and direct application of content to work settings is radically changing the environment for higher education.

The recent developments of the worldwide web and later web 2.0, virtual reality to build simulated learning environment such as “Second Life”, a 3 dimensional virtual reality website, and availability of mobile and wireless communication Technology are predicted to have extensive effects upon learning environments at all levels. Educational institutions and commercial companies are experimenting with these technologies and are designing new methods to take advantage of these emerging technologies and are marketing their programs to new audiences and in new ways. Corporations are forming alliances with universities to promote learning using technology. Completely new models for universities are also being developed to
respond to the opportunities created by a growing worldwide market for learning and new technologies.

Mobile technology is introducing new approaches to learning for both students from traditional classrooms to those learning in blended and/or totally online learning environments. “Second Life” has become available on some brands of mobile devices.

In the notable Leonardo da Vinci Project on technology and learning, Keegan (2002) indicated the industrial, electronic, and wireless revolutions all influenced transitions in learning since the 18th century. Advancements in technology have taken learners from dLearning (distance learning) to eLearning (electronic learning), and ultimately, to the mLearning (mobile learning) model of today. “The mixing of distance learning with mobile telephony to produce mLearning will provide the future of learning” (Keegan, p. 168).

1. Background of Study

In this global economy, English language has become the international language of business and science. To become a successful business person or renowned scientist, one needs to know and understand English. The existing problem facing many students is to learn and improve their English language skills, i.e. English conversation and pronunciation. There have been attempts in designing courseware for learning English for personal computers as well as online and eLearning courses. Studies conducted by a number of researchers such as Hsia & Chung (2003) and Cappel and Hayen (2004) have shown the effectiveness of online English learning. Often these eLearning courses are not freely available for students or educational
institutions, besides the learners need to have access to a PC and access to the Internet in order to use and learn these online English courses.

Advancements in wireless technology have supported mobile learning. Wireless communication, integral to handheld devices such as PDA (Personal Digital Assistant) phones, Smart phones, Pocket PCs, and Tablet PCs, provides electronic access to mobile learning. Current technologies support essentials for successful language learning including multimedia messages, oral conversations, digital storytelling, and collaborative learning.

Research regarding the impact of mobile technology on language learning continues to grow. Norbrook and Scott (2003) indicated mobile technologies may encourage and motivate foreign language learners through portable, immediate learning more than localized classroom learning. Kukulska-Hulme (2005) described the potential of mobile technology applications for foreign language learning in three case studies: (1) SMS (Short Messaging Service for mobile phone users) and Italian vocabulary learning at Griffith University, Australia; (2) iPods in Spanish language learning at Duke University, United States; and (3) digital voice recorders and mini camcorders in German and Spanish language learning at The Open University, UK. Mobile applications may replace face-to-face communication in content-aware settings. Continued research is crucial to explore and define the characteristics and results of mobile language learning. Once defined, these could facilitate implementation of new instructional strategies for accelerated second language learning.
As mentioned earlier, the three main categories of mobile English learning have been SMS, podcasting, and voice recorders. McNicol (2004) has shown the effectiveness and popularity of such English mobile learning among Japanese. This researcher plans to introduce a new method of mobile English learning by using Flash Lite on mobile devices in order to develop multisensory English lessons for mobile devices so that learners could hear while reading the texts of the lessons on their mobile device screens. As the educational theories, i.e. cone of experience (Dale, 1969), states that the effectiveness of learning improves when more senses are involved, in this case hearing and reading. One advantage of mLearning over eLearning is the availability of mobile devices compared to PCs. This might be the ideal situation for a learner to learn a foreign language on demand and on his/her own pace and at any location where he/she feels comfortable.

2. mLearning and Mobile Devices

Mobile Learning has been made possible due to the advancement in mobile devices technology. Mobile Computer (2006) defines mobile computer as any computing device intended to move location while maintaining functionality. Many types of mobile computers have been introduced since the 1990s, including laptop computers, subnotebooks, personal digital assistants (PDAs), tablet PCs, and smart phones.

The popular Tech-Guide web site defines a wireless network (2006) as a technology that enables two or more computers to communicate using standard network protocols, but without the connecting cables. It uses radio waves for transmission of data, allowing computers to share printers, files or an internet connection without any wires between them.
Wireless networking relies on radio frequencies to link one or more groups of users together, or to provide a link between two buildings. The data transmission between the individual computers required each of them to have a wireless network adapter. A wireless network hub or router is used to bridge the wireless network to traditional ethernet or home phoneline networks, or provide a shared internet connection.

Wireless networking has improved the usefulness of mobile computers by allowing access to the Internet or any network possible almost at any location which indeed enhances the concept of asynchronous eLearning by definition of “anytime” and specially “anyplace”. Ally (2004) defined mLearning as the delivery of electronic learning materials on mobile computing devices to allow access from anywhere and at anytime.

As the prices of mobile devices such as MP3 players, smart mobile phones, PDAs, and notebooks are dropping, more and more students could afford to own one of these devices. Many varieties of mobile devices have easy access to the Internet either using GPRS or WiFi (Wireless ieee 802.11 b/g) technologies. Many of these mobile devices can play audio files in MP3 format or video files in flash or Windows media player format. These devices could become ideal tutoring tools for students to listen or watch the audio and video lectures again and again to improve their understanding of the class lectures when audios of the lectures are recorded or videos of the lectures are taken.
3. Statement of the Problem

Thailand is going through many changes in education and the use of advanced technologies and ICT in its educational institutions. The Thai government requires all educational institutions to play a more proactive and developmental role in preparing the Thai people to cope with the globalization movements today and for the decades to come. Thailand is now a front door into Southeast Asia, and wants her people to sharpen their skills and improve their knowledge in order to gain a competitive advantage in the global market. As English language has become the international language of commerce, science and Technology, business, and arts; Thai government has undertaken a policy of improving the English understanding, listening, and speaking of Thais from elementary schools to universities. Teaching English in Thai schools faces many challenges including lack of qualified English teachers.

Bangkok Post (2008) reported that the number of mobile phone users in Thailand has reached 53 million by the end of 2007. These ubiquitous mobile devices come with many features that could be utilized for mobile learning. Learning a foreign language such as English language by these mobile devices could be a great benefit to the users of these devices as they do provide learning opportunities at any time and at any place and pace.

Assumption University is the first international university in Thailand established in 1969 where the media instruction has been English since its inception. In order to prepare students to study their courses in English, Assumption University students are required to take the 4 required English courses, English I, English II, English III, and English IV. The university also provides English Laboratory for students to supplement English teaching in class room. This research
explored the use of mobile devices capable of playing Adobe Flash files and its effects on students learning English at Assumption University.

Most mobile devices today, smart mobile phones and PDAs, are capable of playing Adobe Flash Lite. This software was originally developed on personal computers (PCs) and more recently Adobe has provided the player version of this charge on many computer platforms including Macintosh and Linux platforms, and the Lite version on many of mobile devices. There are already many application programs developed under Flash, users can play these application programs using their PCs and mobile devices. Flash could be used to develop English lessons so that students can learn the language whenever and where ever they wish.

Creating a productive and satisfying learning experience involves actively engaging students and having them take responsibility for their own learning. For this purpose, English lectures to improve listening comprehension, conversation, and pronunciation were developed and tested on students and their effects were analyzed to see if there has been any improvement in English learning of students. The attitude and the result of mobile learning before and after the experiments were also studied.

4. Purpose and Objectives

4.1 Purpose

The purpose of this research was to design and develop a Flash-based mobile learning system for English as second language (FML4ESL) using mobile devices capable of playing Adobe Flash Lite.
4.2 Objectives

The objectives of this research were as follows:

1) To analyze the existing mobile learning systems in learning a second language.
2) To develop an mLearning system for learning English as a second language.
3) To identify components needed for an effective FML4ESL.
4) To evaluate the FML4ESL system in a simulated situation.

5. Research Questions

The researcher did try to explore and answer the following questions:

1) What are the components for an mLearning system for second language learning?
2) What are the elements in an mLearning system and how is it developed to be effectively utilized for learning English as a second language?
3) How do students interact with the proposed FML4ESL and its effects on improving their English language?
4) In what areas of language learning the FML4ESL is more effective?

5.1 Independent Variables

1) mLearning technology (method)
2) Demographic characteristics
3) Students’ experiences in use of mobile devices
4) Learning behavior
5) Support received in use of the mLearning
6) Perceived ease of use
7) Perceived value
8) Trust
9) Perceived ease of adoption

5.2 Dependent Variables
1) Students’ achievement
2) An mLearning model for learning English language

6. Significance of the Research

During the last five years mLearning has become a viable tool for learning by academicians and technology enthusiasts. Mobile devices if used in conjunction with eLearning methodologies or blended mode of learning could provide a true learning on demand of the sort of anywhere and at any time.

Jackson (2004) and Krazit (2005) have argued the issue of choice between laptops, handhelds, or tablet PCs especially by the increase use of wireless. Briggs (2006) concludes that a significant proportion of the demand for portable wireless devices is now generated within educational institutions. Mobile and wireless devices will be playing an important role in education. This research tries to shed some light on various ways that mobile devices are being used in education in learning English and will explore the new possibilities of incorporating such devices in education, especially in learning English as a second language. A system will be developed for an effective English mLearning.
The Ninth Thai Education Plan (1998-2004) stresses education for life as well as learner-centered education. Consequently, a change in educational method is essential; learner-centered method has been implemented in the new curriculum in response to the concept of basic education. Moreover, the adoption of lifelong education and lifelong learning as guiding principles of education policy are able to provide extensive education and learning opportunities mainly because of the Internet and mobile and wireless devices capable of connecting to the Internet. The finding of this research will therefore help Assumption University and many other universities in Thailand to the methods on how to integrate mobile devices in teaching English and other courses.

In this age of globalization and rapid technological innovation, multiple forms of literacy are becoming increasingly relevant to economic and civic participation. Realistically, many adults who want to learn a second language are challenged by lack of time, location flexibility, and convenient access. Current mobile technologies can address these concerns through the interactive mobile Web site and podcasting, which supports anytime, anyplace learning. To better ensure quality in mobile language learning, it is essential to explore and define its effectiveness and characteristics, and to figure out the instructional design strategies for handling learning contents and limitations of mobile technologies. Ultimately, the goal is to develop appropriate instructional design guidelines regarding the use of mobile technologies in learning English as a second language for education and training.

As the result of this research, an effective mLearning system for English language learning was developed to provide a cheap and mobile way of learning English on demand, at
any location and at any pace. This research could lead to a cheap tool for the Thai Education plan to provide good English education to students and all those interested to learn the language.

7. Limitation of the Research

The objective of this research is to develop English language courseware for mobile devices using Adobe Flash Lite. At this time, smart mobile phones and PDAs with either Symbian or Windows Mobile operating systems (OS) support Flash Lite. The owners of higher ends Nokia smart phones and PDAs with Windows mobile could benefit from Flash based English mobile learning. Some models of Sony-Ericson, Samsung, and LG also support Flash. The courseware developed could not be used with every model of mobile phones. Often the higher end of mobile phones or PDAs are required to utilize the units for mobile English learning.

8. Achieved Outcomes

The achieved outcomes of this dissertation are (1) a Flash-based Mobile Learning System for Learning English as a Second Language (FML4ESL); (2) a positive achievement in students’ learning English language ability when mobile devices are utilized; (3) a set of prototype lessons, developed based on the FML4ESL to be used as a guideline for developing other language learning; (4) the improvement of attitude of students towards learning in general and mobile learning in particular; (5) a tool in the quest for lifelong learning through mLearning based on mobile technologies currently available and future trends; (6) addressing challenges faced in connection with the provision of education using mobile devices, as well as its impact on distance students and teachers.
9. Definition of Terms

**Instant messaging (IM):** Messaging conversations occurring in real time; offering a “presence awareness” feature, indicating whether people on one’s list of contacts are currently online and available to chat. IM has been used as a media to motivate online learners.

**Language learning effect:** The learning result per learning hour in this study.

**Language learning result:** The test score of learning in this study.

**Mobile learning (mLearning):** A learner-centered mobile computing paradigm with the feature of learning anytime and anywhere via mobile devices that especially involve telephony mobile communication.

**Mobile Web site:** A particular site that supports WAP 1.0 and WAP 2.0 protocols and different micro browsers used in various mobile handheld devices.

**Moblogging:** The technology that allows publishing of audio or video contents to one’s Weblog in the Internet via a mobile device such as a cellular phone or PDA.

**Multimedia Messaging System (MMS):** The successor to Short Message Service. This enables mobile phone service subscribers to compose and send messages with one or more multimedia (digital photos, audio and video clips) components.
**Online learning:** A type of e-learning environment where learners must sit in front of their computers with connection to Internet learning sites.

**Personal Digital Assistant (PDA):** Any mobile handheld device that provides networking, computing, and information storage retrieval capabilities for personal or business use. Some PDAs incorporate handwriting and/or voice recognition features.

**Podcasting:** The audio or video distribution of learning content to mobile devices. It provides the portability and on-demand nature of accessing learning content, and can be viewed as another variant of mobile learning (Kaplan-Leiserson, 2005).

**Short Message Service (SMS):** A service that permits the sending of short messages (also known as SMSes, text messages, messages, or simply texts) between mobile phones and other handheld devices. SMS is now available on a wide range of networks, including 3G networks.

**Smart phone:** Any mobile handheld device that integrates mobile phone capabilities and personal information management in the same device. The key features include Internet access for sending/receiving e-mails and surfing mobile Web sites, built-in camera for audio recording and video capturing, multimedia player for playing audio and movie files, contact management and scheduling application, and occasionally the ability to download and install software for special needs.
**Third Generation (3G) network:** The mass telecommunication network built with third-generation mobile telephone technology. The services in 3G network provide both voice services (such as making a telephone call) and non-voice data services (such as Internet access, downloading information, exchanging e-mail and multimedia messages). These mobile access technologies (such as Enhanced Data rates for GSM Evolution [EDGE], 1x Evolution-Data Optimized [1xEV-DO], Universal Mobile Telecommunications System [UMTS], and High Speed Downlink Packet Access [HSDPA]) can provide higher data transmission speed for multimedia applications. The average speed is around 400 Kbps to 700 Kbps, with bursts up to more than a mega-bit per second (1000 Kbps).

**Worldwide Interoperability for Microwave Access (WiMAX):** The domain of working group number 16 of the IEEE 802 (IEEE 802.16) that specializes in point-to-multipoint broadband wireless access. Predictions suggest that WiMAX will take over the 3G networks and become the 4G wireless technology.
CHAPTER II

LITERATURE REVIEW

1. Introduction

This literature review chapter provides introductory information about the history of distance learning, electronic learning, mobile learning, mobile devices, and other related issues, thus establishing a rich context for the research study. Specifically, this literature review investigate issues related to (a) mobile technology and learning, (b) learning theories and mobile learning theories, (c) language learning with technology, and (d) second language learning with mobile technology. This chapter is expected to provide the basic and necessary insights for existing mobile technology and mobile learning and how a system could be developed a system for a second language learning based on the existing mobile technologies.

2. Distance Learning

Distance from the source of learning has always been an obstacle. Learning or more specifically distance learning has gone through changes over the ages, especially during the industrial and later information revolution. Here is a brief historical background of distance learning:

2.1 Distance Learning (dLearning)

The technologies – especially communications and transport - developed during the industrial revolution in the late nineteenth and early twentieth centuries, paved the way for
dLearning (Keegan, 2002). dLearning stands for distance learning, and it means offering tutorial services at a distance. A more detailed definition of distance education, often referred to as dLearning follows:

Distance education is education where teacher and pupils/students are separated by space and/or time. Technical media are used to impart knowledge and to make possible real two-way communication, in support of the process of teaching... (Stortingsmelding nr. 43, 1988-89).

A remark to Stortingsmelding nr. 43 is that distance education need not necessarily include the use of technical aids. Norsk Kunnskaps-Institutt (NKI), for instance, has offered Internet-based teaching since 1987. Previously, communication between the teacher and student was done by regular mail or phone.

Keegan (2002) characterized distance education by:

1) separation of teacher and learner
2) influence of an educational organization
3) use of media to link teacher and learner
4) two way exchange of communication
5) learners as individuals rather than grouped
6) educators as an industrialized form

dLearning offers students the opportunity to work or stay at home and study course materials when they find it convenient. Course materials took the form of printed material sent by post. This called for improved road and rail transport especially to marginal areas. Advancements in information technology in the 80s, lead to the introduction of audio-visual aids, cable and satellite that further enhanced the learning experience. Through the application of these new technologies, it then also meant that it would be possible to link several geographically dispersed locations simultaneously, and create a virtual classroom. Technology thus extended the dLearning experience from one that was solely individual to one offering group-based, face-to-face teaching at a distance (Keegan, 2002). Group-based dLearning is not limited to part-time
students. It can be used for the simultaneous dissemination of didactical content to full-time students at several locations. By providing the teacher with an array of technological tools it became possible - among other things - to be joined by experts from a remote location who would further enlighten students on various subjects (Chen, 2002). Such educational moments provide students with a better understanding of a given area, and aims at motivating the use of dLearning. dLearning has also allowed teachers to have a more flexible time schedule (Chen, 2002) as all teaching sessions could be stored on visual-audio aids and dispatched or broadcasted.

2.2 Electronic Learning (eLearning)

The electronics revolution in the 80s also marked the era of personal computing. Since then, we have witnessed technological advances in processor speed, and significant drops in the price of personal computers. Each new chip from AMD and Intel brings with it an increase in the performance to price ratio. Personal computers are now a ubiquitous commodity in homes throughout the developed world, and are increasingly gaining ground at institutions and homes in the developing world. Catalyzed by the introduction of the World Wide Web in the 90s, dLearning took a new dimension – eLearning. Klaussen (2002) attributes the “main change-over” from dLearning to eLearning as having taken place at that time.

The term eLearning is analogous to online education. Paulsen and Keegan et al. (2002) provide the following definition of this form of education:

Online education is characterized by:

1) The separation of teachers and learners which distinguishes it from face-to-face education
2) The influence of an educational organization which distinguishes it from self-study and private tutoring
3) The use of a computer network to present or distribute some educational content
4) The provision of two-way communication via a computer network so that students may benefit from communication with each other, teachers, and staff.

Brahmawong (2005) provides the following definition for eLearning:

eLearning is a system of learning in which ICT is used to support interactive two-way communication among learners and instructors. The combination of on-screen interactive (OSI) and web-based instruction is developed for effective teaching and learning in the form of digital and analog, synchronous and asynchronous, and on-line and off-line, and narrowcast or broadcast delivery systems.

One great advantage of the World Wide Web is that it is platform independent and supports several media types, for instance, audio and video. It is also available globally. From an educational perspective, it meant that teaching could now take place both synchronously and asynchronously (Keegan, 2002). The impact on students is that they may study course content from their computer screens, and thus are not dependent on being physically present at school. Time and place are no longer restrictions as the learning experience can be tapped anywhere one has a computer and access to the Internet. The teacher’s role is made more flexible in that they can now tutor from the confines of their offices or homes. Student-teacher / student-student interaction in eLearning is mediated through the use of e-mail, discussion forums, chat rooms and the like. The model in Figure 2.1 below illustrates how eLearning works: The screen is the computer screen where the students receive course content, student support services, have access to the web and other materials. The student may also communicate with the teacher or peers from here via e-mail, or a chat session, for instance.
eLearning, which includes online learning, web-based training, virtual universities and classrooms, digital collaboration, and technology assisted distance learning (Keegan, 2002), depends on the availability of a wired network connection to the Internet. This restricts its use among students and corporate professionals who are constantly on the move. However, with the current popularity of wireless networking technologies, the concept of learning at anytime, anywhere is slowly beginning to take shape. Keegan (2002) notes that the move from wired to wireless was already evident as we entered the new millennium. On the one hand, it may be argued the eLearners can overcome the “anywhere” limitation of eLearning by printing course content, and taking it along with them (Klaussen, 2002). On the other hand, they are still handicapped by the fact that they cannot access additional course content on-demand (Klaussen, 2002).
2.3 Mobile Learning (mLearning)

Wireless technology and the capability of being mobile while learning are the main features of mLearning. Coupled with the use of a hand-held wireless device and software / hardware solutions that make it possible to access educational content, students are exposed to a new educational experience, mobile education or mLearning. Experts in the field have offered different definitions for this form of education. The following quotes are obtained from “The future of learning: From eLearning to mLearning” (Keegan, 2002):

“The ability to receive learning anytime, anywhere and on any device” (Chabra, Figueiredo, 2002).

“The point at which mobile computing and eLearning intersect to produce an anytime, anywhere learning experience” (Harris, 2001).

mLearning – “it’s eLearning through mobile computational devices: Palms, Windows CE machines, even your digital cell phone” (Quinn, 2000).

Based on these definitions, and for purposes of this research, the following definition of mLearning is offered here:

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.

In defining mobile learning one confronts tensions between functionality and mobility. There is a continuum from the point of view of functionality in the devices used for eLearning
and mLearning. This continuum goes from desktop computers to laptop computers to PDAs or handhelds or palmtops to smart phones to mobile phones. There are many, especially in the United States of America, who include laptop computers in their definition of mobile learning. In defining “mobile learning” the focus should be on mobility. Mobile learning should be restricted to learning on devices which a lady can carry in her handbag or a gentleman can carry in his pocket. A mobile device is by this definition a hand-held, wireless device that is capable of showing web pages. The device may be a PDA, mobile phone or a hybrid.

Figure 2.2 below illustrates how mLearning works. The phone symbolizes a WAP enabled phone, smartphone or PDA. By means of a wireless Internet / intranet connection, students can receive course content located on a remote server, student support services and other material that constitute the overall educational package. The hand-held wireless device allows for student-student and student-tutor interaction. The main difference in this model compared to eLearning is that all communication is wireless.

