

EXPLORING CHINESE INTERNATIONAL
STUDENTS' ACCEPTANCE OF
MOBILE LEARNING

by

ZHETAO GUO

ANGELA D. BENSON, COMMITTEE CHAIR

BECKY ATKINSON
ANDRÉ R. DENHAM
MARGARET L. RICE
VIVIAN H. WRIGHT

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ABSTRACT

With the rapid development of mobile technology, many colleges and universities plan to incorporate, or have started to explore, the use of mobile technology in academics. To improve the educational use of mobile devices, it is necessary and important to investigate students' acceptance of mobile learning. As one of the largest groups of international students in U.S. universities, Chinese international students were the major focus of this study. Using the Unified Theory of Technology Acceptance and Use (UTAUT) model as a theoretical framework, the researcher explored Chinese international students' use of mobile learning and examined whether the four UTAUT determinants (performance expectancy, effort expectancy, social influence, facilitating conditions) affect Chinese international students' acceptance of mobile learning.

Online surveys were used for data collection. The descriptive data indicate that the majority of the participants owned mobile devices such as smartphones, tablets, iPads, MP3, and MP4 players. They frequently used these mobile devices for various learning activities. In addition, the results reveal that there was no significant difference of participants' behavioral intention to use mobile learning based on gender, age, level of experience, and voluntariness of use. Effort expectancy and facilitating conditions were significant predictors of participants' behavioral intention to use mobile learning. Facilitating conditions and behavioral intention were not significant predictors of participants' use behavior of mobile learning. However, there was slight interaction between facilitation conditions and behavioral intention. This research provides

university administrators and educators information on the factors influencing Chinese international students' acceptance of mobile learning and their actual usage of mobile learning. The findings also expand the existing body of knowledge in the fields of mobile learning and the UTAUT model.

DEDICATION

I dedicate this dissertation to my parents, Xudong Guo and Xuezhen Hu, and also my grandparents.

LIST OF ABBREVIATIONS AND SYMBOLS

a	Cronbach's index of internal consistency
β	Probability of making a Type II error
df	Degrees of freedom: number of values free to vary after certain restrictions have been placed on the data
F	Fisher's F ratio: A ration of two variances
M	Mean: the sum of a set of measurements divided by the number of measurements in the set
n	Sample size
p	Probability associated with the occurrence under the null hypothesis of a value as extreme as or more extreme than the observed value
SD	Standard Deviation: the variation measure in mean distribution
SE	Standard error: an estimate of the standard deviation of a sampling distribution
t	Computed value of t test
$<$	Less than
$>$	More than
$=$	Equal to

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CHAPTER I: INTRODUCTION

The rapid growth of mobile technology and the increased use of mobile devices with internet access by higher education students have opened additional avenues of communication, providing greater opportunities for collaboration and expanding access to traditional learning and information resources (Donaldson, 2010). According to the report by EDUCAUSE, mobile device ownership of undergraduate students has increased about 60% in 2012 compared to the previous year. Moreover, nearly twice as many students in 2012 (67%) reported using smartphones for academic purpose than in 2011 (37%), with tablet or e-reader usage accounting for 67% and 47%, respectively (Dahlstrom, 2012). “Mobile technology figures prominently in the future of higher education, particularly in its integration into teaching and learning” (Rossing, Miller, Cecil, & Stamper, 2012, p. 1). Motivated by this trend, many colleges and universities plan to incorporate, or have started to explore, the use of mobile technology in academics.

To improve the educational use of mobile devices, it is necessary and important to investigate students’ acceptance of mobile learning. Technology acceptance is defined as a user’s willingness to employ technology for the tasks it is designed to support (Teo, 2011). For this study, a student’s acceptance of mobile learning is a student’s willingness to use mobile technology for learning. According to Akour (2010), “In higher education, the success of mobile learning depends upon student acceptance of the technology; therefore, student acceptance should be a key concern for administrators considering the implementation of mobile learning” (p. 9). As one of the largest group of international students in American universities (Nelson,

2013), Chinese international students were the major focus of this study. Using the Unified Theory of Technology Acceptance and Use (UTAUT) theory as a theoretical framework, the researcher examined Chinese international students' use of mobile learning and determined the factors that affect their acceptance of mobile learning.

Framework

The Unified Theory of Acceptance and Use of Technology (UTAUT) provided the conceptual framework for this study. UTAUT was created by Venkatesh, Morris, Davis, and Davis in 2003. It aims to explain user intentions to use a technology and subsequent usage behavior. Behavioral intention to use a technology is defined as a person's subjective probability that he or she will use a technology (as cited in Konerding, 1999). Use behavior is the actual behaviors of using a technology by a user. For this study, behavioral intention to use mobile learning means a Chinese student's subjective probability that he or she will use mobile technology for learning. Use behavior means the actual behaviors of using mobile technology for learning by a Chinese student.

Venkatesh et al. (2003) called these main factors affecting the acceptance of ICT (information and communications technology) determinants. These four determinants are performance expectancy, effort expectancy, social influence, and facilitating conditions. Determinant is defined as a factor that decisively affects the nature or outcome of something (from Oxford Dictionaries online). For this study, a determinant of acceptance of mobile learning is a factor that decisively affects a Chinese student's willingness to use mobile technology for learning. Age, gender, experience, and voluntariness of use are the four moderating factors. According to Springer Reference, a moderating factor is a variable that affects the direction and/or strength of the relationship between an independent variable and a dependent variable.

Therefore, these four moderating factors affect the strength of the relationship between the four determinants and behavioral intention, as well as the relationship between the four determinants and use behavior.

Statement of the Problem

The number of the international students, especially Chinese international students in American universities has been increasing dramatically. According to the annual “Open Doors” report from the Institute of International Education, more international students attended American colleges and universities in the 2011-12 school year than ever before, making it the sixth consecutive year in which international student enrollment has increased. There were 764,495 international students enrolled at colleges and universities in the United States in the 2011-12 academic year. China continues to lead the way as the No. 1 country of origin, with 194,029 students in 2011-12, a remarkable 23.1 percent increase from the previous year (Abrams, 2012). Chinese international students make up about a quarter of the international student population in American colleges. On the one hand, like American students, Chinese international students are inevitably influenced by mobile technology. On the other hand, as minorities in American universities, Chinese international students may have a different personal, academic and cultural background than their American peers. A review of the literature provides very limited research on international students’ use of mobile learning, especially of Chinese international students. Additionally, there is a lack of research using UTAUT on whether Chinese international students plan to use or are currently using mobile devices to facilitate their learning. More research is needed to determine the factors that affect Chinese international students’ acceptance of mobile learning.

Purpose of the Study

Using UTAUT as the theoretical framework, this study gained understanding of Chinese international students' acceptance of mobile learning. Whether the four UTAUT determinants (performance expectancy, effort expectancy, social influence, facilitating conditions) affect Chinese international students' acceptance of mobile learning was examined.

Research Questions

There were seven research questions for this study. They included the following:

1. What is Chinese international students' use of mobile learning;
2. Is there a significant difference between Chinese male students and female students on their behavioral intention to use mobile learning;
3. Is there a significant difference between the participants' ages and their intention to use mobile learning;
4. Is there a significant difference between participants' levels of experience and their intention to use mobile learning;
5. Is there a significant difference between the following two groups on their behavioral intention to use mobile learning: Chinese international students who feel that using mobile learning is voluntary, Chinese international students who feel that using mobile learning is required by professors;
6. Are the following independent variables significant predictors of Chinese international students' behavioral intention to use mobile learning: performance expectancy, effort expectancy, social influence, and facilitating conditions; and

7. Are Chinese international students' behavioral intention to use mobile learning and facilitating conditions significant predictors of Chinese international students' use behavior?

Methodology

This research used online surveys for data collection. Participants for this study were Chinese international students who were currently enrolled in undergraduate and graduate programs at a public university in the southeast region of the United States. According to the university's enrollment data, there were 831 enrolled Chinese international students (undergraduate and graduate). Raosoft sample size calculator was used to determine the sample size for this study at a statistical confidence level of 90%, with a 5% margin of error. A sample size of approximately 205 complete survey submissions was required. Participants were solicited for the survey through census sampling of all Chinese international students in the participating university. The university's international office sent the invitation letter and the link of the online survey to all the Chinese international students via campus email. Demographic data collected from the participants included age, gender, major, degree, and experience of using mobile learning. Quantitative data analysis methods included t-test, ANOVA, multiple regression, and descriptive statistics.