Figure 2.2 Wireless learning environment of tomorrow (Source: Keegan, 2002)
mLearning not only breaks barriers, but also presents new challenges in the educational arena.

3. History of mLearning

The history of mLearning dates back to the introduction of PDAs during the 1990s. By 2000, it was already clear that the future would be wireless. M-commerce was already replacing e-commerce, there were wireless applications for banking, stock exchanges, business, and the home – the move to wirelessness in telephony and computing was irreversible.

The move to 3G, already rolled out in some countries and soon to be rolled out in many more, will enhance this transition to wirelessness. The establishment of 3G will consolidate the move to wirelessness in telecommunications. The justification of mobile learning and a solid foundation for this new sector of provision comes from the ‘law’ of distance research which states that ‘It is not technologies with inherent pedagogical qualities that are successful in distance education, but technologies that are generally available to citizens’. A typical example is the 12 inches laser discs of the early 1990s. These laser discs had excellent pedagogical possibilities and excellent courses were developed for them especially in the field of ESL (English as a Second Language), but they were not successful because not enough people owned one. Never in the history of the use of technology in education has there been a technology that was as available to citizens as mobile telephony. Mobile Phone (2006) estimates the total number of mobile phone users worldwide at 2.14 billion by the end of 2005 for a world population of just over 6 billion. IT Use – World and Asia (2005) estimates the number of mobile users in Thailand
to be 22 million by March 2004. And by the fact that in August 2006 the Ministry of ICT in Thailand decided to change the mobile phone number from 9 digits to 10 digits show that the number of mobile phones have reached 30 millions in Thailand. Sales will continue as ownership of the latest model becomes of social importance and multi-ownership is already an important phenomenon.

4. Mobile Technologies and Mobile Learning

Today’s phones and PDAs fit in our pockets and can connect us to a variety of information sources and enable communication nearly everywhere we go. It’s argued that these mobile technologies may enable a transition from occasional, supplemental use of desktop computers to frequent and integral use of personal mobile technologies (Soloway et al., 2001) to augment physical and situated learning (Roschelle & Pea, 2002; Roschelle, 2003).

Early results in mobile learning research have suggested that there are positive effects on learning with handheld computers (Crawford & Vahey, 2003). However, much of the research is driven by the technical capabilities of new devices and application of theory to the use of these technologies for educational purposes is lacking and educational potential of mobile technologies have been sparsely explored (Naismith et al., 2005; Klopfer et al., 2002).

One of the most effective means of support in the distance learning environment is to make contact with the learner, anything that will bring the lecturer and the learner closer together where there could be a “meeting of minds” (Lusunzi, 1998). As these students struggle to cope
with all this information as well as the demands of learning by a distance they come to realize that they need help, so much so that without intervention they might drop out (Molefi: 1999).

Through the support of mobile devices the learners’ throughput rates might be improved and the quality of the learning experience enhanced. Active learning might immerse where previously inactive studying took place.

5. Applications of mLearning in Universities

5.1 Kingston University (UK)

At Kingston University (UK) an experiment was undertaken to research the effectiveness of a two-way Short Message Service (SMS) campaign in the university environment (Stone et al., 2002a, b). The team has developed a system that sends SMS to students registered to the service. The content of messages is about their schedule, changes in it, examinations dates and places, student’s marks and etc. After registering the students were automatically separated in 5 different groups. One group was receiving announcements via e-mail, other 3 groups via SMS (but different interaction was necessary in every group) and the last – via web. The conclusions of the experiment were that the students in certain scenarios where a certain type of response is required preferred SMS as a medium to e-mail or web-based announces. They feel the data is more personal and they like this. SMS could be efficiently used in education (mLearning) as a complementery media. As the technology improves (i.e. EMS and MMS, potential more user-friendly interface) the potential increases too.
5.2 University of Helsinki

At the University of Helsinki the LIVE (Learning In Virtual Environment) experiments, made with SMS system and with WAP phones, were very positive (Seppälä 2002). The project went on by introducing digital imaging and sharing photos between the participants (teachers). The conclusions were that it is very possible that the introduction of MMS and the other 3G services in the large scene will lead to more and more possibilities for mlearning.

5.3 Sheffield Hallam University

Another project (Garner et al. 2002) on evaluation of a Short Messaging System (SMS) to support undergraduate students was done at Sheffield Hallam University, Norway. The experiment was with 67 undergraduate psychology students. The implemented system was for managing learning activities (to guide, prompt and support the students in their learning) rather than for learning. The findings were overwhelmingly positive, with students perceiving the system to be 'immediate, convenient and personal'.

Positive results were underlined and after the outcomes from a survey in Norway - almost 100% of the students in that University have cell phones and SMS system would be widely accepted (Divitini et al. 2002). Once again an SMS system was considered to be used to spread information about lectures and classes, corrections in the schedule and etc. In certain cases students find it more convenient than e-mail or WWW as the information reaches them in real time.
5.4 University of Birmingham

One of the biggest initiatives in the mLearning domain is the one of University of Birmingham – the HandLeR project at http://www.eee.bham.ac.uk/handler/default.asp. The project tries to understand in depth the process of learning in different contexts and to explore the lifelong learning. The stress is on communication and on human centered systems design. The main concepts they investigate are concept mapping and knowledge sharing, lifelong learning, wearable learning technologies and conversation between mobile learners.

5.5 Tampere University of Technology

Similar in some concepts to HandLeR is the project undertaken at the Tampere University of Technology, Finland (Ketamo 2002a) where PDAs are used for lifelong learning (mathematical education) of children. The study content is presented in the form of a game (again the idea of human-centered education is explored) where the pupils can communicate and help each other and the electronic device is used to measure the average students’ knowledge level and to adopt the speed of presenting new material to the learners’.

5.6 University of Oslo

To support “Problem-Based” Learning was the aim of KNOWMOBILE project in Norway (Smordal et al. 2002) where PDAs and smart-phones were used for experiment in medical education of students from the School of Medicine at University of Oslo. The students were put in different environment and were given different devices (some of the students were living together and were having PDAs with possibility to connect to each other; another group were able to connect between each other via Internet but were working in separate location, and so
on). After few weeks of experiment the team found out that the students are using the devices mainly to read information from the digital medical handbook (not to retrieve it via Internet as it was expected) and as communication device (to discuss problems with colleagues but mainly for sending SMS messages and to organize social events after hours). The research found that the reason for this was that even the medical students were eager to test the PDAs and investigate how they can be useful in learning they still had some technical difficulties. With proper guidelines and education the students could make it better so these problems are easy to overcome. They concluded that the PDAs should not be regarded as Personal Digital Assistants, but rather as gateways in complicated webs of interdependent technical and social networks.

5.7 Ramkamhaeng University

In Thailand, for the first time in September 2005, Ramkhamhaeng University in cooperation with Total Access Communication Public Company Limited (DTAC) introduced ‘RU Mobile Learning’ (dtac 2005) project which will be the new channel for university students and general people to access education via mobile phones. Ramkamhaeng University would be offering mobile learning to students through mobile devices besides their satellite and eLearning methods.

5.8 Other mLearning Research

Research on new forms/tools for collaboration is been going on in different institutions, schools and Universities. In few different projects people are experimenting on the collaborative conceptual mapping and notes-taking systems (Ketamo 2002b; Milrad et al. 2002). An example of such collaborative work is a project that took place at MIT (Klopfer et al. 2002). The team
uses PDAs to simulate the real environment (in the form of map) and to use simulation for a game, played by kids. They use PDAs equipped with GPS extensions. The idea is that the virtual world simulated on the PDA (which has the same geographical characteristics as real world) is “polluted”. Kids have to take “virtual” probes from the water and/or air in the polluted area or surroundings, analyze the results, interview people and read information about similar situations and finally find out how to sublimate the environment. During the game they collaborate by doing different probes and analysis and giving the results (reports) to their classmates or leaving them (probes and reports) in a certain place in the area (map), where other kids can find and use them. The kids have to collaborate because they are forced by time limitations.

Advanced wireless technologies (IEEE 802.11, Bluetooth, and GPRS) are used in a project for development of ad-hoc classroom and eSchoolbag system at the Aletheia University in Taiwan (Chang et al. 2002). The so called “Paperless education” is being observed together with the acceptance from the students (the term “paperless education” and research on the topic is made also at http://www.paperlessclassroom.org/). The traditional classroom was replaced by the new developed electronic tools (electronic blackboard, rubber, color chalk and so on). Pupils were strongly encouraged to communicate and to learn together (in groups).

Applications for recording the data and taking notes had been developed for Palms and the pedagogical effect of them is analyzed (Aleahmad et al. 2002; Slotta et al. 2002).

Again in Taiwan (Liu et al. 2002) students were equipped with network-connected PDAs and their achievements were shown on a whiteboard. The results from the pedagogical point of
view were again very positive (as the students were very shy they preferred to keep quiet and the teacher could not find out the real level of their knowledge). Compared with traditional classrooms virtual environment and technology motivate more participation and collaborative dynamics between instructor and learners.

6. Mobile Technology and Learning

Mobile technology is a fundamental infrastructure to support mobile learning. It is a rapidly evolving mobile communication technology that includes local area wireless networks by Wi-Fi; 3G telephony mobile networks; and related mobile devices such as smart phones, pocket PCs, ultra-mobile PCs, Personal Digital Assistants (PDA), and other handheld devices. Currently, most mobile devices can deliver multimedia contents, and relating 3G mobile networks can provide higher networking bandwidth that can support multimedia applications such as online gaming and audio/video podcasting and conferencing.

Wireless communication comes with the technologies used in both wide area networks and local area networks. Adachi (2001) indicated in his paper Wireless Past and Future that mobile communications systems used for mass communication have evolved from 1G voice application to 3G voice with rich media applications.

1. First generation (1G) systems: These were the first generation systems, and use analog technology for voice communication.

2. Second generation (2G) systems: Representative 2G systems are Global System for Mobile Communications (GSM) and Code Division Multiple Access (CDMA) networks. They use digital technology and support high bit rate voice, limited data communications (such as Short Messaging Service), and different levels of encryption.
3. 2.5 G system: An example of this system is General Packet Radio Service (GPRS) network. It addresses the “always-on” capability that allows the customer to receive content or services without manually invoking a service or transaction. It permits users to send and receive data at speeds of up to 115 Kbps.

4. Third generation (3G) systems: Representatives of 3G systems include Wideband Code Division Multiple Access (WCDMA), which is also known as UMTS in Europe, EV-DO, and 1xRTT. These systems have become distributed worldwide in recent years. 3G systems have improved system capacity, reliability, extended services, and significantly higher data rates. These mobile communication systems can provide higher speeds up to 2 Mbps in a fixed or stationary wireless environment, and speeds to 384 Kbps in a mobile environment. (Jamalipour & Yabusaki, 2003)

Popular wireless technologies used in local area networks have the following facts in networking bandwidth and communication distance (wirelessdictionary.com, 2006):

1. Infrared (IrDA): A cordless data connection uses infrared light with data speeds of up to 4 Mbps for fast Infrared, or 115 Kbps for Serial Infrared. Distance and lighting can prevent two units from talking, and most units do not work reliably beyond 12 to 24 inches.

2. Bluetooth: Short-distance radio-based technology that operates at 2.4 GHz on the ISM (industrial, scientific, medical) band with maximum operating range about 10 meters and data speeds of up to 721 Kbps.

3. WiFi (802.11b): Operates in the 2.4 GHz frequency band and supports bandwidths of up to a maximum of 11 MB with a range of about 150+ feet (bandwidth decreases with the range).

4. WiFi5 (802.11a): Operates in the 5-GHz radio spectrum and supports rates up to 54 megabytes per second with a range of about 150+ feet (bandwidth decreases with the range.) Here, 802.11b and 802.11a are not interoperable or compatible.

These are the different communication bandwidths (speeds) and distances provided by each technology, and the mobile applications are basically limited by those two factors. For example, the wireless connection provided in an airport or public area is using the Wi-Fi
technology, and the short messaging service is using GPRS or 3G technology. The more networking bandwidth, the more online learning applications are feasible (i.e., video conferencing). In addition, mobile technology provides “wearing” computing ability that invites convenient participation in learning environments anytime and anywhere, such as surfing mobile Web sites. It introduces a ubiquitous learning environment that enables educational swarming at a planetary level. These features make mobile technology a key role in further enhancing online learning experience with the dynamics of enhanced expression and added convenience in cyberspace.

Mobile devices used for mobile learning have integrated features that are defined by a number of characteristics. They support learning activities that need just-in-time or just-for-me help. Learning material (content) is presented in short (small) chunks in time and sequence. An audio-video format, with emphasis on audio content applications such as podcasting, is incorporated for the main learning content. Lastly, these mobile devices include text messaging and multimedia messaging capability for an alternative style of communication. As an example of mobile device, Mobile Whack (2006) described the benefits of multimedia features incorporated into their Treo™ 700w Smart phone. According to Mobile Whack’s review, this mobile phone has shortcomings in a low memory ceiling and a low resolution screen. It has an organizer, and includes features for e-mail, messaging, Web access, and connecting wirelessly to other Bluetooth devices. Optimized for multimedia, the Treo™ 700 is a music player, video recorder, and camera all-in-one. A digital camera can be used to take pictures and send them on the fly and capture moments on video and play them back on the screen or send them to friends via email or Multimedia Messaging Service. A MultiMedia Card/Secure Digital Card expansion
slot is provided for extra storage space, allowing for adding even more pictures, video clips, music, e-books, games, and memory.

In responding to the needs of mobility and related challenges, the development of mobile technologies keeps growing and evolving. A newer broadband wireless technology called WiMAX is coming soon in 2008-2009. This technology theoretically provides single-channel data rates up to 75 M bits per second (Mbps) on both the uplink and downlink, compared with 11-54 Mbps for Wi-Fi local area wireless connection; and 115-500 kbps for 3G mobile networks, such as EV-DO or W-CDMA (Vaughan-Nichols, 2004). In addition, 4G mobile communications are developing as the next generation of wireless networks that will replace 3G mobile networks sometime in the future (Lu, Walke, & Shen, 2004). These higher speeds’ wide area mobile networks and rich media capabilities’ mobile handheld devices have built up a very strong infrastructure to support mobile learning in education. Benefits applicable to mobile learning include enhancements for educators to seize teaching moments and better facilitate collaborative learning opportunities (Shih, 2005). Learners now have access to anytime-anyplace, 24/7 learning; enhanced motivational support through Push Technology; and ongoing opportunities to create an active learning environment for their learner group. An overall benefit of mobile learning is the potential for increased effectiveness in the student-centered learning environment.

7. Podcasting

7.1 Definition

Podcasting is a way for the distribution of multimedia data (usually audio) over the Internet. “Pod-” is a reference to the Apple iPod. However, the iPod’s name in podcasting is due
to the dominance of the Apple iPod hardware in the MP3 player market. In general, podcasting can be done with any kind of device which enables audio replay – including mobile MP3 players, smart mobile phones, PDAs, laptops, as well as traditional desktop computers (Windows or Linux PCs and Macs). The ending “-casting” is derived from broadcasting. However, in contrast to broadcasting, podcasting usually downloads the respective content to the user’s device for local or mobile replay. These downloads can be initiated manually but more often, users subscribe to so called podcasts, i.e. document collections or “shows” that are normally focused on one particular topic. New documents or “episodes” are then downloaded automatically and uploaded to, for example, a mobile MP3 player as soon as this device is connected to the respective computer. The concept of podcasting dates back to the end of the year 2000 but really took off around 2004 (Wikipedia 2006a). In fact, the New Oxford American Dictionary declared “podcasting” the 2005 word of the year and, according to Wikipedia (2006b), defined it as “a digital recording of a radio broadcast or similar program, made available on the Internet for downloading to a personal audio player”. However, today podcasts are not only limited to audio content but include multimedia data, such as slide shows with synchronized audio replay and video for mobile multimedia players (such as the new video iPod from Apple) as well. In the same way as podcasting is not limited to any particular replay device, its realization is not based on proprietary technologies but builds on common, standardized approaches for media creation and delivery, such as RSS 2.0 or Atom for the subscription of podcast shows. The main reason why podcasting has gained such a tremendous popularity is the integration into a whole concept together with tools that support easy production, hosting, and distribution services on the producers’ side, as well as easy subscription, automatic download (to a computer) and upload (to a mobile player), and easy organization on the consumers’ side.
7.2 The Usage

Podcasting provides trainers and teachers with powerful, personal tools for delivering exactly the right content to learners at the right time - anytime, anywhere. The strength of podcasting lies in the potency of voice communication, which cuts through the dense text of the Internet and offers a human connection during distance training.

Figure 2.3 Podcasting – From the producer to listener

I: Record and edit your podcast contribution. Create an audio file with a microphone and a recording software, i.e. Audacity (Open Source) on your computer. Convert it to space preserving and widespread MP3 or AAC format.

II: Place your contribution on a webserver. Additionally create a RSS (XML structure) file which contains a description and the URL's (links) to the audio or video files.
III: A podcast client software on the subscriber's computer keeps the user informed about new episodes and manages the data transmission.

IV: Synchronize your mobile device with the podcast client software on your computer.

7.3 Podcast Client Software

Podcast client software lets users subscribe to and manage podcasts. Podcast clients or podcatchers” exist for many platforms. Besides software for computer platforms (Windows, Linux, MacOS) there also exist implementations for many mobile devices (Pocket PC, Palm, Smartphone, Symbian Phones memory cards and USB sticks). Listeners don’t need to buy new music player gadgets, they can use the device they already have.

Subscribing to (or unsubscribing from) a podcast is very easy. The listener only has to copy a weblink (feed URL) to the preferred podcatcher software (or simple deletes the link). Normally the software runs as background service on a PC and reviews the feed URL after a specified interval. Users can choose to update podcasts at a specific time (for example every day or every six hours). If the feed data has substantively changed from when it was previously checked, the program locates the new contributions and automatically downloads them to the subscriber’s computer or even to the mobile device. With podcast technology the explicit download driven by the user can be eliminated as the data is automatically handled on the receiver’s end and downloaded to the playlist of the playback device as long as the receiver is
subscribed to the cast. The latest updates are always readily available with no effort required by the listener.

Training and Development (T&D) experts forecast that podcasting will be a solution to many training problems. Weinstein (2006b) presented predictions from six training and development experts about training in 2006, and three of the six experts specifically mentioned podcasting as an emerging technology. In addition, the experts expressed consensus that in 2006, more learning will be chunked for delivery in snippets to be received by learners who are multitasking. They agreed that learners will want customized learning options to maximize the benefits from each moment invested in training. Podcasting is a natural fit for these expectations because of its unique attributes.

7.4 Enhanced Podcasts

Enhanced podcasts do not only contain audio information, but also integrate new data information that can be synchronized to the audio information. For example an image or an URL can be shown at a certain time concurrently to the audio information in a synchronized manner. There are software tools available to support the production process as well as the consumption of enhanced podcasts. Most of them are free- or shareware. Like usual podcasts, enhanced podcasts can be used on different platforms and devices. Players are available for Windows or Mac computers as well as for mobile devices.

Enhanced podcasts based on recorded lectures offer a very interesting approach to support the ubiquitous learning process. With the combination of a fine granulated structure of a
recorded lecture, an enhanced podcast allows a very precise navigation to specific content of a lecture that can be used anytime and anywhere.

### 7.5 Video Podcasts

The next generation podcasts are called video podcast (or vodcast, videocast). Vodcasts are the video equivalent of a podcast and contain, as the name implies, video information instead of audio. Video podcasts can contain downloadable video files but also streaming sources. Therefore it is more difficult to create a vodcast than a simple audio podcast.

The problems with the comprised multimedia contents are versatile and it is a big step from a simple audio podcast to the video content in a videocast. Producers have to keep in mind, that there are a lot of different video codecs, formats and also resolution diversities. As a result the production and distribution depends on the capacity and features of the client device.

This seems to be one of the reasons why audio podcasts are more popular than video podcasts. Nevertheless the automatic download step of the latest episodes is certainly again a very important feature, because subscribers don’t have to select items or channels on their tiny hardware displays. The video content in a vodcast can also be split into chapters. Some podcast clients can navigate through the created chapters. An adversarial problem is presently that mobile devices (like the video iPod) cannot use this video chapter features.
7.6 Podcatching Basics

With the newest *iTunes* (2006) software (versions 5 and higher) or any other synchronizing software, podcatching is easy and free by just plugging an iPod or other MP3 player into a personal computer. It is just enough to create (or log in to) the *iTunes* account and search the podcasts tab of the music store or any site offering podcasting. Subscribing to a store or podcasting site allows automatic downloading.

One can be a podcatcher even if not having an iPod or other MP3 player. Podcasts can be played on the computer or saved on a CD. For more information about podcatching, visit the Apple Computer *iTunes* Podcast page (Your favorite, 2006).

7.7 Podcasting Basics

Creating a podcast involves several steps. The first step is to plan the podcast. During this step, a script is written and music and sound effects are selected. Smith (2005) advised podcast creators to plan the not only the content but also the “tone, inflection, emphasis, and pace” of the performance (p. 32). Smith included three key tips for podcasting success: keep the podcast short; make longer messages modular; and pay attention to simple elements of spoken presentations.

The second step is to record the voice file. A microphone can be used with the MP3 player, PC, or digital voice recorder for this step. The third step is to mix a voice file with music and sound effects and save it in MP3 format (32 kbz is the lowest quality for MP3 players to
work). Audacity (2006) is a well-known free open source audio mixing package; however, many commercial home studio packages also provide this functionality.

The fourth step is making the new MP3 file available and creating the RSS feed. To accomplish this, one must post the MP3 file in a web folder on a web server. Then create the feed. FeedBurner (2006) is one free tool you can use. Once the RSS feed is created, the RSS feed must be tested. Feed Validator (2006) is one option. Step by step instructions are available via the Podcasting News website (Making a Podcast, 2006).

Once this work is done, the podcast could be announced to the world by submitting its feed to several podcast directories, like Podscope for example. Each time a podcast is updated with a new episode, a ping service must be used, such as Fresh Podcasts to export the new update to subscribers. Basic information about these steps is available on wikiHow (How to Start Your Own Podcast, 2006).

7.8 Podcasting and Beyond

Regardless of the challenges, podcasting is already proving to be a valuable tool for teachers, trainers, and learners as evidenced by the examples listed in articles by Weinstein (2006a), Wilson (2006) and Balas (2005). Clyde (2005) cited a Pew Internet report, “More than 22 million American adults own an iPod or an MP3 player, and of those, more than six million have listened to podcasts or downloaded web broadcasts” (p. 54). As more and more people have the technology and skills to use podcasts, trainers and learners can benefit from the human voice connection, time-shift and multitasking capabilities, and the relative ease of receiving and
creating podcasts. Podcasts can extend the classroom into learners' daily down-time when text cannot be used.

Mobcasting may become the next generation of podcasting. Clyde described mobcasting, which involves podcasts delivered to mobile phones, and she predicts that the term podcasting will give way to new terms—like webcasting and screencasting—which more accurately reflect the fact that podcasts are not restricted to iPods. In addition, Balas (2005, p.32) mentioned vodcasts—podcasts with video components—as an emerging application. Wood (2003) suggested that Gameboys may be the next entertainment technology co-opted for training purposes and O'Keefe (2005) cautioned that for all these new applications to be effective, the content must be “reengineered to suit the smaller screen size, reduced memory capacity and lack of a keyboard.” Since 2000, the term mLearning has been catching on. This new umbrella term describes all these evolving mobile instruction options. The day cannot be far off when mLearning is as common as eLearning is today.

8. Mobile Language Learning

Applications for mobile learning are on the rise and mLearning is both fast and convenient. It provides a unique learning system that ensures more time will be spent on actual learning rather than on the methods of organizing in preparation for learning.

One of the first projects using mobile phones in language learning was developed by the Stanford Learning Lab (Brown, 2001). Specifically, they developed Spanish study programs utilizing both voice and email with mobile phones. These programs included vocabulary
practice, quizzes, word and phrase translations, and access to live talking tutors. Their results indicated that mobile phones were effective for quiz delivery if delivered in small chunks; they also indicated that automated voice vocabulary lessons and quizzes had great potential. Their tiny screen sizes were deemed "unsuitable for learning new content but effective for review and practice" (Thornton & Houser, 2002, p. 236). Live tutoring was also effective, but poor audio quality was judged to potentially affect comprehension adversely.

Thornton and Houser (2002; 2003; 2005) also developed several innovative projects using mobile phones to teach English at a Japanese university. One focused on providing vocabulary instruction by SMS. Three times a day, they emailed short mini-lessons to students, sent in discrete chunks so as to be easily readable on the tiny screens. Lessons defined five words per week, recycled previous vocabulary, and used the words in various contexts, including episodic stories. Students were tested biweekly and compared to groups that received identical lessons via the Web and on paper. The authors then explored usability and learning issues. The results indicated that the SMS students learned over twice the number of vocabulary words as the Web students, and that SMS students improved their scores by nearly twice as much as students who had received their lessons on paper. Students' attitudes were also measured. The vast majority preferred the SMS instruction, wished to continue such lessons, and believed it to be a valuable teaching method. The authors theorized that their lessons had been effective due to their having been delivered as push media, which promote frequent rehearsal and spaced study, and utilized recycled vocabulary.
Tony McNicol (2004), a self-starter from Tokyo, Cerego Japan, believed that there is a huge potential for smart learning software. He gathered psychologists, cognitive neuroscientists, and information scientists to foster learning with technology. Some of these technologies included mobile phones that played short audio clips in English to help with pronunciation for English as a Second Language (ESL) students. The goal of mobile learning is not to replace the traditional classroom environment but to enhance it. Another goal is to educate teachers in how to implement mobile learning and create a great classroom experience. The mode of delivery for mLearning is not important because it is clear that the potential is significant. It is predicted by some scholars that in the future students will depend significantly on their mobile devices or other wireless technologies. Students will bring their mobile devices to school to enhance their individual educational experiences (McNicol).

Mobile Internet technology embedded in cell phones is opening wide the doors to learning opportunities. Technology is credited with removing much of the cognitive burden of organizing a study structure, thus allowing the student to primarily focus on learning. McNicol (2004) described how 10 million Japanese are tuning into learning English with mobility, and at their convenience. It seems that mobile technologies have become more of an extension of the individual and are increasingly perceived as a necessity for life and learning.

Experiments in Japan on mobile language learning revealed that the learning content is best configured in short learning units or sessions. For instance, a unit on language vocabulary would fit the capabilities of mobile devices for learning in a brief period, such as 5 minutes’ time. Another helpful feature to include in mobile language learning is customization of learning.
to fit individual needs and learning experience (McNicol, 2004). While accommodating adaptive mobile learning will entail more computing and programming efforts, learning in this way will continue to enhance mobile learning experiences and learning outcomes.

Several other free and commercial mobile language learning programs have become available during past couple of years: the BBC World Service Learning English section offers English lessons via SMS in Francophone West Africa and China (Godwin-Jones, 2005); and an EU-funded initiative known simply as ‘m-learning’ provides English lessons directed towards non-English speaking young adults. The goal of such programs is to engage new kinds of learners (e.g., young, disabled) in a time and place of their preference (Godwin-Jones, 2005). Norbrook and Scott (2003) suggest that portability and immediacy, rather than localization, are the essential motivating factors in mobile language learning. Further, lessons are provided in bite-sized format, a fact appealing to busy students (McNicol, 2004). Lessons are typically delivered several times a week or even daily, include translations, and provide options for further context-based applications.

9. Educational Theories

This section looks at two educational theories and their application to mobile learning.

9.1 Bloom’s Taxonomy

In 1956, a group of educational psychologists led by Dr. Benjamin Bloom, set out to develop a classification of levels of intellectual learning behavior. The classification consisted of three overlapping domains:
1. *Cognitive domain*, which is concerned with knowledge and the development of intellectual attitudes and skills;

2. *Affective domain*, which is concerned with emotion as well as values, and

3. *Psychomotor domain*, which is concerned with things that students might physically do. These are principally manual and physical skills. In other words learning through physical practice (Doyle, 2001).

Each of the domains in the taxonomy described above is further divided into sublevels. The focus here is on cognitive domain. The cognitive domain has six educational objectives, which range from the simplest to most complex behavior:

1. **Knowledge.** At this level one is capable of recalling previously learnt material. It is the simplest of the six educational objectives;

2. **Comprehension.** This level measures one’s ability to understand and interpret material;

3. **Application.** Upon reaching this level, the learner should be capable of putting the knowledge gained into practice;

4. **Analysis.** The learner is capable of identifying constituent parts that make up the topic at this level;

5. **Synthesis.** This marks the level where the learner uses previously learnt ideas to create new one, and
6. **Evaluation**, which is the most complex level. The learner is capable of independent judgment on a subject matter presented before him or her. Based on his or her evaluation, they select the best course of action (Doyle, 2001).

The simpler behavior must be mastered in order to move to the next level. The six educational objectives can thus be presented in the form of a pyramid or hierarchy as shown in Figure 2.4 below. Knowledge is the foundation upon which all other levels build.

The six levels presented in Figure 2.4 were created with the traditional classroom in mind. For mobile education to be useful, it should be capable of supporting at least one of these levels.

![Figure 2.4 Bloom's taxonomy (Source: Doyle, 2001)](image)
Topland (2002, p.14) identifies how mLearning may contribute to the learning process at each level in Bloom’s taxonomy. In higher education, particular attention has to be taken to develop the learner’s analysis, synthesis and evaluation of material. A student could thus, for instance, use the mobile device as a supplement to other study methods before selecting the best course of action for solving a given problem (level 6). Projects such as Knowmobile project (Lundby, 2002) provide real-life examples of the use of mobile devices during medical student internships at local hospitals in Norway. Although students in the project did not find it convenient to use the PDAs to solve all their medical tasks, it provided them with a quick and convenient way for just-in-time (level 3) access to information sources and an alternative channel for interacting with colleagues (Lundby, 2002).

In order to effectively support the different levels of Bloom's taxonomy, user friendly mobile devices and adequate underlying technologies have to be in place.

By Blooms framework, mLearning might improve learning processes on every level by:

• Provide repetition-service on learned subjects (level 1)
• Provide tests on learned material (level 2)
• Give Just in Time (JiT) learning that the learner can use in a practical situation (level 3)
• Provide background-information so the user can evaluate the relevancy of data to the specific situation (level 4)
• Give tools that help the user to develop new documents or projects (level 5)
• Give the user different information on the same subject to let he/she evaluate/judge what information that is relevant (level 6)
9.2 Online Teaching System

Paulsen (2002) makes reference to Verner's work in which three components that constitute the process of adult education are identified: methods – organizing people for learning, techniques – helping the participants to learn, and devices. He also cites Stubbs and Burnham's model for an electronic distance education system in which electronic devices play a major role in facilitating teaching, learning and the dissemination of course content, where the tutor and student are separated by time and space (Paulsen, 2001). By applying this model to an online teaching system, Paulsen (2001) presents a new model that not only seeks to address the weaknesses in that presented by Stubbs and Burnham, but also focuses on the student (see Figure 2.5 below).

![Figure 2.5 Model of an online teaching system (Source: Paulsen, 2002)](image-url)
The main components in the model are the learner (or student), teacher, content, methods, techniques and devices. For online education to be effective there must be a perfect interplay between each of these elements. Like in any system, its effectiveness depends on limitations placed on it by the system environment (Paulsen, 2002).

Parallels can be drawn to mobile education based on the model above. The focus in this section will be on the role of the actors and interpersonal relationships that exist between them, with mobile technologies as the medium for communication. It should also be observed how mobile technologies affect how actors in mobile education work.

The teacher’s role in mobile education is a facilitator in the learning process. The main challenge is to provide pedagogical support to mobile students independent of time and location (Fageberg et al., 2002). To do so, changes in the way the teacher works are essential. Tight classroom schedules are non-existent and most educational content is readily available to the tutor on the mobile device or can be accessed using a wireless Internet connection (Sariola, Sampson, et al., 2002). These possibilities allow for a great degree of flexibility and interactivity that is important in adult student education (Paulsen, 2002). Other studies indicate that the use of mobile devices in education facilitated communication with colleagues in addition to allowing them to search the web for resources (Shotsberger & Vetter, 2001). Shotsberger and Vetter note that when teachers interact synchronously while surfing the web for resources, they can plan lessons that incorporate web resources more effectively, while drawing from the experiences and insights of a large pool of teachers. These possibilities may contribute to a better quality of material that is presented to students as it allows the teacher to exchange views on different
topics. It also gives the teacher a light tool to use for personal research and collaboration with students and peers when they are not within the confines of the educational institution.

The student's role is that of an information seeker. To assist them in realizing this objective, wireless data solutions allow them to access a wide range of internal and external learning resources. The former encompasses educational materials that are copyright material produced by the school, while the latter refers to freely available (or in some cases may require a fee) web resources (Paulsen, 2001, p. 203). Exposure to the Internet "enhances the learning experience by increasing student-instructor and student-student interactions" (Shotsberger & Vetter, 2001). In addition, students can establish learning communities with individuals who share similar interests, but who are not students at the school. According to Sariola (2001), mLearning also offers students the opportunity to conveniently interact with researchers particularly in authentic research situations. mLearning may thus have a place as a useful tool in experiential learning. However, its use as a tool in learning science subjects is limited, as one cannot have the same experience as that derived from physically working in a laboratory. Batista (2000) states that students equipped with mobile learning devices will spend less time in the library. With all study material readily available on mobile device, students no longer need to spend much of their time in the library looking for academic resources. This raises important issues with regards to student-computer ratio (Hansen, 2002). An increase in the number of those adapting mLearning will free more library resources, such as computers connected to the Internet, to other students or teachers. Other research indicates that when students use mobile devices as a learning tool, the response rate to the tutor's questions is much higher than in a traditional classroom (Shotsberger & Vetter, 2001). Increased responses have a double effect: It
enables reserved students to participate more actively in discussions (Paulsen, 2001, p.100) and it provides the tutor with better feedback on how well a given topic has been understood (Shotsberger & Vetter, 2001). In effect what this means is a higher quality of service for the student as the teacher can adapt his study methods to cater for the students who seem to have problems with certain areas of the syllabus. In summary, one can say that mLearning makes the student’s total learning experience very flexible.

Students are assumed to study more often, but for shorter periods because it only takes seconds to get set up and ready for studying the mLearning way. Studying often and for shorter periods of time may give pedagogic advantages such as improved focus and better concentration on the subject. However, it cannot be assumed that the student will memorize very effectively because studying this way can be very stressful. The educational institutions might provide cheaper courses. The number of available courses will possibly increase because the institution does not have to provide facilities for the teaching to take place and the classes can include, in theory, an unlimited amount of students. The cost of engaging a teacher who does his work at home and gets paid per corrected/reviewed report or per answered enquiry is very cost efficient in that the costs are bound to the specific amount of students. This means that the institution may run a course with only ten students, because the cost is not a problem when the course already has been developed.

9.3 Active Learning Theories

Most of the time, in a typical classroom setting, students are involved only passively in learning, i.e., in listening to the instructor, looking at the occasional overhead or slide, and
reading (when required) the text book. Research shows that such passive involvement generally leads to a limited retention of knowledge by students, as indicated in the 'cone of experience' shown in Figure 2.6.

Active learning involves students directly and actively in the learning process itself. This means that instead of simply receiving information verbally and visually, students are receiving and participating and doing.

![Figure 2.6 The Cone of Experiences (Source: Dale, 1969)](image)

The NTL Institute of Applied Behavior Science has come up with the “Learning Pyramid” which shows approximate retention rate in various mode of learning as shown in Figure 2-7.
Figure 2.7 The Pyramid of Learning (Source: National Training Laboratories. Bethel, Maine).

10. Technology Acceptance Model (TAM)

10.1 Definition

TAM is an extension of Ajzen and Fishbein’s theory of reasoned action (TRA). It was developed by Fred Davis and Richard Bagozzi (Bagozzi et al., 1992; Davis et al., 1989). TAM replaces many of TRA’s attitude measures with the two technology acceptance measures—ease of use, and usefulness. TRA and TAM, both of which have strong behavioral elements, assume that when someone forms an intention to act, that they will be free to act without limitation. In the real world there will be many constraints, such as limit the freedom to act (Bagozzi et al., 1992).
10.2 TAM Usage

According to Taylor and Todd (1995), the innovation diffusion and acceptance can be approached from several levels. Some researchers have approached the situation from a macro-view within a societal context or at country level. Other researchers have examined this issue at an organizational level and still other researchers have approached this issue by investigating the determinants of adoption and usage by individuals (e.g. Mathieson, 1991).

Taylor and Todd (1995), further distinguish the research on the determinants of information technology usage into two streams: those based on intention-based models, exemplified by such theories as TAM, and diffusion of innovation, best exemplified by Rogers’ diffusion of innovation theory (Rogers, 1995).

TAM proposed by Davis, Bagozzi, and Warshaw (1989) to explain computer usage behavior is one of most-widely used model in this issue of technology adoption. The TAM has received extensive empirical support through validations, applications, and replications (Mathieson 1991; Plouffe, Hulland, and Vandenbosch 2001; Legris, Inghamb, and Collerettec 2003). It was adapted from the Theory of Reasoned Action (TRA) which was developed by Ajzen and Fishbein (1980) which is very general. TRA is “designed to explain virtually any human behavior” (Ajzen and Fishbein, 1980) and consist of two factors that affect behavioral intentions; attitude towards behavior and subjective norms. Attitude is defined as an individual’s positive or negative feeling towards performing a behavior. Subjective norm is the individual’s perception of social pressure to perform the behavior.
The TAM proposes two specific beliefs—perceived ease of use (PEOU) and perceived usefulness (PU)—that determine one’s behavioral intention to use a technology. Behavioral intention is a measure of the strength of one’s intention to perform a specified behavior. Figure 2.8 shows the TAM.

Perceived usefulness is defined as “a prospective user’s subjective probability that using a specific application system will increase his or her job performance within an organizational context” (Davis, Bagozzi, and Warshaw 1989). Further, the TAM assumes that perceived usefulness will be influenced by perceived ease of use, because, other things being equal, the easier is a technology to use, the more useful it can be.

Perceived ease of use refers to “the degree to which the prospective user expects the target system to be free of effort” (Davis, Bagozzi, and Warshaw 1989: 985). By assuming that other variables are constant, the easier is a technology to be used, the higher is its possibility to be adopted by users.
10.3 TAM for mLearning

The dissertation by Eija Kaasinen (2005) studies user acceptance of mobile services - based on a series of case studies mobile Internet and location-aware information services targeted at consumers and accessed mainly by mobile phones. A technology acceptance model for mobile services has been proposed on the basis of the results of the case studies. According to the model, user acceptance is based on three factors: perceived value of the service, perceived ease of use, and trust. A fourth user acceptance factor is, perceived ease of adoption, is required to get the users from intention-to-use to actual usage as shown in Figure 2.9. Based on the TAM for mobile services, design implications for each user acceptance factor are proposed:

User acceptance is crucial to the success of new technologies, but it difficult to predict. User acceptance of new technologies that are not just incremental improvements on existing ones but cause remarkable changes in peoples lives – so-called disruptive technologies – is especially hard to predict because these technologies may take decades or longer to undergo the transition into everyday objects (Norman, 1998). However, some technologies, i.e. short message services on mobile phones, got adopted very quickly even without significant marketing.

![Figure 2.9 Technology Acceptance Model for Mobile Services as an extension of TAM by Davis](image-url)
The technology acceptance model has been evolved and applied widely, but mainly in the context of introducing ready-made products rather than in designing new technologies. However, Davis himself together with Wenkatesh also encourages using the model as a design tool (Davis and Venkatesh, 2004).

11. Summary

Initial results on the use of mobile technology, such as those reported in Mlearn 2001, 2002 and in the 2002 IEEE workshop (Milrad, Hopper and Kinshuk, 2002) have been encouraging. Researchers have suggested, for example, that mobile learning enhances autonomous and collaborative learning (Cereijo Roibás and Sánchez, 2002), and that it can be applied to a wide age range of students (Inkpen, 2000; Perlin and Fox, 1993; Sharples, Corlett and Westmancott, 2002 and Soloway, Norris, Blumenfield, Fishman, Krajcik and Marx, 2001).

As mobile technologies continue to evolve, portable mobile phones have become social staples. Mobile learning is a growing subdivision of the eLearning movement, and is further evidenced by European initiatives, such as mLearning, Mobilearn, and other mobile learning projects worldwide. Challenges related to the use of mobile technologies in education include support frameworks in educational institutions, administrative and faculty training, secure mobile learning access, appropriate instructional design, and student adaptations in learning styles for mobile learning.

In this literature review, the researcher considered existing research findings regarding use of mobile technologies for learning, pedagogical changes, and other noteworthy shifts within
mobile learning environments. Also reviewed were evolving mobile learning theories and instructional designs for delivering mobile language learning content.

Each learning environment, from a traditional classroom to a handheld mobile learning device, has contributed to advancements in learning. Each has strengths and weaknesses in a given educational market (i.e., the traditional online learning environment needs a physical site with wire connection to the Internet; the mobile or ubiquitous learning environment is portable without constraints of time and place, and would be situated, content-aware, and motivated for learners). For a foreign, second language learner, it means that educators can take into consideration rich media features (voice recording, video capturing, multimedia messaging, digital storytelling, moblogging, and podcasting/celcasting) and diverse messaging communications (instant messaging, email, and Web access) provided by mobile technologies to engage language learners and to improve their language learning experiences.

As emerging technologies continue to enter the market, it is imperative that timely research continues to elicit crucial data and information regarding their use and impact on teaching and learning, such as user-friendly interface and operation, netiquette, the digital divide, and instructional practices. The impact and effectiveness of applying mobile technologies in second language learning is no exception and worth further exploration.

12. Lessons Learned

By reviewing the literature available to this researcher on mLearning, this researcher learned that though there have been some experiments with positive result on learning English
using podcasting (audio only) and SMS (text only), there has not yet been any academic research on use of multimedia where multi senses are engaged in learning for the purpose of learning English using mobile devices. This provides a good opportunity to conduct a research and development of a courseware for learning English as a second language. Adobe Flash Lite is one of the most popular and widely available applications for this purpose.

Another important lesson learned is that courseware on mobile devices should not be lengthy and allows the user to be in control of the lesson.
CHAPTER III
RESEARCH METHODOLOGY

This chapter explains the methodology of the study and the survey conducted among students to explore their attitudes toward mLearning. It also describes the purposes of the study, research questions and hypotheses, research design, selection of participants, research procedures, instruments, learning platforms, data collection and analysis, expected findings, and ethical issues.

1. Purpose and the objectives of the Study

The purpose of this research was to design and develop a Flash-based mobile learning system for English as second language (FML4ESL) using mobile devices capable of playing Adobe Flash Lite.

The objectives of this research were as follows:

1) To analyze the existing mobile learning systems in learning a second language.
2) To develop an mLearning system for learning English as a second language.
3) To identify components needed for an effective FML4ESL.
4) To evaluate the FML4ESL system in a simulated situation.