Significance of the Study

This research fills the gap in studying minority students, specifically Chinese international students' acceptance of mobile learning. The findings from this research expand the existing body of knowledge in the fields of mobile learning and technology acceptance.

Acceptance of a technology can be crucial to its use and success. Understanding students' acceptance of mobile learning is essential to the successful delivery of academic, organizational,

and instructional information (Donaldson, 2010). Because of the increasing enrollment of Chinese international students in American universities, the group of Chinese international students has gradually become a more significant part in American universities. Therefore, administrators and educators should consider Chinese international students' acceptance of mobile learning as well.

In general, this study benefits both administrators and educators. The findings from this study provide university administrators with information on the factors influencing Chinese international students' acceptance of mobile learning. This information can help administrators make the most educated decisions and policies on implementation of mobile learning. In addition, this study provides educators with information on Chinese international students' actual usage of mobile technology for academic purposes, so that educators can better apply mobile technology in their instructional practices. Therefore, this study ultimately promotes effective mobile learning, and advance the success of mobile learning implementations in universities.

Definitions of Key Terms

Mobile learning: Learning delivered or supported solely or mainly by handheld and mobile technologies (Traxler, 2007). For this study, mobile learning is defined as formal learning by means of wireless mobile devices, such as a PDA, smartphone, mobile phone, iPod, tablet, game console, personal audio player, e-reader and so on. According to the Organisation for Economic Co-operation and Development (OECD), formal learning is always organized and structured, and has learning objectives. From the learner's standpoint, it is always intentional, and the learner's explicit objective is to gain knowledge, skills and/or competences.

Technology adoption: The process through which organizations or individuals decide to make full use of an innovation in their daily businesses (Rogers, 1983). According to Van Biljon

and Renaud (2009), technology adoption and technology acceptance are interrelated.

“Acceptance is an essential precursor of adoption” (p. 1), since “adoption will not occur without a person having accepted the technology” (p. 2).

Technology acceptance: A user’s willingness to employ technology for the tasks it is designed to support (Teo, 2011). For this study, it is a student’s behavioral intention to use mobile technology for learning.

Behavioral intention to use a technology: A person’s subjective probability that he or she will use a technology (as cited in Konerding, 1999). For this study, behavioral intention to use mobile learning means a student’s subjective probability that he or she will use mobile technology for learning. It is used to measure a student’s acceptance of mobile learning, which ultimately affects a student’s adoption of mobile learning.

Use behavior: The actual behaviors of using a technology by a user. For this study, use behavior of mobile learning is the actual behaviors of using mobile technology for learning by a student, which indicate the adoption of mobile learning by a student. It is directly influenced by a student’s behavioral intention to use mobile learning.

Determinant: A factor that decisively affects the nature or outcome of something (from Oxford Dictionaries online). For this study, a determinant of acceptance of mobile learning is a factor that decisively affects a student’s willingness to use mobile technology for learning.

Performance expectancy: The degree to which an individual believes that using the system will help him or her to attain gains in job (Venkatesh et al., 2003). For this study, it means the degree to which a student believes that using mobile devices for learning will help him or her to improve academic outcomes.

Effort expectancy: The degree of ease associated with the use of the system (Venkatesh et al., 2003). For this study, it means the degree of ease associated with the use of mobile devices for learning.

Social influence: The degree to which an individual perceives that important others believe he or she should use the new system (Venkatesh et al., 2003). For this study, it means the degree to which a student perceives that important others believe he or she should use mobile devices for learning.

Facilitating conditions: The degree to which an individual believes that an organizational and technical infrastructure exists to support use of the system (Venkatesh et al., 2003). For this study, it means the degree to which a student believes an organizational and technical infrastructure exists to support the use of the mobile devices for learning.

Moderating factor: A variable that affects the direction and/or strength of the relationship between an independent variable and a dependent variable (from Springer Reference online). For this study, age, gender, experience and voluntariness are the variables that affect the strength of relationships between the four determinants (performance expectancy, effort expectancy, social influence and facilitating conditions) and Chinese international students' behavioral intention to use mobile learning, as well as the strength of relationship between facilitating conditions and use behavior.

Experience: A person's practical knowledge, skill, or practice derived from direct observation of or participation in events or in a particular activity (from Merriam-Webster dictionary online). For this study, it means a student's knowledge and skill of using mobile technology for learning obtained from direct observation or participation.

Voluntariness of use: The degree to which use of the technology is perceived as being voluntary, or of free will (Moore & Benbasat, 1991). For this study, it means the degree to which use of the mobile technology for learning is perceived as being voluntary or of free will for a student.

Chinese international student: A Chinese national who is enrolled for credit at a higher education institution in the U.S.

CHAPTER II:
REVIEW OF THE LITERATURE

Introduction

The concept of mobile learning has emerged with the rapid development in computer technologies, mobile devices, and wireless technologies. Mobile technologies have great educational potential with mobile learning becoming an irresistible trend. According to the EDUCAUSE 2012 report, college students continue to bring their own devices, favoring small, portable ones, and desire access to academic progress information and course material via their mobile devices (Dahlstrom, 2012). Various studies concerning mobile learning have been conducted. The number of research articles regarding mobile learning has significantly increased from 2001 to 2011, and research samples in higher education were selected the most (Hwang & Tsai, 2011). This literature review provides insight into the current research base related to the definition, characteristics, benefits and challenges of mobile learning, and its usage in higher education. Several studies have been conducted to investigate college students' acceptance of mobile learning, but their primary focus is on the general American student population. So far, no research has been located that investigates the factors affecting Chinese international students' intentions to use mobile learning, and to explore the age and gender differences in terms of the acceptance of mobile learning.

Defining Mobile Learning

Mobile learning is also called m-learning. There are many different definitions for mobile learning in the literature. These definitions focus on different characteristics of mobile learning, such as technology, mobility, ubiquitousness, and learner perspective. There are direct definitions defining mobile learning purely in terms of its technologies and hardware. It is defined as learning delivered or supported solely or mainly by handheld and mobile technologies (Traxler, 2007). These mobile technologies include mobile phones, smartphones, PDAs, MP3/MP4 players (e.g., iPods), handheld gaming devices (e.g., Sony PSP, Nintendo DS), Ultramobile PCs (UMPCs), mini notebooks or netbooks (e.g., Asus EEE), handheld GPS or voting devices, and specialist portable technologies used in science labs, engineering workshops or for environmental or agricultural study (Masoud, Masoud, Vahid, & Ali Jamali, 2011). Another view of mobile learning focuses on its mobility. Mobile learning happens anytime and anywhere, as long as learners carry their mobile devices. For example, Park (2011) viewed mobile learning as the use of mobile or wireless devices for the purpose of learning while on the move. This definition is also related to the technological perspective of mobile learning.

Some researchers critiqued these technology-focused definitions of mobile learning. According to Traxler (2007), the problem of these definitions is that they are constraining, techno-centric, and tied to current technological instantiations. He stated that we should explore other definitions that “look at the underlying learner experience and ask how mobile learning differs from other forms of education, especially other forms of e-Learning” (p. 4). Woodill (2010) clarified that mobile learning is not about putting e-learning course materials into a smaller package that learners can access on a mobile device; rather, it is thinking differently about learners and the possibilities that being both mobile and connected can offer to learners.

While considering mobility from the learner's perspective rather than technology's, O'Malley, Vavoula, Glew, Taylor, Sharples, and Lefrere (2003) defined mobile learning as "Any sort of learning that happens when the learner is not at a fixed, predetermined location, or learning that happens when the learner takes advantage of the learning opportunities offered by mobile technologies" (p. 6). El-Hussein and Cronje (2010) identified three important concepts of mobile learning: mobility of technology, mobility of learner and mobility of learning. They concluded that mobile learning is "any type of learning that takes place in learning environments and spaces that take account of the mobility of technology, mobility of learners and mobility of learning" (p. 20). Some researchers also considered mobile learning as an extension of e-learning. For instance, Quin (2000) defined mobile learning as e-learning that can be realized by means of mobile computing devices.