2. Research Design

This research was a multi-disciplinary type of research consisting of 3 distinct components or phases.
The first phase of this research was to design and develop an mLearning system for learning English as a second language using Adobe Flash Lite programming for mobile devices. This developed system was the engine or the operating system for mobile language learning. In this section, the expert opinions of professional English lecturers experienced in teaching English as a second language had been sought to prepare the contents. The need assessment of students had also been sought before developing the English lessons for this system. This phase of the research is considered as ‘Research Design’ in IT terminology where an IT artifact is designed and developed, more often it is also called ‘Research and Development’ or R&D.

The second phase of this research was to try out this Flash-based mobile system developed in the previous phase in order to evaluate its usefulness and effectiveness in learning English as a second language. In this phase, sample students owning Flash-based mobile devices were recruited to try out the Flash-based mobile system. Pretest, posttest, surveys, and interviews had been organized to collect data related to students’ performance in English learning and their attitudes toward mobile English learning.

The third and the last phase of this research was to analyze the data gathered in the second phase in order to explore the attitude of students towards learning English on their mobile devices and to evaluate the usefulness of the developed Flash-based system. Both quantitative and qualitative methods forming a mixed type of research have been utilized to analyze the data. Based on the analysis of data, conclusions were made indicating the strengths and weaknesses of the developed system and recommendations on how to improve the system.
As part of the research methodology of this thesis, the proof of concept is demonstrated by measuring the impact of the proposed system on student learning. Such impact is defined by the accumulation of transformation that occurs in the learners as a result of using the proposed system for learning English as a second language.

2.1 Type of Research

This research basically falls into the R&D research category where an IT artifact is developed, tested, and improved. Selecting a research methodology is important due to the fact that the choice of research practices depends upon the questions asked, and the questions depend on the context in which the research is conducted (Denzin & Lincoln, 1994). There are relative tradeoffs in information between quantitative (numeric) and qualitative (verbal) research methods. Mixed research is a type of research where quantitative and qualitative methods and techniques are mixed in one overall study, and where the possibilities for mixing are almost infinite. Johnson and Onwuegbuzie (2004) indicated that mixed research combines quantitative and qualitative techniques within a single study, and it offers an array of opportunities with complementary strengths and non-overlapping weaknesses. Strengths of mixed research include the use of words, pictures, and narrative that add meaning to numbers. Weaknesses present as challenges in cost and time. It would be better for researchers to use a mixture of approaches that are most effective in real-world situations, such as mobile learning activities. Mixed method research and mixed model research are two major types of hybrid research. This researcher will apply mixed method research in which experiments, tests, surveys, and interview will be conducted in the study to gain superior evidence for the result.
apply mixed method research in which experiments, tests, surveys, and interview will be conducted in the study to gain superior evidence for the result.

2.2 Population & Samples

In order to conduct this research, the researcher had to recruit volunteers who owned mobile devices capable of playing Adobe Flash Lite. This researcher designed and developed a new website hosted at the http://mlearn.cide.au.edu, a Linux based server located at the College of Internet Distance Education. This was a Moodle based, open source, Learning Management System (LMS) as shown in figure 3.1.

Figure 3.1 Moodle LMS is used to recruit and provide information to participants.
A banner was prepared and was posted on the home page of the University website at http://www.au.edu as shown in figure 3.2.

![Figure 3.2 Banner posted at AU homepage to invite students to join mLearning](image)

Figure 3.2 Banner posted at AU homepage to invite students to join mLearning

By clicking on this banner, students were guided to the Moodle mlearn website at http://mlearn.cide.au.edu as shown in figure 3.1. Besides the banner, this researcher also prepared fifteen A4 and five A3 size posters with the information about this research and inviting students to join and participate in the research. These posters were posted on various locations in both Suvarnabhumi and Hua Mark campuses of the university.

This researcher also contacted couple of lecturers at the English department requesting them to allow him to take few minutes of their classes to explain to their students about the experiment and to encourage them to participate in the experiment. This researcher originally estimated that there could be a total of around 100 volunteers in this experiment and probably 50 of them would fully participate in the research till the end of the experiment. But in reality there were 166 students applied to participate in the research, 56 (33.7%) of them did the pretest and out of this 56 volunteers, 26 (46.4%) of them fully completed all research components including pre-survey, voice recording, posttest, and post-survey.
2) groups can validly be compared; and
3) the size of difference or correlations between them in the population can be assessed.

There are varieties of mobile phones with Flash Lite and MP3 players built in on them with a price of Baht 6,000 and above. Students and teenagers prefer to spend more on their gadgets to have more features and options on them as the question number 12 of the survey indicates. This research will recruit from the volunteers owning such mobile devices. This will fulfill the first of Sapsford’s sampling goals.

In this experiment the same users were tested before and after treatment. Analysis of Variance (ANOVA) was applied to analyze volunteers’ achievement scores before and after treatment and measure their achievements in using the mobile English learning, thereby satisfying Sapsford’s second sampling goal.

However because the sample was, of necessity, self-selecting, it might not be meaningful to assess differences or correlations within the population as we have no guarantee that the population is typical of the mobile device using population at large. The sample may fail to satisfy the third of Sapsford’s goals.

2.3 Research Instruments

This researcher utilized Adobe Flash programming to develop a Flash-based mobile learning system that works on Flash enabled mobile devices. The main instrument in this research hence was Flash enabled mobile devices. This researcher developed courseware for these mobile devices for learning English as a second language. This researcher prepared the
course contents for English lessons with the consultation with professional English teachers. This research used Adobe Flash CS3 under Windows Vista to develop the courseware units (lessons). Each lesson consisted of 8 or 9 slides and covered a specific English lesson. The lessons utilized MP3 sound files and English text files to deliver a lesson that could be controlled by the user. The lessons were Flash ‘swf’ file format that could be uploaded to mobile devices and then used Flash Lite Flash player for learning English lessons.

Flash was originally introduced by Macromedia in December 1996 for the web browsers, and since then it has gone through a number of incarnations. In 2004, Flash Lite 1.1 was released for mobile devices. In 2005, a newer version Flash version 2 was introduced. In 2006, Adobe acquired Macromedia and released Adobe Flash version 2.1. And in 2007, Adobe released a software package suite called Adobe Flash CS3 which among many applications also included Adobe Flash Lite 3.0. Flash Lite player for mobile devices is free of charge and can be downloaded from the Adobe site (www.adobe.com). This researcher will prepare the courseware to work under Flash 1.1 and higher versions so that the owners of older mobile phones, up to 3 years old, could participate in this research. Flash Lite 3 and Flash Lite 2.1 are backward compatible and can run programs developed under Flash 1.1.

This researcher also used a Moodle web-based Learning Management System (LMS) as shown in figure 3.1 as an online instrument. The researcher provided information about Mobile Learning System, provided the list of mobile devices that can play Adobe Flash, and also provided the guidelines on this research and its components, and how to proceed completing this research. This guideline is shown in Appendix C. This guideline was also translated into Thai.
language for the benefit of those Thai students who might have difficulty understanding the guideline in English. The Thai translation is shown in Appendix D.

After reading the guidelines from the Moodle mlearn site on how to participate in this research, students were requested to apply online in order to provide them with login information, i.e. user name and password to be able to login and access the research material. Once the application was received, an email containing user name and password was sent to the applicant to login the mlearn site. When logged in, the volunteers could read more guidelines about mobile learning. They were requested to reply to a pre-survey and a pretest before downloading the lessons for their mobile devices. They were also requested to record their voice while reading a paragraph from an article from an English newspaper.

Every week, this researcher uploaded 3 mobile lessons on to the site for students to download them and to install them on their mobile devices. They were requested to listen to the lessons as often as possible. Total 12 lessons for mobile devices were uploaded for a period of 4 weeks. At the end of the 4-week trial period, volunteers were requested to finish the online posttest and the post-survey; and they were also requested to record their voice reading the same paragraph from the same newspaper and to submit it electronically.

2.4 Data Analysis

All the data from pretest, posttest, and the surveys were collected and analyzed. SPSS version 15 and Microsoft Excel version 2007 have been used to analyze the collected data. ANOVA technique of SPSS was used to measure if there has been any progress in scores of
pretest and posttest. The pre-survey and post-survey have also been analyzed to explore the opinions and attitudes of volunteers towards mLearning. With the assistance of an English lecturer, the recordings of students' voices before and after trial were also listened and analyzed to see if there has been any improvement in each student's pronunciation. Based on detail study of all these data analysis, conclusions had been drawn.

Certificates and gifts were awarded to those participants who fully completed all the components of this research.

3. Research Procedures

In order to conduct this research, the 7-step approach was explored (Brahmawong, 2007):

3.1 Review of Documents

The first step in doing any kind of research is studying the existing literature related to the topic under investigation to explore and to understand what have been done in the area of research by other researchers and how they have gone in conducting their researches. Chapter two of this proposal explains the documents and literature studied in the area of mobile learning and how mobile devices have been used in learning in general and learning English in particular.

Based on the review of literature done as explained in Chapter two of this proposal, there have been a number of researches in use of mobile phones in education and learning a language as a second language. Most these researches are either audio based with the MP3 player of text based with the use of SMS. There has not been any research in the area of multi sensory where
more than one sense is involved in learning. Adobe Flash provides a good application to combine more than one media such as text and audio or video to produce a game or courseware. As explained in Cone of Experience in chapter two; when more senses are involved, the learning would be more effective. Adobe Flash could be used to combine text and audio to produce courseware for mobile phones where portability of the device and the multi sensory features of Flash could be combined to produce a courseware for learning English as a second language anywhere and at any time and any pace.

3.2 Survey of Needs for the FML4ESL

It is essential to evaluate students' attitude towards mobile learning and mobile English learning to explore the need assessment before proceeding to develop the FML4ESL. At the first stage of this research, an online survey was prepared and students were requested to spend about 10 minutes to answer to the survey. In a period of 3 months more than 400 students replied to this survey. The survey questions are shown in Appendix A and Appendix B. The result of this survey is discussed in Chapter IV of this dissertation.

3.3 Design Conceptual Framework for mLearning Model

Quantitative research is used to determine the relationship between one thing, an independent variable and another, a dependent or outcome variable in a population. In this research the effectiveness and usefulness or in other words the success of the Flash-based mobile learning system for learning English as a second language (FML4ESL) is the dependent variables. There are many factors or variables which may affect the success of this system. These factors are the independent variables as follows:
3.4 Survey Experts Opinions

To develop a system for learning English as a second language for mobile devices, two ESL teachers and one IT and technology expert were interviewed to explore their views on the use of mobile devices, i.e. smart mobile phones and PDAs for students of ESL to learn English. The summary of questions and recommendations is as follows:

1) What are the goals for the courseware?

   To provide students with the rules of English conversation in daily life.

   To familiarize students with the tone and pronunciation of a native speaker.

2) Who are the learners that will be using FML4ESL?

   High-school and university students.

   Any learner who likes to learn English as a second language.
3) What instructional content will be provided for mLearning students?

Learners will be provided with the instructions on how to install Flash if their mobile devices do not come with Flash installed.

Learners will be provided with the instructions on how to upload courseware units to their mobile devices and how to proceed in trying out the lessons.

4) How will the FML4ESL be used to enhance learning?

Each unit of the courseware emphasizes on a specific theme with examples and practice.

5) What sort of administrative information will be provided?

Email addresses for help and support.

A web based forum for students, ESL teacher, and the researcher to exchange views and pose their questions.

6) Will the users participate in any activities while mLearning?

All the participants have to complete all the tasks and activities for each unit.

7) What technology will be used to support the users?

Email, WWW, Forums, online chats (Skype, MSN).

8) What is the length of the course and how often will the participants meet?
The courseware has 12 units (lessons) and it is intended for one month period, three units per week.

9) What are the prospective students' learning needs?

To learn and practice using the courseware on their mobile devices.

10) What prior experiences are they likely to have?

Basic knowledge of their mobile devices.
Basic knowledge of the Internet, email, forum, and chat.

11) What factors might affect their success in the course?

Knowledge of mobile devices and their features.
Frequency of listening to the Flash-based mobile learning units.
Practice as required by each unit.

12) What types of student support will be essential?

Mainly technology onsite support and help with methodological issues and general support through e-mail.

3.5 A Draft Model for mLearning

Initial model for an mLearning involves just putting the existing course material for use on a group of mobile devices. However, models for effective mLearning will involve a transition from “isolated skills practice” toward integrating technologies as tools throughout the
disciplines. Hawkins (1996) argued that in order to realize high standards, education needs to move beyond traditional strategies of whole group instruction and passive absorption of facts by students. New, more effective methods are based on engaging students in complex and meaningful problem-solving tasks. Technologies need to be used to bring vast information resources into the classrooms. We need a transition from inadequate support and training of teachers to support for all teachers to learn how to use technologies effectively in everyday teaching (Hawkins, 1996).

Honebein (1996) summarizes "seven pedagogical goals" of constructivist, learner-centered environment.

1. Provide experience with the knowledge construction process [student responsibility for learning].
2. Provide experience in and appreciation for multiple perspectives [viewpoints and problem solving].
3. Embed learning in realistic and relevant contexts [authentic learning tasks].
4. Encourage ownership and voice in the learning process [student centered with teacher as consultant].
5. Embed learning in social experience [encourage collaboration].
6. Encourage the use of multiple modes of representation [different mediums].
7. Encourage self-awareness of the knowledge construction process
5. Embed learning in social experience [encourage collaboration].
6. Encourage the use of multiple modes of representation [different mediums].
7. Encourage self-awareness of the knowledge construction process

Based on the above guidelines, the following model as shown in figure 3.3 could be derived. However in many cases the content is the technology itself.

![Figure 3.3 A draft model for mLearning](image)

As shown in figure 3.3, in an mLearning system all components interact with each other. Instructor develops course content which is used by learners using the mLearning technology. Instructor could directly interact with the learner to measure the learners' achievements. And the course content is uploaded to mobile device (technology) which is downloaded by students.

3.6 System Verification
Hypothesis 1

The hypothesis is that the Flash based mobile learning system could improve the English proficiency of students. It can play a useful and effective role in learning English as a second language due to Flash support for multimedia. Pretest, posttest, survey, and interview were used to measure the students’ achievement and their progress before and after treatment. The Analysis of Variances (ANOVA) and qualitative methods are used to test this hypothesis.

Question 2

Could mobile devices with the English courseware prepared by professional ESL English teachers improve the English pronunciation of students?

Hypothesis 2

The hypothesis is that students can improve their English pronunciations when regularly listening to native speakers speaking. To test this hypothesis, participants in this research were requested to read a paragraph and record their voice while reading it both before and after trying out the FML4ESL. The recorded voice files were sent to the content expert by email for analysis and scoring. The content expert of the mobile English lessons listened to all recorded voices and scored them 1 to 10 depending on accuracy of pronunciation. The scores are shown in Appendix E as pre-oral and post-oral.

Question 3

Could Flash based mobile learning system improve the English proficiency of students regardless of their English level of proficiency?
Hypothesis 3

The hypothesis is that the Flash based mobile learning system could improve the English proficiency of students regardless of their current level of English proficiency. This hypothesis could prove the mobile English learning could be used by students at all levels of English proficiency. Pretest, posttest, and surveys were used to measure the students’ achievement and their progress classified by their English proficiency before and after treatment. The Analysis of Variances (ANOVA) and qualitative methods are used to test this hypothesis.

Question 4

Would the perceived value (attitude) of mLearning by students influence the learning outcome of the Flash-based mobile learning system?

Hypothesis 4

The hypothesis is that the students’ perceive value of English learning would influence the outcome of English learning. Questionnaire, pretest and posttest were used to verify this hypothesis.

Question 5

Would the perceived ease of use of mLearning by students influence the learning outcome of the Flash-based mobile learning system?

Hypothesis 5
The hypothesis is that the students' perceive ease of use mobile English learning would influence the outcome of English learning. Questionnaire, pretest, and posttest were used to verify this hypothesis.

3.6.1 Develop English Courseware for FML4ESL System

With the assistance from couple of expert professional English lecturers with experience in teaching English as a second language, this researcher adopted their existing English lessons and converted them to Flash-based English lessons for few popular mobile devices, i.e. Nokia, Sony Ericson, and Windows mobile based PDAs capable of playing Adobe Flash Lite for mobile devices. Flash Lite is the version of the Macromedia/Adobe Flash Player that has been specifically designed for use on mobile phones. Using Flash technology on a mobile phone provides the same advantages as using Flash on the desktop. One can create rich, interactive, compelling user experiences that have a consistent display across a range of platforms. Figure 3.4 displays a slide from one of the lessons.

The objectives of the Flash-based English lessons for mobile devices are as follows:

• Flash programming allows full control of mobile devices and the lessons by the user.
• Students can listen to native speakers reading a passage or a lesson.
• While listening, students can see and read the text on the screen of their mobile device.
• Students can also learn spelling, grammar, and rules for conversation.
• There are exercises in each unit (lesson) asking students to practice what they learned.
• Students can also learn spelling, grammar, and rules for conversation.
• There are exercises in each unit (lesson) asking students to practice what they learned.

![Image](image.png)

Figure 3.4 A slide from a unit (lesson)

For this research, the researcher produced 12 lessons also called units. Each unit consists of 8 slides for a total of 96 slides. Each lesson is short for couple of minutes based on recommendation as explained in chapter 2, section 6.4 of this dissertation. Participants uploaded these lessons to their mobile phones and used the Adobe Flash-Lite application program of their mobile devices to start studying a lesson. User could control the progress of a unit by using the knob on the mobile device. It could go backward and listen to the same slide again and again by clicking the knob towards the left or could go forward by clicking the knob towards right to go to the following slide.

3.6.2 Tryout the Courseware

(1) Select Participants
requirements of this research on participants. For example, the participants were required to complete the following tasks before starting to use the lessons for their mobile devices. Some of the requirements are as follows:

- Replying the online pre-survey
- Answering the online pretest
- Recording the voice while reading a paragraph and submitting it to the researcher
- Accessing the lessons from the mlearn site and uploading them to the mobile devices
- Playing, listening, and reading the lessons on their mobile devices
- Replying the online post-survey
- Answering the online posttest
- Recording the voice while reading a paragraph and submitting it to the researcher

There were lots of requirements for volunteers to participate in this research. This might be the main reason for the low number of participant in this research.

Out of this 56 who replied to pretest and pre-survey, 41 (73%) of them downloaded the mobile English lessons but only a total of just 26 students out of 56 (46.4%) completed all the components of this research and replied to posttest and post-survey.

(2) Inform Volunteers of Training Materials

A welcome email was sent to all participants with the attachment explaining the requirement of research, its procedure, and training material how to use the Flash-based mobile
system to learn English lessons. The same information was also posted on the mlearn website at http://mlearn.cide.au.edu.

(3) Conducting Pretest & Pre-Survey

The content experts who provided the contents for the mobile English lessons were requested to prepare a multiple choice test to be used for both pretest and posttest. A test then was prepared by the content experts with 20 questions. This test was put online with a time of 20 minutes to finish the test.

All participants were requested to take the online pretest to evaluate their existing level of English language proficiency. The scores were recorded so that to be compared with their scores after taking the posttest. Participants were also required to fill in the online pre-survey. The participants were given a choice of a face-to-face interview or using MSN to chat online with the researcher or recording their own voice while reading a paragraph from a newspaper. Majority of students chose to record their voice and sent to the researcher by email. The content experts listened to all the recorded voice to give a score based on the pronunciation of the participants.

(4) Conduct mLearning Experiment

During a 4-week experiment participants were requested to practice 3 units per week as often as possible. A forum was also created in order to be in touch with the participants during this period to guide and to monitor their progress weekly. The researcher was also in touch with participants through emails and forums to answer their questions in case of technical difficulties. Quite a number of participants contacted the researcher during this period, most of the problems
were of technical nature and were solved by emails, and few participants met the researcher personally to assist them solve their problems.

(5) Conduct Posttest & Post-Survey

After the 4-weeks period of practice, the same test was put online as posttest, and the participants were requested to answer the posttest with the same 20 questions and the time limit of 20 minutes. The participants were also requested to reply to the post-survey. Participants were again requested to have a second interview either online or face-to-face or record their voice while reading the same paragraph. Majority decided to record their voice and submit it to the researcher by email.

(6) Data Collection and Analysis

All the data from pretest, posttest, and the surveys were collected and analyzed. SPSS and Microsoft Excel were used to analyze the collected data. ANOVA technique of SPSS was used to measure if there has been any progress in scores of pretest and posttest. The result of the surveys and recorded voice were also analyzed and combined with the result of ANOVA, a conclusions were drawn.

Certificates and gifts were awarded to those participants who fully complete the pretest, posttest, and the surveys.

3.7 Finalize the mLearning Model

In the last step, the data collected during the try out was analyzed and conclusions were drawn. SPSS, ANOVA, and MS-Excel were utilized in data analysis and testing of the
hypotheses. Based on the outcomes of the results, surveys, and tests, this researcher developed a model for a Flash based mobile system for learning English as a second language. The system could be improved based on the model proposed.

4. Summary

Adobe Flash based English language lessons were developed for few categories of smartphones and PDAs. Volunteers were recruited to try out and these lesson on their mobile devices. Data about volunteers, their pretest, posttest, survey questionnaires, and recorded voice and observation of their progress were collected and stored on MySQL database system. SPSS and Excel were used to analyze the data to find out if Flash based (multimedia) way of delivering English lessons for mobile devices could be beneficial to students and if there were any progress in their learning English language.
CHAPTER IV
DATA ANALYSIS AND RESULTS

The purpose of this research was to design and develop a flash-based mobile learning system for learning English as second language (FML4ESL) using mobile devices capable of playing Adobe Flash Lite. At the first step, a need assessment survey was conducted to evaluate students’ attitude towards mLearning in general and mobile English learning in particular. As the result of this survey was positive, this researcher designed and developed a prototype of FML4ESL. The system and its courseware for learning English were tried out on volunteers studying at Assumption University who owned Flash enabled mobile devices to explore its effectiveness, strengths and weaknesses.

This chapter presents the result of the need assessment survey and the data collected during pretest, posttest, pre-oral, post-oral, pre-survey, and post-survey of tryout of the FML4ESL. The data collected are analyzed and are explained. Based on analyses of data, the hypotheses of this research are evaluated and reported.

The scores in pretests, posttests, pre-oral, and post-oral are used for quantitative analyses using one-way ANOVA. The results of pre-survey and post-survey will be used for both quantitative and qualitative data analyses.

1. Need Assessment for Mobile Learning

In order to conduct this research, university students owning mobile devices with Adobe Flash enabled were needed as volunteers. Most of the current smart phones and PDAs being used
by students these days have the Adobe Flash features built-in. Before conducting the research, the researcher wanted to explore students’ attitudes towards mobile learning, how they were using their mobile devices, types of mobile devices being used, and whether they would be willing to participate in an mLearning experiment. To achieve this, the author designed and developed three online surveys, one for students owning a mobile device, one for students who do not currently own a mobile device and the last one for the lecturers.

The author designed a special survey webpage that was placed on one of the CIDE servers at the url of http://mlearn.cide.au.edu (Figure 4.1). The definition of ‘mobile learning’ was posted on the main webpage. In order to encourage students to participate in either of the two surveys, 5 Gift Certificates of 500 Baht each from the Mall Department store, Bangkok were purchased for awarding to 5 randomly selected students among all participants. The survey page provided two choices to students to select from. The first choice was for those who owned a mobile device and the second choice for those who did not own a mobile device. By selecting either of these choices, students were transferred to the questionnaire prepared for them. The surveys were prepared using the open source software PHPesp. Appendix A shows the questionnaire for those owning a smart mobile device and Appendix B shows the questionnaire for those who did not own the smart mobile device at the time the survey was taken. A banner and a notice were also placed on the Assumption University main website (www.au.edu) advertising the survey with the link to the survey main web page. The survey went online in August 2007. During August 2007 till October 2007, 312 students who owned a mobile device responded to the first survey. Other 98 students who did not own a mobile device but planned to purchase one in the future responded to the second survey.
responded to the first survey. Other 98 students who did not own a mobile device but planned to purchase one in the future responded to the second survey.

Figure 4.1 Homepage introducing mLearning and inviting students to join the survey. (Designed by this researcher at url http://mlearn.cide.au.edu)

Below is some demographic information from the two surveys:

- 312 (76%) out of 410 respondents owned a smart mobile device.
- 61% of those who did not own a smart mobile device, planned to purchase one within 1 year.
- 235 (57%) of respondents were male and the other 175 (43%) were female.
- 231 (56%) of respondents were in the age group 18-22 and 105 (26%) in the age group 23-27.
- 304 (74%) of respondents were Thai national and the other 106 (26%) were foreign students.
- 304 (74%) of respondents were undergraduate students, 85 (21%) graduate students, and 19 (5%) doctorate students.
• 203 (50%) of respondents were from the biggest School of the University, School of Business Administration and the other 50% from all other schools.

In survey A, it was asked to rank (1 to 10) the applications on their mobile devices that they mostly use. Figure 4.3 shows the ranking. Then it was asked the average daily time spent on their mobile devices doing the above applications or activities. Their response is shown in figure 4.2.

Later in Survey A, it was asked if they thought it would be useful for them to have the audio or video of the class lectures available for their mobile device. 285 (91.3%) of the respondents confirmed ‘yes’ as shown in figure 4.3. When asked if they would be willing to pay for the audio/video of the class lectures, 71 (22.8%) replied ‘yes’, 48 (15.3%) replied ‘no’, and the other 193 (61.9%) replied ‘depends on the price’ as shown in figure 4.4.
Figure 4.2 Average ranking of applications used by students on their mobile devices

![Bar chart showing average ranking of applications used by students on their mobile devices.]

Figure 4.3 Average hours spent daily on mobile devices by students

![Pie chart showing distribution of average hours spent daily on mobile devices.]

Figure 4.4 91.3% of students responded 'YES' to have the audio or video of the class lectures for their mobile devices.
Figure 4.5 When asked if they are willing to pay for audio/video of the class lectures

Then in Survey A, it was asked to rank (1-10) the importance of the applications most wanted on their mobile devices. Figure 4.6 shows the wish list of students.

Figure 4.6 Ranking of application wish-list to have for their mobile devices
Based on this survey research, it became clear that students at Assumption University had a very positive attitude towards mLearning. Majority of students wish to receive information from the university on their mobile devices, they also would like to have audio or video of the lecture for their mobile devices; they are willing even to pay for these audio/video of various lectures.

2. Trying Out the FML4ESL

The need assessment survey confirmed that majority of students surveyed had a positive attitude towards mobile learning and English learning using mobile devices. The researcher continued his research by designing the FML4ESL and the development of 12 English lessons for this system. It took a period of nine months to develop this system with the 12 mobile lessons. At this stage, the researcher had to test and evaluate the system to explore its effectiveness, strength and weaknesses.

Through emails, banner on the university home page, posters, and contacting couple of English lecturers, there were a total of 166 students visited the Moodle mlearn website and filled the online application form to participate in this research. Just 56 out of 166 (33.7%) of these completed the pre-survey and pretest. The low number might indicate the rigid and demanding requirements of this research on participants. For example, the participants were required to complete the following tasks before starting to use the lessons for their mobile devices. Some of the requirements are as follows:

- Replying the online pre-survey
- Answering the online pretest
• Recording the voice while reading a paragraph and submitting it to the researcher
• Accessing the lessons from the mlearn site and uploading them to the mobile devices
• Playing, listening, and reading the lessons on their mobile devices
• Replying the online post-survey
• Answering the online posttest
• Recording the voice while reading a paragraph and submitting it to the researcher

There were lots of requirements for volunteers to participate in this research. This might be the main reason for the low number of participant in this research.

Out of this 56 who replied to pretest and pre-survey, 41 (73%) of them downloaded the mobile English lessons but only a total of just 26 students out of 56 (46.4%) completed all the components of this research and replied to posttest and post-survey.

The population for this study consists of 26 participants, who successfully finished all components of this research among 166 applicants who filled the online application form. Out of this 166 applicants, 56 of them started the research by answering the pre-survey and pretest but just 26 of them finished the research by completing all the components. Appendix E presents the scores and time taken to finish pretest and posttest. It also shows the frequency of usage of listening to lessons, pre-oral, and post-oral scores. Table 4.1, 4.2, and 4.3 present some demographic information.
Table 4.1 Gender Demographic

<table>
<thead>
<tr>
<th>Gender</th>
<th>Frequency</th>
<th>Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>10</td>
<td>38.5</td>
<td>38.5</td>
</tr>
<tr>
<td>Female</td>
<td>16</td>
<td>61.5</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td>26</td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>

Table 4.2 School Demographic

<table>
<thead>
<tr>
<th>School</th>
<th>Frequency</th>
<th>Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>BBA</td>
<td>8</td>
<td>30.8</td>
<td>30.8</td>
</tr>
<tr>
<td>ART</td>
<td>17</td>
<td>65.4</td>
<td>96.2</td>
</tr>
<tr>
<td>ICT</td>
<td>1</td>
<td>3.8</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Table 4.3 English course being taken in semester 1/2008 by participants

<table>
<thead>
<tr>
<th>Course</th>
<th>Frequency</th>
<th>Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic English</td>
<td>2</td>
<td>7.7</td>
<td>7.7</td>
</tr>
<tr>
<td>English I</td>
<td>1</td>
<td>3.8</td>
<td>11.5</td>
</tr>
<tr>
<td>English II</td>
<td>1</td>
<td>3.8</td>
<td>15.4</td>
</tr>
<tr>
<td>English III</td>
<td>1</td>
<td>3.8</td>
<td>19.2</td>
</tr>
<tr>
<td>English IV</td>
<td>5</td>
<td>19.2</td>
<td>38.5</td>
</tr>
<tr>
<td>Passed All</td>
<td>16</td>
<td>61.5</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td>26</td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>

3. Descriptive Information

Table 4.4 displays the descriptive information about some variables of interest. The pretest score and the time taken to finish the test (pre-time) have been taken from the online pretest which the participants took before downloading the mobile lessons. The posttest and the time taken to finish the test (post-time) have been taken from the online posttest which the participants took after downloading and listening to mobile lessons. The pretest and posttest was multiple choice questions that had been prepared by the ESL content provider. There were 20 questions in the test and each question scored 1 point for a total of 20 marks.
The usage (frequency of use) was taken from the post-survey. In the post-survey, participants were asked the number of times they listened and practiced to the lessons. The researcher had no way to verify the frequency of usage but he trusts all participants replied to all survey questions very honestly.

The pre-oral relates to the recorded voice ranked by the ESL language content provider. The content provider was requested to rank a score 1 to 10 to recorded voices based on the pronunciation of participants’ recorded voice. Post-oral was also ranked the same way by the same content expert.

**Table 4.4** Descriptive Information for some dependent variables

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Min</th>
<th>Max</th>
<th>Mean</th>
<th>Std. Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pretime (minutes)</td>
<td>26</td>
<td>4:14</td>
<td>19:26</td>
<td>9:30</td>
<td>4:06</td>
</tr>
<tr>
<td>Pretest (max=20)</td>
<td>26</td>
<td>6.00</td>
<td>16.00</td>
<td>10.20</td>
<td>2.41</td>
</tr>
<tr>
<td>Posttime (minutes)</td>
<td>26</td>
<td>2:49</td>
<td>12:15</td>
<td>7:00</td>
<td>2:17</td>
</tr>
<tr>
<td>Posttest (max=20)</td>
<td>26</td>
<td>9.10</td>
<td>20.00</td>
<td>16.55</td>
<td>3.66</td>
</tr>
<tr>
<td>Usage (frequency)</td>
<td>26</td>
<td>1</td>
<td>10</td>
<td>3.58</td>
<td>2.28</td>
</tr>
<tr>
<td>Preoral (max=10)</td>
<td>26</td>
<td>3.5</td>
<td>7.0</td>
<td>5.25</td>
<td>1.01</td>
</tr>
<tr>
<td>Postoral (max=10)</td>
<td>26</td>
<td>4.0</td>
<td>7.0</td>
<td>5.92</td>
<td>0.97</td>
</tr>
</tbody>
</table>

4. Data Analysis for Question 1

Question 1: Could Flash-based mobile learning system improve the English proficiency of students?

The hypothesis was that the Flash based mobile learning system could improve the English proficiency of students. It can play a useful and effective role in learning English as a second language due to Flash support for multimedia. Pretest, posttest, surveys were used to measure the students’ achievement and their progress before and after treatment. The one-way
repeated-measure Analysis of Variances (ANOVA) was used to test this hypothesis. Tables 4.5, 4.6, and 4.7 displays the SPSS result of this analysis.

**Table 4.5 Time Factor**

<table>
<thead>
<tr>
<th>Time</th>
<th>Dependent Variable</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Pretest</td>
</tr>
<tr>
<td>2</td>
<td>Posttest</td>
</tr>
</tbody>
</table>

**Table 4.6 Descriptive Statistics for pretest and posttest**

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pretest</td>
<td>10.20</td>
<td>2.41</td>
<td>26</td>
</tr>
<tr>
<td>Posttest</td>
<td>16.55</td>
<td>3.65</td>
<td>26</td>
</tr>
</tbody>
</table>

**Table 4.7 Multivariate Tests for Research Question 1**

<table>
<thead>
<tr>
<th>Effect</th>
<th>Value</th>
<th>F</th>
<th>Hypothesis df</th>
<th>Error df</th>
<th>Sig</th>
<th>Partial Eta Squared</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pillai's Trace</td>
<td>0.75</td>
<td>73.84</td>
<td>1.00</td>
<td>25.00</td>
<td>0.00</td>
<td>0.75</td>
</tr>
<tr>
<td>Wilks’ Lambda</td>
<td>0.25</td>
<td>73.84</td>
<td>1.00</td>
<td>25.00</td>
<td>0.00</td>
<td>0.75</td>
</tr>
<tr>
<td>Hotelling’s Trace</td>
<td>2.95</td>
<td>73.84</td>
<td>1.00</td>
<td>25.00</td>
<td>0.00</td>
<td>0.75</td>
</tr>
<tr>
<td>Roy’s Largest Root</td>
<td>2.95</td>
<td>73.84</td>
<td>1.00</td>
<td>25.00</td>
<td>0.00</td>
<td>0.75</td>
</tr>
</tbody>
</table>

The standard univariate ANOVA indicates a significant time effect $F(1,25) = 73.84$, $p <= 0.05$. This indicates a significant improvement after treatment, students’ English proficiency scores have significantly improved after using the mobile English lessons. The result is statistically significant which indicates the test failed to reject the hypothesis. The Hypothesis is therefore accepted.
5. **Data Analysis for Question 2**

Question 2: Could mobile devices with the English courseware prepared by professional ESL English teachers improve the English pronunciation of learners?

The hypothesis was that students can improve their English pronunciations and conversation when regularly listening to native speakers speaking. To test this hypothesis, participants in this research were requested to read a paragraph and record their voice while reading it both before and after trying out the FML4ESL. The recorded voice files were sent to the content expert by email for analysis and scoring. The content provider of the mobile English lessons listened to all recorded voices and ranked them 1 to 10 depending on accuracy of pronunciation. The scores are shown in Appendix E as pre-oral and post-oral.

The one-way repeated-measure Analysis of Variances (ANOVA) was used to test this hypothesis. Tables 4.8, 4.9, and 4.10 displays the SPSS result of the one-way repeated-measure ANOVA.

### Table 4.8 Time Factor for oral test

<table>
<thead>
<tr>
<th>Time</th>
<th>Dependent Variable</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Preoral</td>
</tr>
<tr>
<td>2</td>
<td>Postoral</td>
</tr>
</tbody>
</table>
Table 4.9 Descriptive Statistics for pretest and posttest

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preoral</td>
<td>5.25</td>
<td>1.01</td>
<td>26</td>
</tr>
<tr>
<td>Postoral</td>
<td>5.92</td>
<td>0.97</td>
<td>26</td>
</tr>
</tbody>
</table>

Table 4.10 Multivariate Tests

<table>
<thead>
<tr>
<th>Effect</th>
<th>Value</th>
<th>F</th>
<th>Hypothesis df</th>
<th>Error df</th>
<th>Sig</th>
<th>Partial Eta Squared</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pillai’s Trace</td>
<td>0.63</td>
<td>42.24</td>
<td>1.00</td>
<td>25.00</td>
<td>0.00</td>
<td>0.63</td>
</tr>
<tr>
<td>Wilks’ Lambda</td>
<td>0.37</td>
<td>42.24</td>
<td>1.00</td>
<td>25.00</td>
<td>0.00</td>
<td>0.63</td>
</tr>
<tr>
<td>Hotelling’s Trace</td>
<td>1.69</td>
<td>42.24</td>
<td>1.00</td>
<td>25.00</td>
<td>0.00</td>
<td>0.63</td>
</tr>
<tr>
<td>Roy’s Largest Root</td>
<td>1.69</td>
<td>42.24</td>
<td>1.00</td>
<td>25.00</td>
<td>0.00</td>
<td>0.63</td>
</tr>
</tbody>
</table>

The standard univariate ANOVA indicates a significant time effect $F(1,25) = 42.24$, $p\leq 0.05$. This indicates a significant improvement after treatment, students' oral scores have improved after using the mobile English lessons. The result is statistically significant which indicates the test failed to reject the hypothesis. The Hypothesis is therefore accepted.

6. Data Analysis for Question 3

Question 3: Could Flash-based mobile learning system improve the English proficiency of students regardless of their English level of proficiency?

The hypothesis was that the Flash based mobile learning system could improve the English proficiency of students regardless of their current level of English proficiency. This hypothesis could prove the mobile English learning could be used by students at all levels of English proficiency. Pretest, posttest, and surveys were used to measure the students’ achievement and their progress classified by their English proficiency before and after treatment.
First the participants were classified based on their English level. In the pre-survey, participants were asked to identify the English course they were taking at the semester (1/2008). There were 6 groups of participants representing all students of the University. The descriptive data of these 6 groups is shown in Table 4.11.

**Table 4.11** Descriptive Statistics for pretest and posttest

<table>
<thead>
<tr>
<th>English</th>
<th>Pretest</th>
<th>Std. Deviation</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic English</td>
<td>6.50</td>
<td>0.71</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>20.00</td>
<td>0.00</td>
<td>2</td>
</tr>
<tr>
<td>English I</td>
<td>16.00</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>19.00</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>English II</td>
<td>13.00</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>10.10</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>English III</td>
<td>11.00</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>20.00</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>English IV</td>
<td>8.62</td>
<td>2.38</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>13.44</td>
<td>4.57</td>
<td>5</td>
</tr>
<tr>
<td>Passed All</td>
<td>10.56</td>
<td>1.59</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td>17.13</td>
<td>2.75</td>
<td>16</td>
</tr>
</tbody>
</table>

One-way ANOVA could not be applied for these groups of participants as there were just 1 participant in each of English I, English II, and English III groups. To overcome this problem, this researcher reduced the groping as shown in Table 4.11 to Basic, Intermediate, and Advanced groups. Those studying in Basic English, English I, and English II were put in Basic group. Those studying in English III and English IV were assigned to Intermediate group. And all those who have already passed all their English courses were assigned to the advanced group as shown.
One-way ANOVA was then applied to these 3 groups to study the effects of mobile English learning on various groups.

**Table 4.12 Between-Subjects Factors**

<table>
<thead>
<tr>
<th>English Level</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic</td>
<td>4</td>
</tr>
<tr>
<td>Intermediate</td>
<td>6</td>
</tr>
<tr>
<td>Advanced</td>
<td>16</td>
</tr>
</tbody>
</table>

A new dependent variable was introduced called ‘Diff’ which is the difference of the means of posttest from the pretest. This is shown in Table 4.13.

**Table 4.13 Dependent Variable: Diff**

<table>
<thead>
<tr>
<th>English Level</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic</td>
<td>6.77</td>
<td>8.14</td>
<td>4</td>
</tr>
<tr>
<td>Intermediate</td>
<td>5.52</td>
<td>3.19</td>
<td>6</td>
</tr>
<tr>
<td>Advanced</td>
<td>6.56</td>
<td>2.58</td>
<td>16</td>
</tr>
<tr>
<td>Total</td>
<td>6.35</td>
<td>3.77</td>
<td>26</td>
</tr>
</tbody>
</table>

Looking at Table 4.14 (Tests of Between-Subjects Effects) and checking the F value for English Level, the F(2,23) = 0.19 and p = 0.83 (p >= 0.05). The F value is small and the p value is more than 0.05, the test rejects the null hypothesis that there are no differences among the groups. The hypothesis that there are improvements among all groups is accepted though with difference variance.
Table 4.14 Tests of between Subjects Effects (Dependent Variable: Diff)

<table>
<thead>
<tr>
<th>Source</th>
<th>Type III Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig</th>
<th>Partial Eta Squared</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corrected Model</td>
<td>5.61</td>
<td>2</td>
<td>2.81</td>
<td>0.19</td>
<td>0.83</td>
<td>0.02</td>
</tr>
<tr>
<td>Intercept</td>
<td>741.87</td>
<td>1</td>
<td>741.87</td>
<td>48.79</td>
<td>0.00</td>
<td>0.68</td>
</tr>
<tr>
<td>English Level</td>
<td>5.61</td>
<td>2</td>
<td>2.80</td>
<td>0.19</td>
<td>0.83</td>
<td>0.02</td>
</tr>
<tr>
<td>Error</td>
<td>349.75</td>
<td>23</td>
<td>15.21</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>1405.02</td>
<td>26</td>
<td>53.40</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corrected Total</td>
<td>355.37</td>
<td>25</td>
<td>14.21</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

7. Data Analysis for Question 4

Question 4: Would the perceived value (attitude) towards mLearning by students influence the learning outcome of the Flash-based mobile learning system?

The hypothesis was that the students' perceived value towards mobile English learning would influence the outcome of English learning. Questionnaire, pretest and posttest are used to verify this hypothesis. The one-way repeated-measure Analysis of Variances (ANOVA) was used to test this hypothesis.