Traxler (2007) identified the following six specific categories of mobile learning: 1) technology-driven mobile learning – Some specific technological innovation is deployed in an academic setting to demonstrate technical feasibility and pedagogic possibility; 2) miniature but portable e-Learning – Mobile, wireless, and handheld technologies are used to re-enact approaches and solutions already used in 'conventional' e-Learning; 3) connected classroom learning – The same technologies are used in classroom settings to support collaborative learning, such as interactive whiteboards; 4) informal, personalized, situated mobile learning – The same technologies are enhanced with additional functionality, such as location-awareness or video-capture, and deployed to deliver educational experiences that would otherwise be difficult or impossible; 5) mobile training/ performance support – The technologies are used to improve the productivity and efficiency of mobile workers by delivering information and support just-in-time and in context for their immediate priorities; and 6) remote/ rural/ development mobile

learning – The technologies are used to address environmental and infrastructural challenges to delivering and supporting education where ‘conventional’ e-Learning technologies would fail. For this study, mobile learning is defined as formal learning by means of wireless mobile devices, such as a PDA, smartphone, mobile phone, iPod, tablet, game console, personal audio player, e-reader and so on. According to The Organisation for Economic Co-operation and Development (OECD), formal learning is always organized and structured, and has learning objectives. From the learner’s standpoint, it is always intentional, and the learner’s explicit objective is to gain knowledge, skills and/or competences.

Mobile Learning Characteristics

Fezile and Nadire (2011) presented the basic characteristics of mobile learning. Ubiquitous is the most defining characteristic, which means learners can learn anytime and everywhere. Mobile learning can be used for blended learning as well, such as combining classroom instruction with mobile learning to maximize the benefits of both face-to-face and online learning methods. Privacy is another important characteristic of mobile learning. Privacy means that in most cases, only one learner at a time has access to the mobile tool. When learners want to access information, they connect with and download the information independently from other learners. Additionally, mobile learning environments and mobile tools provide learners varying levels of interactivity. Mobile technologies support communication between students and teachers and are useful for collaborative learning activities. And finally, mobile tools can provide instant information and immediate learning materials to learners.

Some researchers proposed some unique educational affordances that mobile devices produce, which also reflect the characteristics of mobile learning. Peters (2007) cited Klopfer, Squire, Holland, and Jenkins’ (2002) work and pointed out five characteristics of mobile

learning. Besides portability, social interactivity, connectivity and individuality, which are consistent with the basic characteristics identified by Fezile and Nadire (2011), context sensitivity is another important feature of mobile learning - the ability to gather data unique to the current location, environment, and time, including both real and simulated data.

Benefits

The first benefit of mobile learning is cost. Some researchers suggested that mobile learning provides relatively inexpensive learning opportunities (Elias, 2011). Although cost remains a barrier to mobile learning in many parts of the world, handheld mobile devices and cellular services are significantly less expensive than PCs and laptops with fixed Internet service. Moreover, the entry point for mobile learning is potentially lower than for forms of online learning. Additionally, the size and inherent portability of the mobile devices facilitates information sharing as a method of lowering access costs more easily.

The second benefit is convenience and flexibility. Convenience is the most obvious benefit of mobile learning. Mobile devices can be used anywhere, anytime, including in the classroom, at home, etc. (Masoud et al., 2011). Because of this flexibility, mobile learning can be more relevant as well since it can take place at the location where the instruction is to be put into practice. This flexibility also means that mobile learning can happen during downtime such as waiting in line for coffee, traveling, etc. (Norman, 2011). Koole, McQuilkin, and Ally (2010) explained that “this flexibility permits frequent dialogue with experts and peers, just-in-time retrieval of information, documentation of personal experiences, and integration of course-based knowledge into aspects of the learners' daily lives-all permitting learners to receive feedback and assess their progress” (p. 61).

Promoting interactivity and collaboration is the third benefit of mobile learning. According to Masoud et al. (2011), by using mobile technologies, learners can interact with each other and with teachers instead of being constrained behind large computer monitors. It also provides additional channels for communication and collaboration through extra layers of visual and audio information automatically triggered or delivered on demand (Kukulska-Hulme, 2013). Norman (2011) argued that mobile learning affords the numerous social learning opportunities, such as SMS texting reminders, knowledge sharing through microblogging, and simply the ability to dial a number and speak to a peer, mentor, or expert to seek the answer to questions. Rossing et al. (2012) did a study on student perceptions on learning with mobile tablets. They found that mobile technology supports collaborative learning environments in which students are expected to discuss concepts, debate questions, and build knowledge together.

Besides the benefits mentioned above, some researchers also explored other specific benefits from the learner's perspective. Norman (2011) listed one less obvious benefit of mobile learning. It is said that since learners are already familiar with the technology when using their own devices, the technological barriers that often can exist when deploying new kinds of learning technologies is eliminated. Moreover, mobile learning empowers learners, enhances content retention, enables more rapid remediation, results in better professional judgments, makes for easier evidence collection and encourages reflection. Attewell (2005) also stated that mobile learning helps learners to improve literacy and numeric skill, to recognize their existing abilities, and to identify where they need assistance and support. It also helps learners to overcome the digital divide, to make learning informal, to be more focused for longer periods, and raise self-esteem and self-confidence.

Challenges

Although cost can be one benefit to mobile learning, it remains a barrier as well in many parts of the world (Elias, 2011). In order to participate in mobile learning, learners need to have mobile devices. The ownership of mobile devices and the cost of internet access or texting may become barriers for some learners. Rossing et al. (2012) reported that the lack of ownership proved frustrating for students. They found that students established stronger group connections and reported stronger collaborative learning when each person had control over a mobile device. Some researchers, such as Norman (2011), suggested that one challenge is how to keep the costs of mobile learning down while designing programs compatible with different devices and multiple platforms.

Technology is the second challenge. The small screens of mobile devices limit the amount and type of information that can be displayed. There is limited storage capacity for mobile devices. Batteries have to be charged regularly, and data can be lost if this is not done correctly. Mobile devices can become out of date quickly. They can be much less robust than desktops. It is difficult to use moving graphics, especially with mobile phones, although 3G and 4G technologies will eventually allow this. Bandwidth may degrade with a larger number of users when using wireless networks (Masoud et al., 2011). Content and software application limitations also exist, which include a lack of built-in functions, the difficulty of adding applications, challenges in learning how to work with a mobile device, and differences between applications and circumstances of use (Kukulka-Hulme, 2007). Mobile device variability is another problem. Elias (2011) explained “Despite recent market excitement about the potential of higher-end smartphones and touch phones, feature phones continue to represent an estimated 85% of the mobile market. The significant challenges of m-learning are partly due to this

diversity” (p. 71). It is difficult to find a single solution to deliver richly interactive mobile content to every possible phone.

Course design is the third challenge. Norman (2011) argued that determining how to effectively design for mobile devices, which is clearly different from designing for a PC, is a challenging task. An additional concern about mobile learning is the possibility for learners to cheat on assessments. Related to assessment is the challenge of tracking learners’ progress. The lack of personal contact and immediate instructor feedback that some learners prefer is another drawback and challenge (Yousuf, 2007).

Some researchers investigated the psychological challenges of mobile learning. Terras and Ramsay (2012) identified the five central psychological challenges facing effective mobile learning. The first three challenges are context dependency, resource limitations and distributed cognition. They are characteristics of cognitive functioning that may be particularly vulnerable to disruption by the increased demands that may be imposed by learning while mobile. The fourth one is that learners must possess the psychological infrastructure to support the mobile learning. This means mobile learners will need to know how they learn in general, be sensitive in particular to the increased demands of mobile learning, and how they can best be managed. Understanding individual differences in technology use is another challenge. “If one is to characterise the experiential aspects of mobile learning, then one must appreciate the individual differences that also drive technology use” (p. 826).

Lastly, mobile learning can raise many ethical and philosophical issues as well. According to Kukulska-Hulme (2013), “Mobile device use is intertwined with everyday life and new norms of acceptable behavior have to be worked out for situations where there is unfettered data capture out in the world, including images of people, recordings, and video clips. This raises

some concerns, as the need to pay attention to these types of issues will not abate” (p. 15). These concerns are related to privacy and encryption problems, which may hinder learners’ intention to use mobile learning.

Uses of Mobile Learning

Most uses of mobile learning are related either to conventional teaching contexts such as face-to-face instruction in universities, colleges, and schools, or to informal learning in public spaces such as museums and libraries (Kukulska-Hulme, 2007). Masoud (2011) argued that mobile devices are useful in education as administration, organization and teaching aids for practitioners, and also as learning support tools for learners. “Use of mobile phones and other mobile devices can have a positive impact on education by facilitating student learning, helping teachers do their job more effectively, and enabling the development of education systems across the globe” (Kukulska-Hulme, 2013, p. 12). There are two major uses of mobile learning in higher education, first the support of learning activities, and second the use in academic libraries.