In the pre-survey, questions number 16 states “Mobile Phones and PDAs could be used to learn and improve English language skills”. Table 4.16 displays the descriptive statistics about this question. 7 out of 26 (26.9%) strongly agreed with the statement, 12 (46.2%) slightly agreed with the same statement, 6 (23.1%) were not sure, and only 1 (3.8%) disagreed with the statement. No one strongly disagreed to this statement.
Table 4.15 Time Factor

<table>
<thead>
<tr>
<th>Time</th>
<th>Dependent Variable</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Pretest</td>
</tr>
<tr>
<td>2</td>
<td>Posttest</td>
</tr>
</tbody>
</table>

Table 4.16 Descriptive Statistics for pretest and posttest

<table>
<thead>
<tr>
<th>Mobile English Attitude</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly Agree</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pretest</td>
<td>11.00</td>
<td>1.53</td>
<td>7</td>
</tr>
<tr>
<td>Posttest</td>
<td>17.00</td>
<td>3.92</td>
<td>7</td>
</tr>
<tr>
<td>Slightly Agree</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pretest</td>
<td>10.00</td>
<td>3.00</td>
<td>12</td>
</tr>
<tr>
<td>Posttest</td>
<td>16.50</td>
<td>3.71</td>
<td>12</td>
</tr>
<tr>
<td>Not Sure</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pretest</td>
<td>10.00</td>
<td>2.10</td>
<td>6</td>
</tr>
<tr>
<td>Posttest</td>
<td>16.01</td>
<td>4.06</td>
<td>6</td>
</tr>
<tr>
<td>Slightly Disagree</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pretest</td>
<td>8.00</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Posttest</td>
<td>15.00</td>
<td></td>
<td>1</td>
</tr>
</tbody>
</table>

Table 4.17 Multivariate Tests for Research Question 4

<table>
<thead>
<tr>
<th>Effect</th>
<th>Value</th>
<th>F</th>
<th>Hypothesis df</th>
<th>Error df</th>
<th>Sig</th>
<th>Partial Eta Squared</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly Agree</td>
<td>0.33</td>
<td>12.48</td>
<td>1.00</td>
<td>6.00</td>
<td>0.01</td>
<td>0.68</td>
</tr>
<tr>
<td>Wilks’ Lambda</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Slightly Agree</td>
<td>0.26</td>
<td>30.81</td>
<td>1.00</td>
<td>11.00</td>
<td>0.00</td>
<td>0.74</td>
</tr>
<tr>
<td>Wilks’ Lambda</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not Sure</td>
<td>0.15</td>
<td>27.56</td>
<td>1.00</td>
<td>5.00</td>
<td>0.00</td>
<td>0.85</td>
</tr>
<tr>
<td>Wilks’ Lambda</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Slightly Disagree</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The standard univariate ANOVA (Wilks’ Lambda) shown in Table 4.17 indicates a significant time effect for those who strongly agreed F(1,6) = 12.48, p <= 0.05. For those who slightly agreed with the statement, the standard univariate ANOVA (Wilks’ Lambda) indicates a more significant time effect than those who strongly agreed with the statement with F(1,11) = 30.81 and p <= 0.05. For those who were not sure, the F(1,5) = 27.56 and p <= 0.05 which also indicates some significant improvement. There was just one who slightly disagreed with the statement, hence there is no F or p values for this group. But looking at the mean in Table 4.16, there is some improvement of the mean for this single participant. For this Question, though there is evidence of improvement in all groups, there is no conclusive evidence that the perceived value and attitude would influence the outcome of mobile learning. The hypothesis is inconclusive.

8. Data Analysis for Question 5

Question 5: Would the perceived ease of use of mLearning by students influence the learning outcome of the Flash-based mobile learning system?

The hypothesis was that the students’ perceives ease of use would influence the outcome of mobile English learning. Questionnaire, pretest and posttest are used to verify this hypothesis. The one-way repeated-measure Analysis of Variances (ANOVA) was used to test this hypothesis.

In the pre-survey, questions number 17 states “I think using mobile phones and PDAs to learn English is”. Table 4.19 displays the descriptive statistics about this statement. 2 out of 26
(7.7%) expressed extremely easy, 15 (57.7%) considered it simply easy, 8 (30.7%) were not sure, and only 1 (3.8%) considered it difficult. No one considered it extremely difficult.

**Table 4.18 Time Factor**

<table>
<thead>
<tr>
<th>Time</th>
<th>Dependent Variable</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Pretest</td>
</tr>
<tr>
<td>2</td>
<td>Posttest</td>
</tr>
</tbody>
</table>

**Table 4.19 Descriptive Statistics for pretest and posttest**

<table>
<thead>
<tr>
<th>English</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extremely Easy</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pretest</td>
<td>8.00</td>
<td>2.83</td>
<td>2</td>
</tr>
<tr>
<td>Posttest</td>
<td>20.00</td>
<td>0.00</td>
<td>2</td>
</tr>
<tr>
<td>Easy</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pretest</td>
<td>10.67</td>
<td>2.70</td>
<td>15</td>
</tr>
<tr>
<td>Posttest</td>
<td>16.55</td>
<td>4.01</td>
<td>15</td>
</tr>
<tr>
<td>Not Sure</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pretest</td>
<td>9.75</td>
<td>1.67</td>
<td>8</td>
</tr>
<tr>
<td>Posttest</td>
<td>15.25</td>
<td>2.92</td>
<td>8</td>
</tr>
<tr>
<td>Slightly Difficult</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pretest</td>
<td>11.00</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Posttest</td>
<td>20.00</td>
<td></td>
<td>1</td>
</tr>
</tbody>
</table>

**Table 4.20 Multivariate Tests for Research Question 5**

<table>
<thead>
<tr>
<th>Effect</th>
<th>Value</th>
<th>F</th>
<th>Hypothesis df</th>
<th>Error df</th>
<th>Sig</th>
<th>Partial Eta Squared</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extremely Easy Wilks' Lambda</td>
<td>0.02</td>
<td>36.00</td>
<td>1.00</td>
<td>1.00</td>
<td>0.10</td>
<td>0.97</td>
</tr>
<tr>
<td>Easy</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wilks' Lambda</td>
<td>0.24</td>
<td>43.90</td>
<td>1.00</td>
<td>14.00</td>
<td>0.00</td>
<td>0.76</td>
</tr>
<tr>
<td>Not Sure</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wilks' Lambda</td>
<td>0.30</td>
<td>16.60</td>
<td>1.00</td>
<td>7.00</td>
<td>0.00</td>
<td>0.70</td>
</tr>
<tr>
<td>Slightly Difficult</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The standard univariate ANOVA (Wilks’ Lambda) indicates moderate time effect for those who replied “extremely easy” $F(1,1) = 36.00$ and $p = 0.10$. For those who replied just easy to this statement, the standard univariate ANOVA (Wilks’ Lambda) indicates a more significant time effect than those who considered it extremely easy with $F(1,14) = 43.90$ and $p = 0.00$. For those who were not sure, the $F(1,7) = 16.60$ and $p = 0.00$ which also indicates some significant improvement. There was just one who considered it difficult, hence there are no $F$ or $p$ values for this group. But looking at the mean in Table 4.19, there is good improvement of the mean for this single participant. For this Question, though there is evidence of improvement in all groups, there is no conclusive evidence that the perceived ease of use would influence the outcome of mobile learning. The hypothesis is inconclusive.

9. Analysis of the Surveys

Two surveys were taken to evaluate participants’ attitudes toward mobile learning before and after trying out mobile English courses. The first survey was called pre-survey which participants took before downloading mobile English lessons from the server and shown in Appendix F and the next survey was called post-survey which participants replied after completing the trying out of all lessons on their mobile devices and shown in Appendix G. This section presents some of the questions and replies of the participants to the surveys.

9.1 Pre-Survey

A total number 56 students joined and participated in the pre-survey. Three demographic data are shown in figure 4.7, 4.8, and 4.9.
Figure 4.7 Gender in pre-survey

Figure 4.8 Education level

Figure 4.9 English Level
In question 14 of the pre-survey, it was asked “Have you ever used your mobile phone or PDA for learning purposes (educational purposes)?” The reply is shown in figure 4.10. Majority of participants had no experience in using their mobile device for educational purposes.

![Figure 4.10](image)

Figure 4.10 Have you used your mobile device for educational purposes?

Question 15 of the pre-survey was to find out the attitude of participants towards the use of mobile devices in learning in general. The question states “Mobile phones and PDAs could be used in mobile learning (mLearning) and could be useful and effective for learning educational applications.” The summary of their replies is shown in figure 4.11. Majority had a positive attitude towards the use of mobile devices in education.

![Figure 4.11](image)

Figure 4.11 Mobile devices could be useful and effective in education?
Question 16 of the pre-survey was to find out the attitude of participants towards the use of mobile devices in learning English using mobile devices. The question states “Mobile Phones and PDAs could be used to learn and improve English language skills.” The summary of their replies is shown in figure 4.12. Though majority had a positive attitude towards the usefulness of mobile devices in learning English, the outcome was a bit less than the previous question which was asking about the usefulness of mobile devices in education.

![Figure 4.12 Mobile devices could be useful and effective in Learning English?](image)

The objective of question 17 of the pre-survey was to determine if the participants considered the use of mobile devices in learning English was easy or not. Figure 4.13 displays their replies which is 50-50.
Figure 4.13 How easy/difficult would it be learning English using mobile devices?

Question 18 asked participants to rank (1 to 10) the importance of the 8 factors in learning English using mobile devices. Figure 4.14 displays the rankings.

Figure 4.14 Ranking of factors in mobile English learning
It is evident from figure 4.14 that the convenience “Learning at any place”, “Learning at any time”, and “Learning at any pace” of mobile English learning is the most important factor in learning. Of course the single factor of lecturer’s pronunciation is also quite important.

Question number 8 of the pre-survey asked participants to rank (1 to 10) their English proficiency skills. As this question is related to post-survey, this researcher retrieved the responses of the 26 participants who successfully finished all the components of the research for comparison. Figure 4.15 displays the response of the 26 participants.

Figure 4.15 Ranking of English proficiency skills before trying out

9.2 Post-Survey

The post-survey was made available after 4-weeks of trial period. 26 participants finished the trying out of the mobile English learning and replied to the post-survey as well. Question 10 of the post-survey asked the participants to rank (1 to 10) the effectiveness of the mobile English lessons on their English proficiency after trying out the mobile learning. Figure 4.16 displays
their replies. Based on this figure, participants believe that FML4ESL has the most influence on their pronunciation. This is related to Question 2 discussed in section 4 of this chapter. This confirms the ANOVA result as calculated by SPSS.

![Figure 4.16 Impact of mobile English learning on participants' English proficiency](image)

Figure 4.16 Impact of mobile English learning on participants' English proficiency

As displayed by figure 4.16, the most impact has been on pronunciation, listening skills, conversation, and reading skill as expected.

Question 11 of post-survey requested the participants to evaluate their English proficiency skills after trying out the FML4ESL. This is exactly the same question asked in pre-survey and is shown in figure 4.15. Figure 4.17 displays the same result after trying out the mobile lessons.
This confirms that all participants had the perception that FML4ESL had improved their English proficiency skills in all areas under question. Pronunciation skill and listening skills have the highest improvement.

Question 9 of the post-survey asked “Do you think the mobile English lessons have improved your English skills?” Figure 4.18 displays participants’ replies to this question.
As shown in figure 4.18, majority of participants believed improvement in their English skills after trying out the FML4ESL.

One special feature of FML4ESL is its multimedia capability which means users could read the text while listening to the lesson. This is an important improvement over English lessons based on just MP3 audio lessons. This researcher wanted to explore how participants thought of this feature. Question 12 of the post-survey is related to this feature of FNL4ESL. Question 12 asked “Was it helpful for you to read the text of what you were listening?” The summary of the replies is shown in figure 4.19.

![Bar chart showing the percentage of participants who found the multimedia capabilities helpful. 58% found it helpful, 38% found it very helpful, and 4% did not notice a difference.]

Figure 4.19 Multimedia capabilities helpful?

25 out of 26 participants (96%) considered this feature either very helpful or helpful for mobile English learning.
Question 13 asked if they would like to have and try more mobile English lessons for free. 92% (24 out of 26) replied yes to this question. Question 14 asked if they would be willing to pay for mobile English lessons. The summary of their reply is shown in figure 4.20.

![Graph showing willingness to pay for mobile English lessons]

**Figure 4.20 Willing to pay for mobile English lessons?**

Question 15 asked “What is a reasonable cost for you to buy a unit (lesson) of mobile English lesson?” Figure 4.21 shows the response to this question. More than 50% of participants are willing to pay Baht 50 or above to get a unit (lesson) of mobile English lesson.

![Graph showing reasonable price for mobile English lesson]

**Figure 4.21 Reasonable price in Baht to buy a mobile English lesson**
The objectives of questions 16, 17, and 18 were to explore the effectiveness, quickness, just-in-time learning features of mobile learning. The results are shown in figures 4.22, 4.23, and 4.24.

Figure 4.22 Mobile English learning is an effective way to learn English

Figure 4.23 Mobile English learning is a quick way to learn English
Figure 4.24 Mobile English learning is ideal for learning English on demand (jit learning)

Question 19 stated “All English classes should adopt mobile English learning in addition to the existing traditional way of learning English in classrooms”. The summary of their replies is shown in figure 4.25. Majority of the participants have a positive view to this question which may indicate mobile English learning would be beneficial to their traditional classroom based learning as well.

Figure 4.25 Mobile English learning should be adopted in addition to traditional classes
Question 20 asked if they would recommend mobile English learning to their friends. 25 out of 26 participants (96%) replied positively to this question which shows a positive view of their experience with mobile English learning.

9.3 Open-Ended Questions in Post-Survey

In the post-survey, there were two open ended questions to seek the opinions of participants as they wished to express it. Question 21 requested the participants to mention what they liked about mobile learning experience. And question 22 asked them to mention what they disliked about mobile learning experience. This researcher did categorize the general responses in both categories and his findings are shown here.

9.3.1 Likes

The main keywords used in most responses in order of repletion were “convenience”, “effective”, “just-in-time learning”, “easy to learn”, “technologically advanced”, and “good for listening and pronunciation improvements.

One participant responded “I can study wherever I want to and I don’t need to carry a big text book around”. Another responded “I think it’s easy to learn, like a book that has the pronunciation which can be effective than normality”. Also one participant remarked “fun way to learn and easy way to learn”. Another remark was “it’s a good idea for learning english for students that have no time or money to go to English Academy school”. One more participant commented “The English-on-demand usually does not consist of listening part, but this program does”. And one last comment was “Wherever I have only my mobile phone I can learn English”. All participants had some good experience about their experience with mobile learning. These findings encourages this researcher about the usefulness of mobile devices in learning.
9.3.2 Dislikes

There were not much dislikes. Here are few comments from participants. One commented “I like everything. no dislike”. Another remarked “Some model of mobile phones may cannot install the lesson”. One more participants replied “The lessons provided are quite limited”. One remark was interesting “The program should convince learners to answer question by their own words, in which this will help learners to quickly improve in speaking and listening skills”.

10. Summary

The number of participants in this research was limited to 26 due to much requirements needed to fulfill by them. The one-way repeated-measure Analysis of Variances (ANOVA) were used to test the hypotheses in this section. There were no conclusive results for couple of hypotheses when the sample size of 26 participants was divided into smaller groups to verify the validity of the hypotheses. However, using questionnaires before and after the treatment could indeed confirm the hypotheses in the participants’ own opinions. This researcher was satisfied with the result of this research and its outcome.
CHAPTER V
FML4ESL PROTOTYPE

This chapter explains the developed prototype of Flashed-Based Mobile Learning System for Learning English as a Second Language (FML4ESL).

1. A Model for Mobile Learning

There are 4 elements that play important roles in mobile learning in general and mobile English learning in particular as follows, technology (mobile devices), instructor (content expert), course content, and of course the learner. A draft model was proposed in chapter 3 of this dissertation as shown again here in figure 5.1.

![Figure 5.1 A simplified model for FML4ESL](image)

Instructor (content expert) prepares contents. Contents under this current model should be composed of texts, pictures, and audio, though other media could be added in its future upgrades. In mobile English learning it’s quite important that the content expert is a native speaker as one
objective of mobile English learning is for the learners to learn right pronunciation from native speakers. Learners are those who own the technology in this case, mobile devices. The contents are prepared for mobile devices that can support Adobe Flash Lite technology. The contents are put together in units or lessons. Each unit should be around 5 minutes and containing around 8 – 10 slides so that most mobile devices currently available in market could play them. Learners can listen to audio lecture while reading the content at the same time. There are other factors that play important roles in mLearning as follows:

- Contexts
- Curricula
- Cultures
- Ethics
- Tools
- Learning activity
- Access to information
- Communication
- Community building
- Appropriation

2. Components of FML4ESL

Very similar to Learning Management System (LMS) for the Internet based eLearning systems, the Mobile Learning Systems (FML4ESL) needs to contain 2 main components, namely the content (learning material) and the interface of the content with the learner. At this time this model does not have enough management features to be called Mobile Learning Management System (MLMS). This prototype model, however, could be considered as an embryonic model for a fuller version with management of user activities. In this section the two components of FML4ESL are presented and discussed.
1.1 Content

The content material should be optimized for the small screens of mobile devices, usually between 2 to 3.5 inches. The contents should be grouped into small chunks of data. Each chunk then could be displayed on the screen of the mobile device. The content could be multimedia material, for this research the researcher is making use of text and pictures to display the contents as learning material and the voice of content expert for listening purpose. As the developed Flash-Based Mobile Learning System is intended to be used for learning English as a second language for the trial purpose, it would be useful to show the pictures of English nouns or actions for better understanding of the meaning of English words by showing their pictures.

The resolution of most modern mobile devices is around 240x320 pixels. This researcher optimized the texts of all the English lessons for the resolution of 240x320 pixels. Mobile devices with lower resolutions display the text with less clarity or sharpness, though still legible. The contrast and brightness could be controlled by the user through mobile device features. Figure 5.2 displays how the content is optimized for a screen resolution of 240x320 pixels.

![Figure 5.2 Optimization of the text under Adobe Flash](image)

Figure 5.2 Optimization of the text under Adobe Flash
The sound associated with the text is in MP3 format with a bit rate of 48 kilo bits per second (kbps) and the best quality available under Adobe Flash. The higher the bit rate the larger the file size, the quality does not affect the file size but it affects the loading time of the content into the mobile device. The small delay (1 to 2 seconds) is acceptable for these lessons as it provides couple of seconds to learner to read and meditate upon the text.

The various combinations of bit rates and quality were tested among 11 participants to select the best combination of sound quality. The only limitation in this selection was the file size, the researcher did not wish the file size for a lesson to exceed more than a 1.1 megabyte (MB) so that the older mobile phones could play them the same as newer ones. Figure 5.3 shows the selection of sound quality for every slide.

![Figure 5.3 Optimization of the sound under Adobe Flash](image-url)


1.2 Interface Design

The Flash-Based Mobile Learning System has a component that controls the functions of mobile devices and their interfaces with the learner. To provide the best functionality and user interface to learners, the researcher consulted with the ESL lecturer who provided the contents and also couple of technology experts to find out the essential functions that need to be provided. Below are some recommendations from experts.

The learner should be able to select a lesson, be able to play a lesson slide by slide, at the end of each slide, the learner should have a choice to repeat the same slide or be able to go forward to the next slide. At the end of a lesson (the last slide), the learner can decide to repeat the same lesson from the beginning all over again or simply quit the lesson and return back to normal mode of operation of the mobile device.

Based on the above recommendations, this researcher decided to divide a slide into 4 distinct layers as shown in figure 5.4.

As shown in figure 5.4, each slide of a lesson comprises 4 layers. The first layer, Layer p, holds the text and the picture of the content on any slide. The second layer, the s layer, contains the MP3 audio sound of the lesson which starts about 2 seconds after the text is displayed on the screen. The third layer, the layer e, is an action script which is executed at the
end of each slide. This action script basically stops the slide from going further. The last layer, the layer c, is the control layer that controls the functionality of the knob on mobile device. The action script for this control layer is shown on figure 5.5 below.

![Action Script for the control layer](image)

**Figure 5.5 Action script for the control layer to control knob on mobile device**

This action script controls the left and the right movement of the knob on mobile devices. The left click causes the same slide to be replayed and the right click causes the next slide to be continued. All slides follow the same logic except the last slide in the lesson. The action script for the last slide is shown in figure 5.6.
Figure 5.6 Action script for the control layer for the last slide of a lesson

```javascript
on (keyPress "<Left>") {
    gotoAndPlay(2);
}

on (keyPress "<Right>") {
    if (frameLoaded) {
        status = fscommand2("Quit");
    }
}
```

Figure 5.7 shows the timeline for the last slide, in this case the slide number 9.

Figure 5.7 Time line for the last layer with FS layer

Very similar to other slides, there are 4 layers on the last slide, slide number 9. There is an additional FS (Full Screen) layer at the first frame of the timeline. The action script on this layer causes the screen on mobile device to use the full screen and to remove the menu the menu options as shown in figure 5.8.
3. The System Prototype

As explained in the section 2 of this chapter, all the slides of this developed MLS contain 4 layers. Separation of media (text and sound) into different layers and their separation from the control layers provide the opportunity that the same MLS could be used to teach other subjects where the main media are text, pictures, and sound.

It’s also possible to develop other layers to contain other media like video clips or animations. It was outside the scope of this research to develop a more complex system. With its present components, this prototype system could ideally be used for learning foreign languages.

For this research and in order to try out the developed mLearning system, the researcher used the English lessons developed by a couple of professional native speakers ESL lecturers. The purpose of trying out the mLearning system was two folds, first to evaluate the effectiveness of learning using mobile devices, and second to evaluate English learning using mobile devices.

4. Implementation of the Prototype System

The prototype system was developed using Adobe Flash CS3 package under Windows Vista operating System. The developed Flash Mobile Learning System for Learning English as a
Second Language (FML4ESL) were in SWF file format which can be run on any computer, including PCs, Macintosh, Linux systems or any Flash enabled mobile devices. By limiting each lesson to 8-10 slides, the SWF are around 1 MB which could be played on most mobile devices. The process of using these SWF (mobile English lessons) on mobile devices is as follows.

4.1 Availability for Access & Downloading

The developed mobile English lessons were placed on a server so that participants to this research could download them. The url of site was provided to them which was:

http://mlearn.cide.au.edu

Participants to this research could access this site located on a server belonging to the College of Internet Distance Education and could download the lessons to their PCs after filling up the online application form.

4.2 Synchronization & Uploading

Most smart phones and PDAs come with software to synchronize the mobile devices with a personal computer. Users use this feature to install new programs on their mobile devices or upload MP3 music to their mobile devices. The same synchronization software could be used to upload mobile English lessons into mobile devices. Most modern mobile devices come with Adobe Flash Lite player installed on them. If not, one can download the Flash Lite player from Adobe site for free and install it on the mobile device using the same synchronization software.
4.3 Playing and Listening to the Mobile Lessons

The mobile English lessons could be activated in one of the two ways. In the first case, users should locate the folder or location where the file is stored on mobile device, usually on a memory stick, and just click on the lesson interested to practice (the swf file). The lesson starts playing, and the user is in control by using the knob handle. In the second case, one should locate the Adobe Flash Lite player icon on the mobile device, and click on its icon. The icon of Flash Lite is shown in figure 5.9. Once clicked, one can open any of the mobile lessons for playing.

Figure 5.9 Adobe Flash Lite for mobile devices

All versions of Adobe Flash Lite 1.0, 1.1, 2.0, 2.1, and newly released Adobe Flash 3.0 could be used for mobile English lessons. It is easy and convenient to load the Flash player and learn English on mobile devices.

5. Summary

The development of MLMS was a time-consuming process. This researcher had to consult with the content experts and technology experts to develop a prototype of the system. Some students were asked to try out the prototype on various mobile phones and PDAs to explore their usability on various models of mobile devices. Based on the feedbacks received, the
prototype was modified and enhanced to be operational on all models of mobile devices that support Adobe Flash Lite technology. There is still room for enhancement and addition of other features to the system which will be discussed later in Chapter 6 of this dissertation.
CHAPTER VI

SUMMARY, CONCLUSIONS, DISCUSSIONS, AND RECOMMENDATIONS

Mobile learning has evolved rapidly from concept to reality by virtue of the availability of mobile technologies such as mobile communication 3G networks and related data services, Smart phones, PDAs and diverse handheld computing devices. New education practices, especially in language learning, are emerging via podcasting (listen and learn) and just-in-time learning with flexibility in learning time and location. Unfortunately, the overall results of language learning and its characteristics via mobile technologies have yet to be adequately explored and defined.

1. Summary

1.1 Purpose

The purpose of this study was to design and develop a Flash-based mobile learning system for learning foreign languages.

The use of Adobe Flash was due to its availability on many brands of smart phones, PDAs, and computers; and also due to the power and flexibility of Adobe Flash to develop multimedia and animation lessons. To test the usefulness and usability of the system, this researcher adopted the existing English lessons that had been developed by professional ESL teachers and converted the lessons to comply with the Flash-based mobile standards. The purpose was two folds, to test the usefulness and usability of the Flash-Based mobile system and to test the improvement in English learning using the mobile devices.
1.2 Research Questions

Research questions and hypotheses were the following:

1. Could Flash based mobile learning system improve the English proficiency of students?

2. Could mobile devices with the English courseware prepared by professional ESL English teachers improve the English pronunciation of learners?

3. Could Flash-based mobile learning system improve the English proficiency of students regardless of their English level of proficiency?

4. Would the perceived value (attitude) towards mLearning by students influence the learning outcome of the Flash-based mobile learning system?

5. Would the perceived ease of use of mLearning by students influence the learning outcome of the Flash-based mobile learning system?

1.3 Research Methodology

There were both online and poster advertisement inviting students at Assumption university to participate in mobile learning research. A Moodle website was developed so that volunteers could learn about the research, to apply to join the research online, to take the pretest and pre-survey online, to download the lessons, and to reply to posttest and post-survey online. 166 students applied online to participate in this research. 56 out of this 166 (33.7%) just completed the pretest and pre-survey. The researcher believes that was due to many requirements on participants as all participants were required to complete a number of tasks, i.e. replying to 2 surveys, taking 2 online tests, recording their voices, and downloading lessons and uploading them to their mobile devices for learning English. And yet out of this 56 who started some components of the research, just 26 of them did finish all the other components. So this
researcher had to rely on the replies of just 26 participants as he could compare the data collected after treatment to the data collected before the treatment of just these 26 participants as sample population.

The test scores served as quantitative measurements of learning results. The survey results were used to determine participant levels of satisfaction, and were also referenced to the test scores. ANOVA was used to analyze data in this experiment by analyzing test scores and degree of satisfaction. ANOVA is a statistical technique used to analyze data that test for a difference between two (or more) means by comparing the variances within and between groups.

Results of the statistical analysis indicates that, at $p < 0.05$ significance level, there were good improvement in the English proficiency of students both in online objective multiple choice questions and also subjective oral tests. It was also proved that the same lessons could improve the English proficiency of students regardless of their current English levels. The results of perceived value and perceived ease of use could not be proven conclusively by statistical analysis due to small sample sizes. The result showed that there was improvement for all groups even those who did not have a positive view of mobile learning. But looking at the post-surveys, majority of participants considered mobile English learning as convenient, usable, and effective after trying out.
2. Conclusion

The Flash-Based Mobile Learning System for Learning English as a Second Language had a positive effect on participants who joined this research for a period of 4 weeks. The usefulness and the effectiveness of the system were verified by pretests, posttests, and surveys.

Conclusion of the study will provide IT technologist guidelines on the use of Flash on mobile devices for learning purposes, especially language learning; and also will provide instructional design guidelines for second language learning using mobile technologies and other related capabilities, such as the use of multimedia on mobile devices for educational purposes. Given the capabilities of mobile technologies regarding learning anytime, anyplace while multitasking, the new paradigm may support an accelerated curriculum course design for second language learning.

The major findings of these research as follows:

1) Majority of students at Assumption University have a positive attitude towards mobile learning and are enthusiastic to learn English using their mobile devices.

2) A Flash-Based mobile learning is best optimized with an audio bit rate of 48 Kbps and the quality set to ‘best’.

3) The same Flash-Based mobile learning system could be also utilized for learning other languages.

4) Smart mobile phones and PDAs could have a positive effect in learning English as a second language at all levels of English learning.
5) Multimedia features of mobile English learning are most effective in English pronunciation, listening and reading comprehension.

6) Convenience and just-in-time learning features of mLearning make it ideal for learning foreign languages.

7) The multimedia features of mLearning make language learning more effective.

8) Students are willing to pay for mobile lessons for their mobile lessons.

9) Mobile English learning is at its best in hybrid mode when supplemented with traditional English learning.

3. Discussions

Mobile learning is a new frontier in distance education and online training, and offers fascinating possibilities. As in all new fields, there are still a lot of things to explore and try out. To take advantage of using mobile technologies at the current stage in learning, it would be a good strategy to blend mobile learning with traditional course design, especially on field trips and in content-aware learning activities. Also, traditional learning Web sites could be expanded with Mobile Web features to offer Web access from mobile devices. Voice recognition technology could be integrated into mobile devices to facilitate the data input. The mobile phone has been treated as a competent educational tool for accessing information on the Internet in developing countries. Mobile phones have high penetration in developing countries, and provide a low-cost platform for information connectivity and education (Berners-Lee, 2007). The instructional design for learning on mobile devices is worth further exploration.
The study was based on certain assumptions, such as participants having enough skills in using personal computers or mobile phones for learning. Measured data by qualitative surveys and quantitative test scores heightened the trustworthiness of the results of this language learning research. However, it was found that some mobile learning participants encountered more difficulties in technical issues, such as synchronization of their PCs with their mobile devices, finding Flash Lite on their mobile devices, or playing the lessons for the first time. Few students discussed such issues on the web forum, or called the researcher to ask by phone, and one student visited him at his office to solve a technical problem on her mobile phone. These factors might have affected the perceptions of participants on the research results.

The low number of participants was due to lack of interest on students to join an activity for a long period of 4 weeks with no support or encouragement from the university or various schools or departments. To encourage research at university, the administration, deans and chairpersons should require their students to join various research activities.

4. Recommendations

New mobile devices and software tools have emerged recently, such as iPhone, Adobe Captivate, and the Flash Lite 3.0, which allows users to create a more comfortable learning environment with rich and interactive mobile learning content. Also, the Net Generation has grown up with these emerging information technologies. Their aptitudes, attitudes, expectations, and learning styles would be a good match for mobile learning. These factors expand and improve the existing mobile learning situations, and indicate the need for more research and further study.
To further discover mobile learning characteristics and the impact on instructional design for second language learning, the following are recommendations that may enhance a future study similar to this one:

1) Study broader learning content by expanding the course content to include writing skills
2) Explore a more variety of mobile devices
3) Recommend the English Department of Assumption University to adopt mobile English learning and develop more courses for their students.
4) Expand the research population to younger students in high-schools or commuting workers
5) Provide mobile English lessons for special interest groups, i.e. hospitality management, nursing, engineering, etc. and evaluate the impact on them
6) Provide direct upload features of the lessons from the server directly to mobile devices
7) Smart mobile phones and PDAs come with recording feature. Voice recognition could be added to this recording feature so that the learner of a second language could record the voice and with proper software evaluate the improvement in his/her pronunciation.
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APPENDIX A

Questionnaire for students owning a mobile device
mLearning Assessment

MOBILE LEARNING ASSESSMENT SURVEY

please click 'submit survey' at the end of this questionnaire after you finish answering all the questions to be eligible for back $50 gift certificate.

Questions marked with * are required.

PART I. Demographic Section
1. Please specify your email address if you would like to participate in the free gift voucher lottery.

2. Gender
   - Female
   - Male

3. Please specify your age group
   - < 18
   - 18 - 22
   - 23 - 27
   - 28 - 32
   - 33 - 37
   - > 37

4. Nationality
   - Thai
   - Non-Thai

5. I am currently living in
   - Central Region of Thailand
   - Northern Region of Thailand
   - North Eastern Region of Thailand
   - Southern Region of Thailand

6. I am studying at
   - Government university
   - Private university

7. I am currently studying towards my
   - Bachelor degree
   - Master degree
   - Doctorate degree

8. I am studying in an
   - International program
   - Thai (local) program

9. My field of studies is related to

10. Name of your university/college? (Optional)
"11. Do you also work?
   - No, I do not work
   - Yes, I have Part-time job
   - Yes, I have a Full-time job

Part II. mLearning

"12. What types of mobile device(s) do you own? (Choose all that applies)

- Blackberry
- iPod
- iPhone
- Smart Mobile phones
- PDA (Windows Mobile based, i.e. O2, ha, Dopod, etc)
- PDA (Palm OS, i.e. Treo, Sony)
- Tablet PC
- Wireless Notebook/Laptop/Tablet PC
- MP3, MP4 Audio Video players
- Others

"13. For how long have you been using the mobile device(s) you own?

- Less than a year
- 1 - 2 years
- 2 - 3 years
- 3 - 4 years
- More than 4 years

"14. Which of the following applications do you use regularly on your mobile device? Rate in terms of usage (1 = lowest frequently used, 10 = highest frequently used)

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<td>Keeping track of appointments and schedules</td>
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<td>MMS or other chat applications</td>
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<td>Record memo and voice</td>
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<td>Receive location specific information</td>
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"15. How much time do you spend on average on your mobile device(s) doing the above applications (activities) per day?

- Less than an hour per day
- 1 - 2 hours per day
- 2 - 3 hours per day
- 3 - 4 hours per day
- 4 - 5 hours per day
- 5 - 6 hours per day
- More than 6 hours per day
16. Do you think it would be useful for you to have the audio or/and the video of the lectures for your mobile device?
   - Yes
   - No

17. Would you be willing to pay to access the audio/video of the class lectures on your mobile device?
   - Yes
   - No
   - Depends on the price

18. What is the highest price you would be willing to pay for a unit of audio lecture in MP3 format? (Approximately 60 - 80 Minutes)
   - 50 - 100 Baht
   - 101 - 150 Baht
   - 151 - 200 Baht
   - 201 - 250 Baht
   - Only if less than 50 Baht
   - No, I am not willing to pay

19. What is the highest price you would be willing to pay for a unit of video lecture in MP4 or flash format? (Approximately 60 - 80 Minutes)
   - 100 - 150 Baht
   - 151 - 200 Baht
   - 201 - 250 Baht
   - 251 - 300 Baht
   - Only if less than 100 Baht
   - No, I am not willing to pay

20. Which of the following applications would you consider as the most important and useful for you if implemented to be used on your mobile device? (1 = lowest useful, 10 = highest useful)

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<th>Application</th>
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<td>Receiving SMS from my university about news and announcements</td>
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<td>Listening to audio of lectures on my mobile device</td>
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<td>Watching video lectures on my mobile device</td>
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<td>Reading ebooks and articles on my mobile device</td>
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<td>Reading lecture notes and PowerPoint slides on my mobile device</td>
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<td>Improving my English skills</td>
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<td>Playing educational games</td>
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<td>Accessing university website on my mobile device</td>
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<td>Registering for my courses using my mobile device</td>
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<td>Paying university bills by my mobile device</td>
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21. Which of the following would you consider as the main obstacle for mLearning? (1=Least important obstacle, 10=Most important obstacle)

<table>
<thead>
<tr>
<th>Obstacle</th>
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<tr>
<td>Price of the mobile device</td>
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<td>Price of coursework (audio, video) for mobile device</td>
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<td>Price of being online (WiFi, GPRS, etc.)</td>
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<td>Screen size of the mobile device</td>
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<td>Keyboard and inputting on mobile device</td>
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22. Which of the following would you consider as the most important advantage of m-learning? (1 = Least Advantageous, 10 = Most Advantageous)

<table>
<thead>
<tr>
<th>Advantage</th>
<th>1</th>
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<tr>
<td>Any time, anywhere sort of learning</td>
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<td>Easy to carry the mobile device everywhere</td>
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<td>Learning on demand</td>
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<td>Commuting to university could be decreased</td>
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<td>Cost of education could be decreased</td>
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<td>Better understanding of lectures</td>
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<td>More communication with teachers and other students</td>
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</table>

23. Do you think by providing m-learning for your studies, the class attendance should be reduced?

- Yes, by 25% (Should attend 3-4 of classes)
- Yes, by 50% (Should attend 1-2 of classes)
- No, the class attendance should not be reduced.

24. Would you be willing to participate in an m-learning project to use your mobile device to improve your English for free?

- Yes
- No

25. Any Comment about m-learning? Your wish list regarding to m-learning. (Optional Question)

PART I. Demographic Section

26. My teaching is related to
APPENDIX B

Questionnaire for students who do not own a mobile device
mLearning Assessment

MOBILE LEARNING ASSESSMENT SURVEY

please click 'submit survey' at the end of this questionnaire after you finish answering all the questions to be eligible for baht 500 gift certificate.

Questions marked with * are required.

PART I. Demographic Section

1. Please specify your email address if you would like to participate in the free gift voucher lottery.

*2. Gender
   - Female
   - Male

*3. Please specify your age group
   - < 18
   - 18 - 22
   - 23 - 27
   - 28 - 32
   - 33 - 37
   - >= 38

*4. Nationality
   - Thai
   - Non-Thai

*5. I am currently living in
   - Central Region of Thailand
   - Northern Region of Thailand
   - Northeastern Region of Thailand
   - Southern Region of Thailand

*6. I am studying at
   - Government university
   - Private university

*7. I am currently studying towards my
   - Bachelor degree
   - Master degree
   - Doctorate degree

*8. I am studying in a(n)
   - International program
   - Thai (local) program

*9. My field of studies is related to

10. Name of your university/college? (Optional)
11. Do you also work?
- No, I do not work
- Yes, I have Part-time job
- Yes, I have a full-time job

Part II. mLearning
12. What type of mobile device(s) would you like to buy? (Choose all that applies)
- Blackberry
- iPod
- Phone
- Smart Mobile phones
- PDA (Windows Mobile based, i.e. O2, hp, Dopod, etc)
- PDA (Palm OS, i.e. Treo, Sony)
- Tablet PC
- Wireless Notebook Laptops: Tablet PC
- MP3: MP4: Audio Video players
- Others

13. When do you think you will buy your mobile device(s)?
- During next 6 months
- During next 12 months
- After 1 year
- After 2 years

14. Which of the following applications do you think would be the most interesting for you to play on your mobile device when you buy it? (1-least interesting, 10-most interesting)
- SMS
- Listening to MP3 audio music
- Watching MP4 video music
- Podcasting/Listening to a program
- Keeping track of appointments and schedules
- Taking pictures
- Voice communication (phone calls)
- Browsing the Internet
- Emailing
- MSN and other chat applications
- Listen to radio
- Record memo and voice
- Receive location (GPS)
- Receive location specific information

15. How much time should be spent on average on your mobile device(s) doing the above applications (activities) per day?
- Less than an hour per day
- 1 - 2 hours per day
- 3 - 4 hours per day
- 5 - 6 hours per day
- More than 6 hours per day
16. Do you think it would be useful for you to have the audio or/and the video of the lectures for your mobile device?

Yes
No

17. Would you be willing to pay to access the audio/video of the class lectures on your mobile device?

Yes
No
Depends on the price

18. What is the highest price you would be willing to pay for a unit of audio lecture in MP3 format? (Approximately 60 - 80 Minutes)

- 50 - 100 Bath
- 101 - 150 Bath
- 151 - 200 Bath
- 201 - 250 Bath
- Only if less than Bath 50
No, I am not willing to pay

19. What is the highest price you would be willing to pay for a unit of video lecture in MP4 or flash format? (Approximately 60 - 80 Minutes)

- 100 - 150 Bath
- 151 - 200 Bath
- 201 - 250 Bath
- 251 - 300 Bath
- Only if less than Bath 100
No, I am not willing to pay

20. Which of the following applications would you consider as the most important and useful for you if implemented to be used on your mobile device? (1 = lowest useful, 10 = highest useful)

- Receiving SMS from my university about news and announcements
- Listening to audio of lectures on my mobile device
- Watching video of lectures on my mobile device
- Reading e-books and articles on my mobile device
- Reading lecture notes and PowerPoints slides on my mobile device
- Improving my English skills
- To communicate with teachers
- To communicate with other students
- Playing educational games
- Accessing university websites on my mobile device
- Repeating for my courses using my mobile device
- Paying university bills by my mobile device

21. Which of the following would you consider as the main obstacle for mLearning? (1 = Least important obstacle, 10 = Most important obstacle)

- Price of the mobile device
- Price of coursework audio/video for mobile device
- Price of being online (WiFi, GPRS, etc.)
- Screen size of the mobile device
- Keyboard and using on mobile device

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22. Which of the following would you consider as the most important advantage of mLearning? (1=Least Advantageous, 10=Most Advantageous)

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- Yes, by 25% (Should attend 3/4 of classes)
- Yes, by 50% (Should attend 1/2 of classes)
- No, the class attendance should not be reduced

24. Would you be willing to participate in an mLearning project to use your mobile device to improve your English for free?

- Yes
- No

25. Any Comment about mLearning? Your wish list regarding to mLearning. (Optional Question)
Guideline in English for participating in mLearning research
Guideline for Joining Mobile English Learning Research

The College of Internet Distance Education (CIDE), by Mr. Firouz Aranaki, Director of Courseware Production Center, is developing a Mobile Learning system (mLearning) for use by CIDE students using a mobile and PDA program. English Speaking and Listening Skills were selected as the prototypes of mLearning courseware and made available to all interested English language students.

Mr. Firouz has designed and developed a mobile phone and PDA program specifically to learn English speaking and listening skills. The English lessons have been prepared by professional ESL teachers. Being an IT professional and a believer in the use of technology in education for an effective learning, Mr. Firouz used Adobe Flash to develop these English lessons into multimedia lessons that can be played on many models of mobile phones and PDAs. The process of learning by using your mobile device is called mobile learning or mLearning.

Now, due to modern advancements in mobile phones and mobile learning, you can learn English almost anywhere and anytime. You can learn English while sitting in a bus or train or waiting for a friend in a restaurant. Instead of wasting time, you can be learning to speak English conversation at your own pace, under your own control without any personal “down time.” The dynamic mobility feature of mLearning along with high-resolution color graphics and advanced sound technology has made learning English easier, more accessible, and more enjoyable than ever before.

You can now download or copy these English lessons into your mobile phones or PDAs to listen and improve your English skills for free if you agree to participate in this research and provide Mr. Firouz with feedback on how you feel about the lessons and if you think these lessons could improve your English skills. Here are the steps needed to participate in this research.

I. Pre-Study
   1. Fill the application form online (click on “Application” link below under the yellow high-lighted text) to provide some information about yourself.
   2. After submitting your Application Form, you will receive an email within 24 hours and you will be provided with Login ID and password to be able to login in this site.
   3. After you receive your login-ID and password by email, you will become a participant in this research and you can login into this site by clicking the “Login” link on top right corner of this web page to access or download other media and material. Having the login-ID, you can download the English lessons for your mobile device.
   4. After you login, you will see an additional link called “Mobile English Learning” under Available Courses. You need to click it to enter the section related to this research and Mobile English Learning.
   5. You will see more information about mobile English learning and this research on this page. Please spend some time to read the information provided.
   6. Answer the first questionnaire (Preliminary Survey) online.
   7. Take the Pretest (A simple online English test to measure your English level).
   8. As these English lessons are mainly designed to improve your English conversation and pronunciation, I would like to measure how these lessons could improve your speaking English language and pronunciation. To achieve this, you have 3 options:
a. You can come to my office and have some chat with me for just 5 minutes at your convenient.
b. You can talk to me using MSN or Skype for 5 minutes
c. You can record your voice reading a short passage that I provide. And you can email me your recorded voice file in MP3 or Wave format.

This Pretest has 20 multiple-choice questions, and you have just 20 minutes to take the test. Remember to click „Submit” before your 20 minutes time is up.