Mobile devices are used to support college student learning activities. In a British study of mobile learning, the Open University in the UK conducted two projects, both of them concerning the use of mobile devices by students in a master’s program in online and distance education. These two projects investigated students’ use of PDAs for reading course materials and their use of their own mobile devices (Kukulska-Hulme, 2007). Brett (2011) evaluated college students’ experiences and engagement with Short Message Service (SMS). In this evaluation, SMS was used to support learning through engaging students in formative assessment objective questions with feedback, and SMS-based collaborative learning tasks. Positive experiences were reported for administrative communications and learning support. Hahn and Bussell (2012) suggested that the curricular uses of the iPad 2 allow students to

connect with course-specific content such as their course management site for taking online quizzes, for class outlines, and for other lecture materials.

Mobile devices, such as iPods and MP3 players, have also been used for additional listening and speaking practice within a French course (Demouy & Kukulska-Hulme, 2010). Wyatt, Krauskopf, Gaylord, Ward, Huffstutler-Hawkins, and Goodwin (2010) noted that the students in a nursing program, regardless of learning style, benefited from using PDAs. Using PDAs connected students with classmates and other nurse practitioner students at distant universities and created a cooperative learning community providing students additional support and knowledge acquisition. Coulby, Hennessey, Davies, and Fuller (2011) reported that mobile technology for assessment had positive effects on students' learning experience. The students found completing assessments using a PDA straight forward, resulting in a more structured format of the assessment and improved level of feedback.

Besides supporting learning activities, mobile technologies are used in academic libraries as well. A study by Paterson and Low (2011) indicated a strong desire among students for mobile library services. Geoffrey (2011) stated that mobile technologies are changing the ways we consume, distribute, and create information. University libraries have changed to recent mobile technological demands. Academic libraries are now providing mobile access to their resources and services. Smart phones and mobile devices are influencing the larger shift within reference services. "In addition to offering in-person support at the reference desk and phone and instant message (IM) assistance, some libraries have also started to advertise reference through text message" (p. 268).

With the widespread use of mobile devices, it is necessary for libraries to provide students access to their collections and services in ways that work well with mobile devices (Dresselhaus

& Shrode, 2012). In a review of the literature, Hahn and Bussell (2012) pointed out that some researchers did studies on use of iPads in libraries. The application of iPads includes using in reference services and as circulating technology. Lippincott (2010) emphasized that “as librarians work with students as part of information literacy classes, at service desks, and in cyberspace, it is important to realize that for students, the mobile device will increasingly become an instrument for creation of digital content, and not just a device for access to content” (p. 210).

UTAUT

Description of the UTAUT Model

There are eight existing Information and Communication Technology (ICT) acceptance models prior to UTAUT. As shown in Table 1, these eight models are Theory of Reason Action (TRA), Theory of Planned Behavior (TPB), Technology Acceptance Model (TAM), Motivational Model (MM), Combined Theory of Planned Behavior and Technology Acceptance Model (C-TAM-TPB), Model of PC Utilization (MPCU), Innovation Diffusion Theory (IDT) and Social Cognitive Theory (SCT). UTAUT has condensed the 32 variables found in the existing eight models into four determinants and four moderating factors (Oye & Ab.Rahim, 2012).

Table 1

Models of ICT Acceptance

ICT Acceptance Model	Introduction	Determinants
Theory of Reasoned Action (TRA)	Drawn from social psychology, TRA is one of the most fundamental and influential theories of human behavior. Davis, Bagozzi, and Warshaw (1989) applied TRA to individual acceptance of technology and found that the variance explained was largely consistent with studies that had employed TRA in the context of other behaviors	Attitude toward behavior; Subjective norm
Technology Acceptance Model (TAM)	TAM is tailored to information system contexts, and was designed to predict information technology acceptance and usage on the job. Unlike TRA, the final conceptualization of TAM excludes attitude in order to better explain intention parsimoniously. TAM has been widely applied to a diverse set of technologies and users.	Perceived usefulness; perceived ease of use; subjective norm
Motivational Model (MM)	A significant body of research in psychology has supported general motivation theory as an explanation for behavior. Within the information systems domain, Davis, Bagozzi, and Warshaw, (1992) applied motivational theory to understand new technology adoption and use.	Extrinsic motivation; intrinsic motivation
Theory of Planned Behavior (TPB)	TPB extended TRA by adding perceived behavioral control as an additional determinant of intention and behavior. TPB has been successfully applied to the understanding of individual acceptance and usage of many different technologies.	Attitudes toward behavior; subjective norm; perceived behavioral control
Combined TAM & TPB (C-TAM-TPB)	This model combines the predictors of TPB with perceived usefulness from TAM.	Attitude toward behavior; subjective norm; perceived behavioral control; perceived usefulness
Model of PC Utilization (MPCU)	Derived largely from Triandis' (1977) theory of human behavior. Thompson, Higgins, and Howell (1991) adapted and refined Triandis' model for IS contexts and use the model to predict PC utilization.	Job-fit; complexity, long-term consequences; affect towards use; social factors; facilitating conditions
Innovation diffusion theory (IDT)	Grounded in sociology, IDT (Rogers 1995) has been used since the 1960s to study a variety of innovations, ranging from agricultural tools to organizational innovation. Within information systems, Moor and Benbasat (1991) adapted the characteristics of innovation presented in Rogers and refined a set of factors that could be used to study individual technology acceptance.	Relative advantage; ease of use; image; visibility; compatibility; results demonstrability; voluntariness of use
Social cognitive theory (SCT)	SCT is one of the most powerful theories of human behavior. Compeau and Higgins (1995) applied and extended SCT to the context of computer utilization. Their model studies computer use but the nature of the model and the underlying theory allow it to be extended to acceptance and use of information technology in general.	Outcome expectations-performance; outcome expectations-personal; self-efficacy; affect; anxiety

Source: Venkatesh et al., 2003

The four determinants of ICT acceptance are performance expectancy, effort expectancy, social influence, and facilitating conditions. As shown by the arrows in Figure 1, performance expectancy, effort expectancy, and social influence have a direct impact on behavioral intention; facilitating conditions has a direct impact on use behavior. Additionally, behavioral intention is shown as a predictor of use behavior. Although facilitating conditions is not considered as a determinant that has a direct impact on behavior intention, many researchers (Nassuora, 2012; Jairak, Praneetpolgrang & Mekhabunchakij, 2009; Alshehri, Drew & AlGhamdi, 2013) have proved that facilitating conditions has a significant positive relationship with behavior intention.

Age, gender, experience, and voluntariness of use are the four moderating factors. According to Springer Reference, a moderating factor is a variable that affects the direction and/or strength of the relationship between an independent variable and a dependent variable. Gender affects the strength of relationship between the three determinants (performance expectancy, effort expectancy, social influence) and behavioral intention; age affects the strength of the relationship between the four determinants (performance expectancy, effort expectancy, social influence and facilitating conditions) and behavioral intention; experience affects the strength of relationship between the two determinants (effort expectancy, social influence) and behavioral intention, between facilitating conditions and use behavior; voluntariness of use affects the strength of relationship between social influence and behavioral intention. Table 2 identifies four moderating factors that have been found to be significant in conjunction with those 8 ICT acceptance models (VenKatesh et al., 2003).

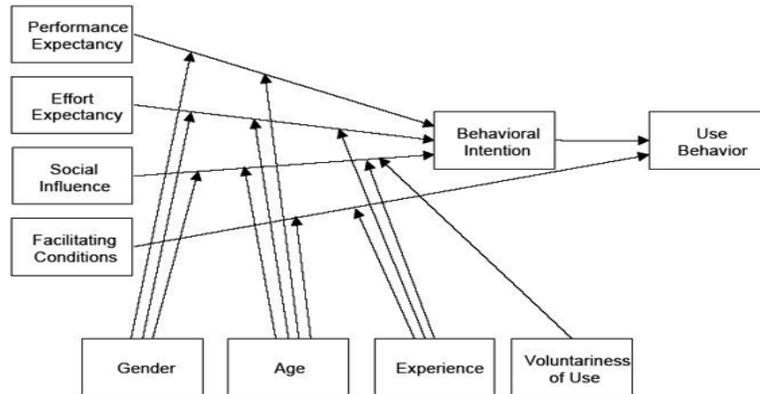


Figure 1. UTAUT Model. (Source: Venkatesh et al., 2003)

According to Venkatesh et al. (2003), “Performance expectancy is defined as the degree to which an individual believes that using the system will help him or her to attain gains in job” (p. 447); “Effort expectancy is defined as the degree of ease associated with the use of the system” (p. 450); “Social influence is defined as the degree to which an individual perceives that important others believe he or she should use the new system” (p. 451); and “Facilitating conditions are defined as the degree to which an individual believes that an organizational and technical infrastructure exists to support use of the system” (p. 453). Age, gender, experience, and voluntariness of use affect the impacts of four determinants on behavior intention and use behavior. Experience is a person’s practical knowledge and skills derived from direct observation of or participation in a particular activity. “Voluntariness is the extent to which potential adopters perceive the adoption decision to be nonmandated” (Agarwal & Prasad, 1997, p. 564). Voluntariness of use is defined as the degree to which use of the technology is perceived as being voluntary, or of free will (Moore & Benbasat, 1991). Behavioral intention to use a technology means a person’s subjective probability that he or she will use a technology (as cited in Konerding, 1999), while use behavior is the actual behaviors of using a technology by a user.

As for this study of mobile learning, behavioral intention to use mobile learning is a student's subjective probability that he or she will use mobile technology for learning. It is used to measure a student's acceptance of mobile learning, which ultimately affects a student's use behavior. Use behavior is a student's actual behaviors of using mobile technology for learning, which indicate the adoption of mobile learning by a student. Performance expectancy means the degree to which a student believes that using mobile devices for learning will help him or her to improve academic outcomes; effort expectancy means the degree of ease associated with the use of mobile devices for learning; social influence means the degree to which a student perceives that important others believe he or she should use mobile devices for learning; facilitating conditions means the degree to which a student believes an organizational and technical infrastructure exists to support the use of the mobile devices for learning. Experience is a student's knowledge and skill of using mobile technology for learning obtained from direct observation or participation. Voluntariness of use is the degree to which use of the mobile technology for learning is perceived as being voluntary or of free will for a student.

Table 2

Roles of UTAUT Moderating Factors in Existing Eight ICT Acceptance Models

Model	Experience	Voluntariness	Gender	Age
Theory of Planned Behavior (TPB)	Experience was not explicitly included in the original TPB. It has been incorporated into TPB via follow-on studies. Empirical evidence has demonstrated that experience moderates the relationship between subjective norm and behavioral intention. Subjective norm becomes less important with increasing levels of experience.	Voluntariness was not included in the original TPB. Although it was not tested, subjective norm was suggested to be more important when system use was perceived to be less voluntary (Hartwich & Barki, 1994).	Venkatesh, Morris, and Ackerman (2000) found that attitude was more salient for men. Both subjective norm and perceived behavioral control were more salient for women in early stages of experience.	Morris and Venkatesh (2000) found that attitude was more salient for younger workers while perceived behavioral control was more salient for older works. Subjective norm was more salient to older women.
Combined TAM-TPB (C-TAM-TPB)	Experience was incorporated into this model in a between-subjects design (experienced and inexperienced users).	N/A	N/A	N/A
Theory of Reasoned Action (TRA)	Experience was not explicitly included in the original TRA. However, the role of experience was empirically examined by Davis et al. (1989). No change in the salience of determinants was found. Karahanna, Straub, and Chervany (1999) found that attitude was more important with increasing experience, while subjective norm became less important with increasing experience.	Voluntariness was not included in the original TRA. Although not tested, Hartwick and Barki (1994) suggested that subjective norm was more important when system use was perceived to be less voluntary.	N/A	N/A
Technology Acceptance Model (TAM)	Experience was not explicitly included in the original TAM. Davis et al. (1989) have provided empirical evidence showing that ease of use becomes nonsignificant with increased experience.	Voluntariness was not explicitly included in the original TAM.	Gender was not included in the original TAM. Empirical evidence demonstrated that perceived usefulness was more salient for women (Venkatesh & Morris, 2000). The effect of subjective norm was also more salient for women in the early stages of experience.	N/A

Model	Experience	Voluntariness	Gender	Age
Motivational Model (MM)	N/A	N/A	N/A	N/A
Model of PC Utilization (MPCU)	Thompson, Higgins, and Howell (1994) found that complexity, affect toward use, social factors, and facilitating conditions were all more salient with less experience. On the other hand, concern about long-term consequences became increasingly important with increasing levels of experience.	N/A	N/A	N/A
Innovation Diffusion Theory (IDT)	Karahanna et al. (1999) conducted a between-subjects comparison to study the impact of innovation characteristics on adoption (no/low experience) and usage behavior (greater experience) and found differences in the predictors of adoption vs. usage behavior. The results showed that for adoption, the significant predictors were relative advantage, ease of use, trial-ability, results demonstrability, and visibility. In contrast, for usage, only relative advantage and image were significant.	Voluntariness was not tested as a moderator, but was shown to have a direct effect on intention.	N/A	N/A
Social Cognitive Theory (SCT)	N/A	N/A	N/A	N/A

Source: Venkatesh et al., 2003

The Application of the UTAUT Model

The UTAUT model “has been extensively and successfully employed across a range of quantitative studies in the commercial, technological and telecommunications industries” (Saravani & Haddow, 2011, p.188). It has been applied by a number of studies on the adoption of different technologies both in work and non-work contexts.

Some researchers used this theory to study the adoption of some technologies in a library context. Tibenderana, Ogao, Ikoja-Odongo and Wokadalam (2010) used the UTAUT model in their research on students and academic staffs’ acceptance and use of hybrid library services in Uganda’s universities. The results proved that the UTAUT model could explain most of the variance towards acceptance and use of e-library services. “Social Influence construct was found to be one of the driving forces of behavior intentions to use” (p. 48) e-library services, while performance expectancy did not have an impact on acceptance and use of e-library services. Besides the research on e-library services, Saravani and Haddow (2011) investigated library staffs’ readiness for mobile libraries across New Zealand and Australia using the UTAUT model. The results demonstrated that the UTAUT model “is useful for analyzing issues involved in the identification of skills and competencies, and specific training to achieve an understanding of predictors of actual usage of technology” (p.188).

The UTAUT model has been applied to the research of commercial and healthcare industries, as well as public works. Some researchers used it as a conceptual framework to study consumers’ acceptance of mobile commerce. The UTAUT model was usually extended in these researches. Min, Ji and Qu (2008) proposed a revised UTAUT for mobile commerce user acceptance. The “culture” and “user’s demographics” replaced the “experience” and “voluntariness” from UTAUT’s moderating factors; the “trust and privacy,” “utility expectancy,”

“convenience” and “cost” were added as the additional determinants, while the “performance expectancy” and “facilitating conditions” were excluded from the revised model. Alwahaishi and Snášel (2013) also used a proposed research model based on UTAUT to investigate consumers’ acceptance and use of information and communications technology, in particular mobile internet service. Three additional determinants—perceived playfulness, attention focus, and perceived value—were added to the original UTAUT model, while “education” and “income” replaced “voluntariness of use” as new moderators. The results proved the validation of this extended model. To examine the determinants of mobile commerce adoption, Chong (2013) extended the UTAUT model by incorporating additional constructs such as perceived value, trust, perceived enjoyment, and personal innovativeness. The results showed that “perceived value is the most significant predictor of mobile commerce adoption, followed by performance expectancy, social influence, trust, perceived ease of use, age, perceived enjoyment, education, personal innovativeness, facilitating condition and gender” (p. 527).

As for its application in the research of the healthcare industry and public works, researchers were more inclined to study the adoption of a specific technology in the healthcare context and public works programs. Vanneste, Vermeulen and Declercq (2013) analyzed the acceptance of a web application called BelRAI by healthcare professionals in Belgium. They found that self-efficacy and facilitating conditions had significant influence on behavioral intention to use this web application. Hennington, and Janz (2007) applied the UTAUT model to study the physician adoption of Electronic Medical Records (EMR) technology. The specific determinants of the adoption of EMR technology were discussed as well. As for the research of its application in public works programs, Wu, Yu, and Weng (2012) studied Kaohsiung citizens’ acceptance and use of I Pass, the electronic ticket used by Kaohsiung MRT system. It was found

that effort expectancy and social influence had significant and positive influence on behavioral intention; facilitating conditions and behavioral intention have significant and positive influence on use behavior. In addition, age, gender, experience and voluntariness of use have moderating effects on the relationships between the latent constructs.