II. Study (4 weeks)
1. Use your login-ID to login to this site and download or copy the mobile English lessons into your mobile phones. Please email me or come to see me in case of any difficulty.
2. Use Adobe Flash Lite Application on your mobile phone to open and listen to these lessons on your mobile phones as often as possible for 4 week.
3. Practice the lessons as required.
4. During these 3 to 4 weeks of learning English by your mobile phone/PDA, please join the forum and express yourself on what you think, strength and weaknesses of mobile learning.

III. Post-Study
1. Take another online test (Posttest) after 3 to 4 weeks of listening and practicing the lessons.
2. Answer to another online questionnaire (survey).
3. You can use one of the options as expressed in section 8 of Pre-Study. This is an important and the last component of this research as it allows me to measure your progress in learning English skills.
4. All the participants will receive an official certificate of completion of the research from the College of Internet Distance Education.
5. There will be a draw and 10 participants will be given a gift voucher of Baht 500 each from the Mall Department Store after the completion of all the components of the research.

IV. Notes
1. All the IDs, names, test scores, and questionnaires will be confidential and will not be shared with other individuals or departments.
2. The summary result of the research will be published.

During the research all participants are welcome to ask questions by email, MSN, Skype, or the forum in case of facing problems in downloading the lessons or playing the lessons on their mobile devices. You’re also most welcome to meet me personally at my office at SC IT building Room 903 at Suvanabhumi Campus. I can also meet you at Hua Mark campus if needed.

Firouz Anaraki
Phone : 02-7232949, 081-6159666
Room 903, 9th Floor, SC IT Center
Suvanabhumi Campus, Assumption University
Email : firouz@cide.au.edu
MSN : firouz19@hotmail.com
Skype : firouz9

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Guideline in Thai for participating in mLearning research
การเข้าร่วมงานวิจัยการเรียนภาษาอังกฤษผ่านโทรศัพท์มือถือ

คุณพิรุษ อนตารี ผู้อำนวยการศูนย์ปฏิบัติการทางอินเทอร์เน็ตแห่งวิทยาลัยการศึกษาทางไกลอินเทอร์เน็ต ได้พัฒนาระบบการเรียนผ่านโทรศัพท์มือถือ หรือที่เรียกว่า Mobile Learning หรือ mLearning ขึ้นเพื่อให้นักศึกษาระดับมหาวิทยาลัยใช้สำหรับฝึกหัดการพูดและฟังภาษาอังกฤษด้วยโปรแกรมที่สามารถใช้ได้บนโทรศัพท์มือถือหรือพีซี

โปรแกรมเพื่อฝึกทักษะการพูดและฟังภาษาอังกฤษผ่านโทรศัพท์มือถือและพีซี ซึ่งคุณพิรุษได้ออกแบบและพัฒนา รวมกับคณะอาจารย์ผู้เชี่ยวชาญจากศูนย์เรียน (ESL) โดยใช้ความเข้าใจทางด้านไอทีและด้านการศึกษาเพื่อมุ่งเน้นการเกิดผลรู้เรื่องมีประสิทธิภาพ บทเรียนภาษาอังกฤษผ่านอินเทอร์เน็ตด้วยโปรแกรมม็อดูลของโปรแกรมเพื่อฝึกทักษะการพูดและฟังภาษาอังกฤษผ่านโทรศัพท์มือถือและพีซีของนักศึกษา

ปัจจุบันนี้คุณสามารถเรียนภาษาอังกฤษ ได้ในทุกที่และทุกเวลาซึ่งเป็นผลมาจากความก้าวหน้าทางด้านโทรศัพท์มือถือ คุณสามารถเรียนภาษาอังกฤษขณะยังคงมีการฟื้นฟูในร้านอาหาร แทนที่จะเดินทางโดยรถ หรือโดยรถไฟ โดยปลอดภัยจากภัยคุณสามารถเรียนบทสนทนาภาษาอังกฤษได้นั้นๆ คุณศึกษาภูมิทัศน์ให้ทราบว่าจะมีการฟื้นฟูหรือยัง เอ็งด้วยกำหนดเวลาและลักษณะการพูดและฟังภาษาอังกฤษที่สิ่งต่างๆ ใช้ได้ทำให้การเรียนภาษาอังกฤษง่ายขึ้น และน่าสนใจมากกว่าเดิม

ดังนั้นจึงขอเชิญ นักศึกษาท่านให้ติดต่ออีเมล์ฝึกหัดการพูดและฟังภาษาอังกฤษผ่านโทรศัพท์มือถือหรือพีซีของคุณเพื่อการเรียนรู้และการพัฒนาทักษะการอ่านอังกฤษของคุณโดยไม่มีค่าใช้จ่ายใดๆเพิ่มเติม ให้รับบัตรประจำตัว และขอให้เข้าร่วมการเรียนการสอน จำนวน 500 บาท จากความมุ่งมั่น หากคุณเข้าร่วมการเรียนรู้เรื่องทั้งหมดให้เคยบจ่าย รับเงินกับความรู้ศึกษาที่คุณได้รับไปจากเรียนทั่วไป และเป็นเหตุที่จะคุณเห็นได้ว่าเรียนดังกล่าวนี้สามารถพัฒนาภาษาอังกฤษของคุณ ดังไปนี้คือขั้นตอนการเข้าร่วมในการเรียนการสอน

ก. ขั้นการเรียนการสอน

1. กรอกแบบฟอร์มออนไลน์ (ก็ที่เรียกว่า Application ข้างล่างซึ่งจะมีชัดเจนกว่านี้) เพื่อให้ข้อมูลที่เกี่ยวกับคุณ

2. หลังจากกดส่งแบบฟอร์มแล้ว คุณจะได้รับข้อความที่จะบอกว่าข้อมูลที่จะเข้าสู่ระบบไว้อีกนึง
3. หลังจากที่คุณรับข้อความและรหัส คุณก็จะเป็นผู้เข้าร่วมงานวิจัยนี้ คุณสามารถเข้าสู่เว็บไซต์นี้โดยเด็กคำว่า "Login" ขั้นตอนนี้จะมีเว็บบราว์เซอร์ใดจะเข้าเว็บไซต์นี้ต่างๆ

4. หลังจากที่คุณเลือกอินเทอร์เน็ตแล้ว คุณจะเห็นหน้าจอว่า "Mobile English Learning" ที่คุณจะเข้าใจได้ จากนั้นให้คุณเลือกส่วนที่มีข้อ graf กับการเรียนภาษาอังกฤษผ่านโทรศัพท์มือถือ

5. คุณจะเห็นข้อมูลเกี่ยวกับการเรียนภาษาอังกฤษผ่านโทรศัพท์มือถือและงานวิจัยนี้ กรุณาใช้อ่านข้อมูลนี้ด้วย

6. ครุภากออกแบบสอบถามตามดังกล่าว (Preliminary Survey) บนเว็บฯ

7. จากนั้นให้ท่านตอบแบบทดสอบ แบบทดสอบเพื่อวัดระดับภาษาอังกฤษของคุณ) ที่มีคำถามยื่นหน้า 20 ข้อ คุณมีเวลา 20 นาทีในการตอบคำถาม จากนั้นให้กดส่งเมื่อหมดเวลา

8. เพื่อให้เหมาะสมกับจุดประสงค์ของการวิจัยนี้ในการพิจารณาการทำนายภาษาอังกฤษและการออกแบบของคุณเพื่อประสูติประสงค์ทั้งหมด 3 ตัวเลือกดังนี้

8.1 คุณสามารถเฉพาะด้วยการที่กำหนดการสอบก่อนประมาณ 5 นาทีก่อนจะตอบข้อ 8.2 คุณสามารถตอบแบบเป็น MSN หรือ Skype เป็นเวลา 5 นาที

8.3 คุณสามารถตอบแบบที่เลือกการทำงานทบทวนคำศัพท์ได้ในเว็บไซต์ให้ได้ถูกต้อง

ว. ขั้นการเรียน (4 สัปดาห์)

1. ให้ใช้เว็บไซต์ของคุณเพื่อเข้าสู่เว็บไซต์แล้วคุณจะถูกส่งกลับไปที่เว็บไซต์ภาษาอังกฤษผ่านโทรศัพท์มือถือของคุณ ทำตามนี้โดยไปที่เว็บไซต์ของคุณเพื่อเลือกและพิมพ์เว็บไซต์บนโทรศัพท์มือถือของคุณให้ยืนยันต่อไปในวันที่ 4 แล้วใช้โปรแกรม Adobe Flash Lite บนโทรศัพท์มือถือของคุณเพื่อเปิดและพิมพ์เว็บไซต์บนโทรศัพท์มือถือของคุณให้ยืนยันตามวันที่ 4 แล้วใช้โปรแกรม Adobe Flash Lite บนโทรศัพท์มือถือของคุณให้ยืนยันต่อไปในวันที่ 4 แล้วใช้โปรแกรม Adobe Flash Lite บนโทรศัพท์มือถือของคุณให้ยืนยันต่อไปในวันที่ 4 แล้วใช้โปรแกรม Adobe Flash Lite บนโทรศัพท์มือถือของคุณให้ยืนยันต่อไปในวันที่ 4 แล้วใช้โปรแกรม Adobe Flash Lite บนโทรศัพท์มือถือของคุณให้ยืนยันต่อไปในวันที่ 4 แล้วใช้โปรแกรม Adobe Flash Lite บนโทรศัพท์มือถือของคุณให้ยืนยันต่อไปในวันที่ 4 แล้วใช้โปรแกรม Adobe Flash Lite บนโทรศัพท์มือถือของคุณให้ยืนยันต่อไปในวันที่ 4 แล้วใช้โปรแกรม Adobe Flash Lite บนโทรศัพท์มือถือของคุณให้ยืนยันต่อไปในวันที่ 4 แล้วใช้โปรแกรม Adobe Flash Lite บนโทรศัพท์มือถือของคุณให้ยืนยันต่อไปในวันที่ 4 แล้วใช้โปรแกรม Adobe Flash Lite บนโทรศัพท์มือถือของคุณให้ยืนยันต่อไปในวันที่ 4 แล้วใช้โปรแกรม Adobe Flash Lite บนโทรศัพท์มือถือของคุณให้ยืนยันต่อไปในวันที่ 4 แล้วใช้โปรแกรม Adobe Flash Lite บนโทรศัพท์มือถือของคุณให้ยืนยันต่อไปในวันที่ 4 แล้วใช้โปรแกรม Adobe Flash Lite บนโทรศัพท์มือถือของคุณให้ยืนยันต่อไปในวันที่ 4 แล้วใช้โปรแกรม Adobe Flash Lite บนโทรศัพท์มือถือของคุณให้ยืนยันต่อไปในวันที่ 4 แล้วใช้โปรแกรม Adobe Flash Lite บนโทรศัพท์มือถือของคุณให้ยืนยันต่อไปในวันที่ 4 แล้...
2. ให้แบบสอบถามออนไลน์
3. ตุลาส่งมาใช้หนังสือจัดส่งที่ให้ก่อนหน้านี้ในส่วนที่ 8 ของ การเรียนเนืองคืน นี้คือ
ส่วนประกอบอันสุดที่สุดและที่สำคัญของการวิจัยนี้เนื่องจากสิ่งนี้ทำให้สมบูรณ์วัตถุประสงค์ที่มุ่งหมายของ
การเรียนภาษาอังกฤษของคุณได้
4. ผู้เข้าร่วมงานวิจัยทุกคนจะได้รับประกาศนียบัตรอย่างเป็นทางการหลังจากจบการวิจัยจากวิทยาลัย
การศึกษาทางอินเทอร์เน็ต
5. กำหนดจะมีการจัดแต่งกาู้คุณละ 10 ท่านเพื่อรับบัตรกันมูลค่า 500 บาทจากคณะมตสิลหลังจาก
งานวิจัยนี้เสร็จสิ้น

หมายเหตุ
1. ข้อมูลที่แนบ ชื่อ แผนงานสอบ และแบบสอบถามจะถูกเก็บเป็นความลับและจะไม่มีการแพร่ปั้นกับ
ใครทั้งสิ้น
2. ผลสรุปของผลงานวิจัยจะถูกพิมพ์โดยไม่มีการเปิดเผยผลการเรียนเป็นรายบุคคล

ในระหว่างการที่วิจัยนี้ ผู้เข้าร่วมงานวิจัยสามารถติดต่อกันได้ที่คุณเปลี่ยน MSN หรือ
Skype หรือโทรศัพท์ในวิทยาลัยนี้ได้ ที่เกี่ยวกับการต่างประเทศหรือการใช้คอมพิวเตอร์
โทรศัพท์มือถือ หรือโทรศัพท์ได้ที่ที่ทำงานของผม ตึก SCIT ชั้น 903 ที่วิทยาเขตสุรนารีมิ หรือ วิทยา
เขตวิทยาลัยตามการแจ้งหมาย

พิธีจานวาง
โทร 02-7232949, 081-6159666
ที่ทำงาน 903 ชั้น 9 ตึก SC IT Center
หมายเล่าส์สำนักวิทยาเขตสุรนารีมิ
อีเมล์ firouz@cide.au.edu
MSN : firouz19@hotmail.com
Skype : firouz9
APPENDIX E

PreTest & PostTest Scores
### Appendix G  Participants scoring

<table>
<thead>
<tr>
<th></th>
<th>Pretime (Minutes)</th>
<th>Pretest (20)</th>
<th>Postime (Minutes)</th>
<th>Posttest (20)</th>
<th>Usage (Frequency)</th>
<th>Preoral (10)</th>
<th>Postoral (10)</th>
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<td>6:43</td>
<td>16.0</td>
<td>1</td>
<td>7.0</td>
<td>7.0</td>
</tr>
<tr>
<td>Participant 23</td>
<td>6:08</td>
<td>14.0</td>
<td>6:18</td>
<td>18.0</td>
<td>1</td>
<td>7.0</td>
<td>7.0</td>
</tr>
<tr>
<td>Participant 24</td>
<td>6:02</td>
<td>11.0</td>
<td>5:50</td>
<td>14:0</td>
<td>3</td>
<td>5.5</td>
<td>6.0</td>
</tr>
<tr>
<td>Participant 25</td>
<td>9:24</td>
<td>10.0</td>
<td>8:12</td>
<td>15.0</td>
<td>3</td>
<td>5.0</td>
<td>5.5</td>
</tr>
<tr>
<td>Participant 26</td>
<td>17:26</td>
<td>12.0</td>
<td>12:15</td>
<td>17.0</td>
<td>3</td>
<td>4.5</td>
<td>5.0</td>
</tr>
</tbody>
</table>
Preliminary Survey

Please answer all questions and click on "Submit Questionnaire" at the bottom of this survey after you finish.

• 1 Student-ID

• 2 Full Name

• 3 Gender
  - Male
  - Female

• 4 Nationality
  - Thai
  - Chinese
  - Indian sub-continent
  - Other Asian countries
  - Others
5 I study at

- Undergraduate Level (Bachelor Degree)
- Graduate Level (Master Degree)
- Doctorate Level (PhD)

6 Faculty/School of study?

7 I am currently taking the following English course in this semester (1/2008)

- Basic English
- English I
- English II
- English III
- English IV
- None

8 Evaluate your English skills
(1 = Very Poor up to 10 = Excellent)

<table>
<thead>
<tr>
<th>Skill</th>
<th>1</th>
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<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reading Skills</td>
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<td>Writing Skills</td>
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<td>Listening Skills</td>
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<td>Grammar</td>
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<td>Conversation</td>
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<td>Pronunciation</td>
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</tr>
</tbody>
</table>
**9** What is the brand name of your mobile phone/PDA?

- LG
- Motorola
- Nokia
- Samsung
- Sony Ericsson
- Sony CLIE
- Windows Mobile based PDA (HP, iPaq, O2, HTC, Dopod, etc)
- Others

**10** What is the brand name and model number of your mobile phone or PDA?

**11** For how long do you have this mobile device of yours?

- Less than 6 months
- Between 6 to 12 months
- Between 1 to 2 years
- Between 2 to 3 years
- More than 3 years
12. Rank the usage of the following applications on your mobile device. (1 = least frequently used, 10 = most frequently used)

<table>
<thead>
<tr>
<th>Application</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voice communication (phone calls)</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>SMS or MMS</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>Listening to MP3 music</td>
<td>O</td>
<td>O</td>
<td>O</td>
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<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>Watching MP4 video clips</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>Taking photos</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>Keep track of appointments and schedules</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
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<tr>
<td>Record memo or voice</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
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<tr>
<td>Receive location or maps (GPS)</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
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<td>O</td>
<td>O</td>
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<td>O</td>
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<tr>
<td>Emailing</td>
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<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>Browse the Internet &amp; WAP</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
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<tr>
<td>mobile learning (mLearning)</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
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<td>O</td>
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</tbody>
</table>

13. On average how many hours per day do you spend on your mobile phones doing the above applications?

- Less than an hour a day
- Between 1 to 2 hours
- Between 2 to 3 hours
- Between 3 to 4 hours
- Between 4 to 5 hours
- Between 5 to 6 hours
- More than 6 hours per day

14. Have you ever used your mobile phone or PDA for learning purposes (educational purposes)?

- Yes
- No
15. Mobile phones and PDAs could be used in mobile learning (mLearning) and could be useful and effective for learning and educational applications.

- Strongly Agree
- Slightly Agree
- Not Sure
- Slightly Disagree
- Strongly Disagree

16. Mobile Phones and PDAs could be used to learn and improve English language skills.

- Strongly Agree
- Slightly Agree
- Not Sure
- Slightly Disagree
- Strongly Disagree

17. I think using mobile phones and PDAs to learn English is

- Extremely easy
- Easy
- Not sure
- Difficult
- Extremely difficult

18. Which of the following factors do you consider important for learning English on your mobile device? (Rank 1 to 10, 1 = least important, 10 = most important)

<table>
<thead>
<tr>
<th>Factor</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
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<th>10</th>
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</thead>
<tbody>
<tr>
<td>Ease of use</td>
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<tr>
<td>Content of the lessons</td>
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<td>Learning at any place</td>
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<td>Learning at any time</td>
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<td>Learning at any pace</td>
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<tr>
<td>Hours spent on learning</td>
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<td>Lecturer's pronunciation</td>
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<tr>
<td>Type of mobile phone</td>
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</table>
APPENDIX G

Post-Survey
1. How easy/difficult was downloading of lessons from the server to your PC?
   - Very easy
   - Easy
   - Average
   - A bit difficult
   - Very difficult

2. How easy/difficult was the installing of lessons on your mobile phones?
   - Very easy
   - Easy
   - Average
   - A bit difficult
   - Very difficult

3. How easy/difficult was playing and listening to the lessons on your mobile device?
   - Very easy
   - Easy
   - Average
   - A bit difficult
   - Very difficult

4. On average how many times did you listen to each lesson on your mobile device?
   - 1
   - 2-3 times
   - 4-5 times
   - 6-7 times
   - 8-10 times
   - More than 10 times
5. **How was the quality of voice (MP3)?**

- High Quality - Easy and clear to understand
- Average Quality - Just OK
- Low Quality - Not so easy nor clear to understand

6. **How was the quality of text on screen?**

- High Quality - Easy and clear to read
- Medium Quality - Just OK
- Low Quality - Not easy nor clear to read

7. **How was the language and pronunciation of the male speaker?**

- Very easy to understand
- Easy to understand
- Average
- A bit difficult to understand
- Very difficult to understand
How was the language and pronunciation of the female speaker?

- Very easy to understand
- Easy to understand
- Average
- A bit difficult to understand
- Very difficult to understand

Do you think the mobile English lessons have improved your English skills?

- Yes, very much
- Yes, moderately
- Yes, a little bit
- No improvement

Please rate the effectiveness of the mobile English learning on you in the following areas (10 = Most Effective, 1 = Least Effective).

<table>
<thead>
<tr>
<th>Reading Skill</th>
<th>1</th>
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<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
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<tbody>
<tr>
<td>Writing Skill</td>
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<td>Listening Skill</td>
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<tr>
<td>Grammar</td>
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</table>

Now evaluate your English skills after using mobile English learning in following areas (1 = Very Poor, 10 = Excellent).

<table>
<thead>
<tr>
<th>Reading Skill</th>
<th>1</th>
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<td>Writing Skill</td>
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</tbody>
</table>
12. Was it helpful for you to read the text of what you were listening?
   - Yes, very helpful
   - Yes, helpful
   - No difference
   - The text caused confusion

13. Would you like to have and try more mobile English lessons for free?
   - Yes
   - No

14. Would you be willing to pay for mobile English lessons for your mobile device?
   - Yes
   - No
   - Depends on cost
15. What is a reasonable cost for you to buy a unit (lesson) of mobile English lesson?
   - Around Baht 100
   - Around Baht 75
   - Around Baht 50
   - Around Baht 25
   - Around Baht 10

16. Mobile English learning is an effective way to learn English.
   - Strongly agree
   - Agree
   - Neither agree, nor disagree
   - Disagree
   - Strongly disagree

17. Mobile English learning is a quick way to learn English.
   - Strongly agree
   - Agree
   - Neither agree, nor disagree
   - Disagree
   - Strongly disagree

18. Mobile English learning is ideal for learning English on demand (Just in time learning).
   - Strongly agree
   - Agree
   - Neither agree, nor disagree
   - Disagree
   - Strongly disagree
19. All English classes should adopt mobile English learning in addition to the existing traditional way of learning English in classrooms.

   - Strongly agree
   - Agree
   - Neither agree nor disagree
   - Disagree
   - Strongly disagree

Would you recommend mobile English learning to your friends who would like to learn English?

   - Yes
   - No

In a few sentences mention what you liked about mobile learning experience.

In a few sentences mention what you disliked about mobile learning experience.

Submit questionnaire