Additional studies examined the adoption of other kinds of technologies, such as social media and internet banking. Mandal and McQueen (2012) used the UTAUT model to explain the adoption of social media by microbusinesses in America. They found that performance and effort expectancy had significant impact on the adoption of social media by microbusinesses. In Turkey, Alikilic and Atabek (2012) examined the social media adoption among Turkish public relations professionals through the perspective of the UTAUT model. The findings revealed that email was the most commonly used social media tool among Turkish PR professionals. Virtual world applications were the least used tool. These PR professionals held a positive attitude towards the adoption of social media. While Mandal and Alikilic focused on social media, Foon and Fah (2011) investigated the factors and determinants of internet banking adoption among Malaysians. The results showed that performance expectancy, effort expectancy, social influence, facilitating condition and trust were the determinants of internet banking adoption. Martins, Oliveira, and Popovic (2014) found the similar results. They developed a conceptual framework that combined the UTAUT model with perceived risk to explore the internet banking adoption in Portugal. The data revealed that performance expectancy, effort expectancy, social influence and the role of risk were the most important predictors of intention.

The UTAUT model has been used to study the adoption of some specific technologies, such as virtual learning environments, mobile technologies, and information systems, in education settings. Schaik (2009) used UTAUT to explore students' acceptance of the

Blackboard website and library website used by students in a university. It was found that UTAUT was more successful in explaining the acceptance of a prescribed library site than that of a prescribed virtual learning environment. Keller (2006) identified performance expectancy, results demonstrability, and social influence as positive factors of acceptance of virtual learning environments. Some researchers have discussed the adoption of tablet PCs in higher education as well. El-Gayar, Moran, and Hawkes (2009) explored college students' acceptance of tablet PCs in a university. A revised UTAUT model was proposed. In this model, three additional determinants, self-efficacy, attitude toward using technology and anxiety, were added. They found that "with respect to key determinants of TPC acceptance, students' attitude has the most direct influence followed by facilitating conditions, performance expectancy, and social influence" (p. 67). According to Anderson, Schwager and Kerns' (2006) study, performance expectancy and voluntariness of use were the most significant determinants of a faculty's adoption of tablets. The findings also validated the UTAUT model. Wang and Wang (2010) explored the user acceptance of mobile Internet and gender differences in Taiwan. They found that performance expectancy, effort expectancy, and social influence had positive effects on individual intention to use the mobile Internet.

Critique of the UTAUT Model

"In spite of these successes in supporting innovations, the UTAUT model has had drawbacks, as well as having faced criticism for nearly a decade" (Awuah, 2012). Venkatesh et al. (2003) indicated that UTAUT explains almost 70 percent of the variance in behavioral intention to use a technology. However, in a review of literature, Thomas, Singh, and Gaffar (2013) mentioned that some researchers found lower explanatory powers of the UTAUT model, such as 64.5%, 63.1%, 35.3% and 39.1%. "The liability and validity of the model are also

general confirmed, but consensus on the nature of the relationships among the factors is not always achieved” (p. 73). Behavior attention has several limitations as well (Moghavvemi, Salleh, Zhao, & Mattila, 2012). First of all, behavior attention “does not fully capture the influence of external factors that potentially inhibit or facilitates the performance of a behavior” (p. 234). Secondly, behavior intention has limited predictive ability to deal with unforeseen events and uncertainties during the time the intention is formed and the behavior is performed. “Finally, behavior intention cannot predict behaviors which are not fully controlled by individual volition” (p. 234).

Raaij and Schepers (2006) stated that the UTAUT model is less parsimonious than Technology Acceptance Model (TAM) because “UTAUT’s high R^2 is only achieved when moderating the key relationships with up to four variables (gender, age, experience and voluntariness) in order to yield more significant coefficients” (p. 840). They also found the grouping and labeling of items and constructs, especially for facilitating conditions and social influence, were problematic, since “it is difficult to see how much a wide variety of items can reflect one single psychometric construct” (p. 841). Additionally, Bagozzi (2007) criticized the UTAUT model as an example that “reaches a stage of chaos, and knowledge is becoming increasingly fragmented with little coherent integration” (p. 245). They argued, “important independent variables have been left out, because few of the included predictors are fundamental, generic, or universal, and future research is likely to uncover new predictors not subsumable under the existing predictors” (p. 245).

College Students' Use and Acceptance of Mobile Learning

College students' acceptance of mobile learning has been studied from various perspectives. Besides the UTAUT model, self-efficacy theory and technology acceptance model were the most commonly used theoretical frameworks. The existing findings indicated that most students held positive attitudes towards mobile learning and they were confident with using mobile learning. Factors affecting students' behavioral intention to use mobile learning were discussed in these studies as well.

Many studies used the UTUAT model to explore the issues of mobile learning adoption in higher education. Research by Wang, Wu, and Wang (2009) investigated the determinants, age and gender differences in the acceptance of mobile learning in Taiwan. They proposed a revised UTAUT model. In this model, the UTAUT construct "facilitating conditions" was replaced by "perceived playfulness" and "self-management of learning." The findings indicated that all these five constructs were significant determinants of behavioral intention to use mobile learning. Additionally, "age differences moderate the effects of effort expectancy and social influence on behavioural intention" (p.112), and gender differences moderated the effects of social influence and self-management of mobile learning on behavioral intention. However, Liew, Kang, Yoo, and You's (2013) research obtained a slightly different result. They found performance expectancy, social influence, perceived playfulness, and self-management of learning were significant predictors of behavioral intention to use mobile learning.

Love and Abu-Al-Aish (2013) proposed another extended UTAUT model to study the factors influencing college students' acceptance of mobile learning. Two new constructs "quality of service" and "personal innovativeness" substituted for facilitating conditions. Whether mobile devices experience moderated the influence of these factors on behavioral

intention was examined as well. The results showed that all the constructs were significant factors that affected behavioral intention to use mobile learning. Mobile devices experience did moderate the effect of these constructs on behavioral intention. Donaldson (2011) also used a modified UTAUT model to investigate a community college's students' acceptance of mobile learning. Besides the original four determinants, the research also examined three additional determinants: perceived playfulness, self-management of learning and voluntariness of use. The results indicated that performance expectancy, social influence, perceived playfulness of learning, and voluntariness of use were significant determinants of behavior intention to use mobile learning.

Some researchers used self-efficacy theory to assess students' attitudes and readiness on mobile learning. Bandura and Schunk stated, "self-efficacy refers to the personal beliefs individuals have that they are capable of learning and performing particular behaviors and is domain-specific" (as cited in Kenny, Van Neste-Kenny, Burton, Park, & Qayyum, 2012, p. 278). Research by Kenny et al. (2012) explored nursing students' readiness on mobile learning in a Canadian college. The results showed a high level of the mobile device ownership among the students, and they were highly confident in mobile learning and prepared to engage in mobile learning. Yang (2012) found that the use of mobile technologies enhanced students' learning and most students had positive attitudes towards mobile learning as well.

A few studies adopted Technology Acceptance Model (TAM) to assess students' acceptance of mobile learning. In this model, perceived usefulness, perceived ease of use, attitude toward using, and external variables affect user's behavioral intention. Park, Nam, and Cha (2012) did a research at a Korean university. To better understand Korean students' perceptions of mobile learning, they revised the original TAM model and added several new

variables. In their study, students' attitude, major and subjective norm were identified as the important factors in influencing students' behavioral intention to use mobile learning. However, research by Suki and Suki (2011) obtained different results among Malaysian students. They found that perceived mobility value and perceived usefulness of the mobile learning were the encouraging factors of students' intention to use mobile learning.

Besides these three theoretical frameworks mentioned above, some researchers studied students' use and perceptions of mobile learning from a more general perspective. Alzaza and Yaakub (2011) looked into college students' awareness and needs of mobile learning in Malaysia. They found that the students already had adequate knowledge and awareness to use mobile technology for learning. The cost of transaction and slow data exchange with networks, as well as personal privacy, were the major concerns of the students. Apparently, students in Saudi Arabia have similar opinions with Malaysian students. Al-Fahad (2009) measured students' attitudes and perceptions towards the effectiveness of mobile learning in Saudi Arabia. The author pointed out "the fact that mobile learning is widely embraced by the student community" (p. 118). Most students agreed that mobile technology made learning more convenient and flexible and they would like to engage in mobile learning. The results of Nassuora's (2013) research were consistent with Al-Fahad's as well. The findings indicated that the acceptance level of students on mobile learning in Saudi Arabia was also high.

In Japan, Thornton and Houser (2005) investigated 333 Japanese university students' use of their mobile devices. "In terms of educational use, more than half of students are already using their mobile e-mail to get information about classes and lectures" (p.221). However, "Concerning the mobile Web, to a large degree, students are not yet using mobile Web for educational purposes" (p. 221). James' (2011) study indicated that Thai university students'

perceptions of mobile learning were a little different from Japanese students. The results showed a mixed response in terms of students' readiness of mobile learning. Many Thai students would not like to use mobile learning to facilitate their learning. The technological constraints of mobile devices, such as mobile broadband and coverage, had a significant impact on student's pedagogical engagement.

Summary

This chapter examined the relevant literature for the proposed study including a brief discussion of mobile learning, college students' use and acceptance of mobile learning, and an overview of the UTAUT model. The definition, characteristics, usage, benefits and challenges of mobile learning were discussed. The UTAUT model is a useful theoretical framework for assessing students' acceptance of mobile learning. Venkatesh et al. (2003) discovered that performance expectancy, effort expectancy, social influence, and facilitating conditions were direct determinants of user behavioral intention and user behavior, and gender, age, experience and voluntariness of use were moderators. Many researchers around the world have started to apply UTAUT theory to their research on students' technology acceptance. However, there remains a lack of research on international students' acceptance of mobile learning, specifically on Chinese international students who study in American universities. The next chapter discusses the methodology of this study. The research design, participants, instrumentation, data collection and data analysis are described in detail.

CHAPTER III:
METHODOLOGY

Introduction

Using UTAUT as the theoretical framework, this study gained understanding of Chinese international students' acceptance of mobile learning. Whether the four UTAUT determinants (performance expectancy, effort expectancy, social influence, facilitating conditions) affect Chinese international students' acceptance of mobile learning was examined. This study was based on Donaldson (2011)'s research on student acceptance of mobile learning. It employed a quantitative approach. An online survey was used for data collection.

Participants

Participants for this study were Chinese international students who were enrolled in undergraduate and graduate programs at a public university in the southeast region of the United States. According to the university's enrollment data, there were currently 831 enrolled Chinese international students. Raosoft sample size calculator was used to determine the sample size for this study at a statistical confidence level of 90%, with a 5% margin of error. A sample size of approximately 205 complete survey submissions was required. The desired response rate was around 25%. Participants were solicited for the survey through census sampling of all Chinese international students in the participating university. The university's international office sent an invitation letter including the link of the online survey to Chinese international students via campus email. Demographic data collected from the participants included age, gender, major and degree.

Instrumentation

Quantitative data were collected through a cross-sectional survey (see Appendix C). According to Patten (2011), survey questionnaires provide an efficient way to collect data; they yield responses that are easy to tabulate or score, and the resulting data are easy to analyze. The UTAUT survey instrument (see Appendix A) and Donaldson (2011)'s survey instrument (see Appendix B) were adopted for this study. UTAUT instrument has been adopted and used by many researchers (Alwahaishi & Snášel, 2013; Awuah, 2012; Birch & Irvine, 2009; Chong, 2013; Donaldson, 2010; Keeton, 2008; Mandal & McQueen, 2012; Martins, Oliveira, & Popovic, 2014; Min, Ji, & Qu, 2008; Saravani & Haddow, 2011; Thomas, Singh, & Gaffar, 2013; Wang & Wang, 2010). It was modified to make the questions relevant to the context of mobile learning and the Chinese participant population. For example, the word "system" was replaced with mobile devices or mobile device for school-related activities, and the word "job" was changed to school-related activities (items 14-29). One item regarding voluntariness of use (item 12), demographic questions (items 30-33), one item regarding experience (item 13), seven items regarding mobile device ownership (items 1-7; items 1, 2, 5 and 10 were adopted from ECAR Study of Undergraduate Students and Technology 2013 survey), and four items regarding usage (items 8-11) were added to the original UTAUT instrument.

In order to fully characterize Chinese international students' intentions to use mobile technology for learning, the survey included questions about ten UTAUT constructs: performance expectancy, effort expectancy, social influence, facilitating conditions, age, gender, experience, voluntariness of use, behavioral intention, and use behavior (see Table 3). Likert scales ranging from strongly disagree to strongly agree were used for all items except items 1-13 and 30-33.

Table 3

Survey Questions and the Related UTAUT Constructs

Survey Questions	Related UTAUT Construct
8	Use behavior
14-16	Performance expectancy
17-19	Effort expectancy
20-23	Social influence
24-26	Facilitating conditions
27-29	Behavioral intention
30	Gender
31	Age
13	Experience
12	Voluntariness of use

During the development of the UTAUT model, Venkatesh et al. (2003) measured the reliability of the UTAUT instrument. “All internal consistency reliabilities (ICRs) were greater than .70” (P. 457). In the preliminary test of UTAUT, the reliability coefficient of the construct ranged from 0.83 to 0.94, while it ranged from 0.88 to 0.96 in the cross-validation test.

Therefore, the reliability coefficient of the UTAUT instrument was strong.

Data Collection

Due to the large number of Chinese international students at the university in this study, an electronic version of the survey was created using Qualtrics, an online survey software. The information sheet (see Appendix D) was presented to the participants at the beginning of the online survey. The university’s international office agreed to support this research by sending an

invitation letter (see Appendix E) including the URL of the survey to all the Chinese international students via campus email.

An IRB (Institutional Review Board) application was submitted for validation with the human rights protocol established by the university in which this study was conducted. Approval from the IRB was granted (see Appendix F). The international office of the university sent an email including the invitation letter and the URL of the online survey to all Chinese international students by campus email twice. The first invitation letter email was distributed in March 2015. An additional email reminder was distributed two weeks later. However, the international office only committed to send out the invitation email twice due to their concern of overwhelming of students with survey requests. Therefore, the researcher was not able to distribute the invitation email to Chinese international students again. All collected data were saved in the researcher's Qualtrics account. They were downloaded and analyzed using SPSS software. Fifty-two responses were received after the first invitation letter was sent, and another fourteen responses were added after the second invitation letter was distributed. Sixty-six participants in total completed the survey. The response rate was around 8%, which did not meet the desired response rate 25%.

Data Analysis

The survey provided data for the following research questions:

1. What is Chinese international students' use of mobile learning;
2. Is there a significant difference between Chinese male students and female students on their behavioral intention to use mobile learning;
3. Is there a significant difference between the participants' ages and their intention to use mobile learning;

4. Is there a significant difference between participants' levels of experience and their intention to use mobile learning;
5. Is there a significant difference between the following two groups on their behavioral intention to use mobile learning: Chinese international students who feel that using mobile learning is voluntary, Chinese international students who feel that using mobile learning is required by professors;
6. Are the following independent variables significant predictors of Chinese international students' behavioral intention to use mobile learning: performance expectancy, effort expectancy, social influence, and facilitating conditions; and
7. Are Chinese international students' behavioral intention to use mobile learning and facilitating conditions significant predictors of Chinese international students' use behavior?

Quantitative data analysis methods included t-tests, one-way ANOVA, multiple regression, and descriptive statistics. The Data Management Plan shown in Table 4 summarizes that data analysis for each research question, the survey items, the independent variables, the depend variables, and analysis method used for each question.

Table 4

Data Management Plan

Research Question	Measure(s)	Independent Variables	Dependent Variables	Analysis Method/ Statistical Test
Question 1	Items 27-29, 30	Gender	Behavioral intention to use mobile learning	Independent samples t-test
Question 2	Items 27-29, 31	Age	Behavioral intention to use mobile learning	Independent samples t-test
Question 3	Items 13, 27-29	Experience	Behavioral intention to use mobile learning	One-way ANOVA
Question 4	Items 12, 27-29	Voluntariness of use	Behavioral intention to use mobile learning	Independent samples t-test
Question 5	Items 14-26, 27-29	Performance Expectancy; Effort Expectancy; Social Influence; Facilitating Conditions	Behavioral intention to use mobile learning	Multiple regression
Question 6	Items: 8, 24-26, 27-29	Behavioral Intention to Use Mobile Learning; Facilitating Conditions	Use behaviors of mobile learning	Multiple regression
Question 7	Items: 8-11	N/A	Usage of mobile learning	Descriptive statistics

Summary

This chapter presented the methodology of this study. A quantitative approach was employed for this study. Quantitative data analysis methods included t-test, one-way ANOVA, multiple regression, and descriptive statistics. A revised UTAUT survey was developed to assess Chinese international students' acceptance of mobile learning. Whether the four UTAUT determinants affect Chinese international students' acceptance of mobile learning was examined. The next chapter describes the findings.

CHAPTER IV: ANALYSIS OF DATA

Using UTAUT as the theoretical framework, this study gained understanding of Chinese international students' acceptance of mobile learning. Whether the four UTAUT determinants—performance expectancy, effort expectancy, social influence, and facilitating conditions—affect Chinese international students' acceptance of mobile learning was examined. In addition, this study explored the difference of Chinese international students' acceptance of mobile learning based on gender, age, level of experience, and voluntariness of use. An independent samples t-test was used for variables that include only two categories such as gender, voluntariness of use, and age groups. One-way ANOVA was used for variables that include three categories such as level of experience. Multiple regression was used to determine the relationships between UTAUT determinants and Chinese international students' acceptance of mobile learning. The online survey was administered using Qualtrics and the data was analyzed using SPSS. This chapter presents the analysis and results.

Sample

Sixty-six Chinese international students participated in this study and completed the survey. Demographic information collected from each participant included gender, age, major, academic rank, and level of experience of using mobile devices for learning activities. The participants consisted of 45% (n=29) male and 55% (n=37) female. The age range of the participants was 18-25 (n=41) and 26-33 (n=25).

Participants' educational fields are reported as follows: 30% studied business, management, and marketing; 15% studied engineering and architecture; 11% studied physical sciences; 8% studied education; 6% studied social sciences; 5% studied communication and journalism; 5% studied biological or life science; 3% studied computer and information sciences; 2% studied fine and performing art; 2% studied health sciences; 2% studied liberal arts or general studies; 2% studied manufacturing, construction, repair or transportation; 2% studied public administration, legal, social and protective services; and 2% undecided. Nine percent of the participants chose "other" and specified their education fields as statistics, public relations, math, social work and physical geography.

These participants represent all academic ranks from undergraduate to doctoral student. Nine percent were freshmen; 14% were sophomores; 18% were juniors; 5% were seniors; 14% were Master's or EdS students; 39% were doctoral students; 2% chose other. Finally, participants were asked about their experience with mobile learning. Eight percent of the participants used mobile devices for school-related activities one to three times a week; 48% used mobile devices for school-related activities once a day; 34% used mobile devices for school-related activities many times per day. Table 5 provides a visual representation of all demographic items.

Table 5

Demographic Information

Responses	n	%
Gender	29	45
Male	37	55
Female		
Educational Field	0	0
Agriculture and natural resources	3	5
Biological/life science	20	30
Business, management, marketing	3	5
Communication/journalism	2	3
Computer and information sciences	5	8
Education, including physical education	10	15
Engineering and architecture	1	2
Fine and performing arts	1	2
Health sciences, including professional programs	0	0
Humanities	1	2
Liberal arts/general studies	1	2
Manufacturing, construction, repair or transportation	7	11
Physical sciences, including mathematical sciences	1	2
Public administration, legal, social, and protective services	4	6
Social sciences, including history and psychology	1	2
Undecided	6	9
Other		
Academic Rank	6	9
Freshman or first-year student	9	14
Sophomore or second-year student	12	18
Junior or third-year student	3	5
Senior or fourth-year student	9	14
Master's or EdS student	26	39
Doctoral student	1	2
Other type of student		
Level of experience	0	0
None	12	18
Novice (use mobile devices for school-related activities 1-3 times a week)	32	48
Intermediate (once a day)	23	34
Advanced (many times a day)		

Research Question 1

The first research question is “what is Chinese international students’ use of mobile leaning?” This question is related to the use behavior construct (survey item 8) in the UTAUT model. Survey items 1 through 7 measured participants’ mobile device ownership. Items 8 through 11 measured participants’ usage of mobile devices for learning activities. Item 8 measured the use behavior construct.

Mobile Device Ownership

Survey items 1 through 7 investigated participants’ mobile device ownership. The majority of the participants owned tablets or iPads; 15% did not have one, and they did not have a purchase plan; 7% did not have one but planned to purchase one within the next 12 months. As for e-readers, more than half of the participants did not have one, and they did not plan to purchase one; 11% did not have one but planned to purchase one; and 29% owned one. Moreover, 95% of the participants owned smartphones; only 4% did not have one and did not plan to purchase one; 1% did not have one but planned to purchase one. As for games consoles, more than half did not have one and did not have a purchase plan; 7% did not have one but planned to purchase one; and 29% owned one. As for MP3 or MP4 players, 41% of the participants did not have one and did not plan to purchase one; 3% did not have one but planned to purchase one; and more than half owned one. Table 6 depicts the total responses for mobile device ownership.

Table 6

Mobile Device Ownership

Device	Responses	n	%
Tablet or iPad	No, and I don't plan to purchase one within the next 12 months.	12	15
	No, but I plan to purchase one within the next 12 months.	6	7
	Yes, I currently own one.	62	78
E-reader	No, and I don't plan to purchase one within the next 12 months.	43	60
	No, but I plan to purchase one within the next 12 months.	8	11
	Yes, I currently own one.	21	29
Smartphone	No, and I don't plan to purchase one within the next 12 months.	3	4
	No, but I plan to purchase one within the next 12 months.	1	1
	Yes, I currently own one.	77	95
Games Console	No, and I don't plan to purchase one within the next 12 months.	46	64
	No, but I plan to purchase one within the next 12 months.	5	7
	Yes, I currently own one.	21	29
MP3 or MP4 Player	No, and I don't plan to purchase one within the next 12 months.	30	41
	No, but I plan to purchase one within the next 12 months.	2	3
	Yes, I currently own one.	41	56

The researcher further investigated participants' ownership of e-readers and smartphones (survey items 2-7). As survey item 2 is shown in Figure 2, more than half of the participants did not have e-readers; 28% percent had Kindles; 1% had Nooks; 3% had Sony Readers; 8% had iPads. In addition, only 8% of the participants who did not have an e-reader planned to buy a Kindle; 67% did not plan to buy one; 24% were not sure about the purchase plan. Survey items 5 through 7 examined participants' ownership of smartphones. As survey item 5 is presented in Figure 3, the majority of these participants had iPhones, 14% had Android phones; 4% had Windows phones; 2% had Blackberry phones; only 4% did not have a smartphone (n=80).

Among the three participants who did not have a smartphone, two of them planned to buy an iPhone.

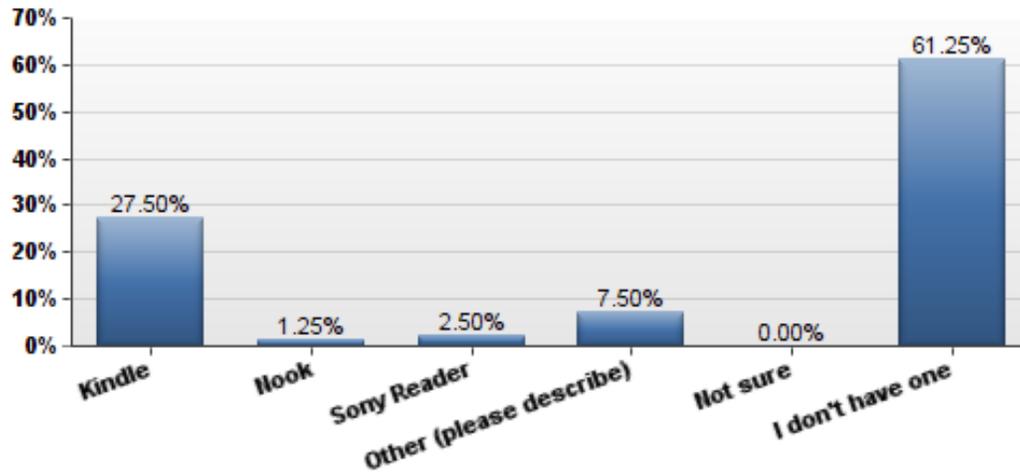


Figure 2. E-reader Ownership.

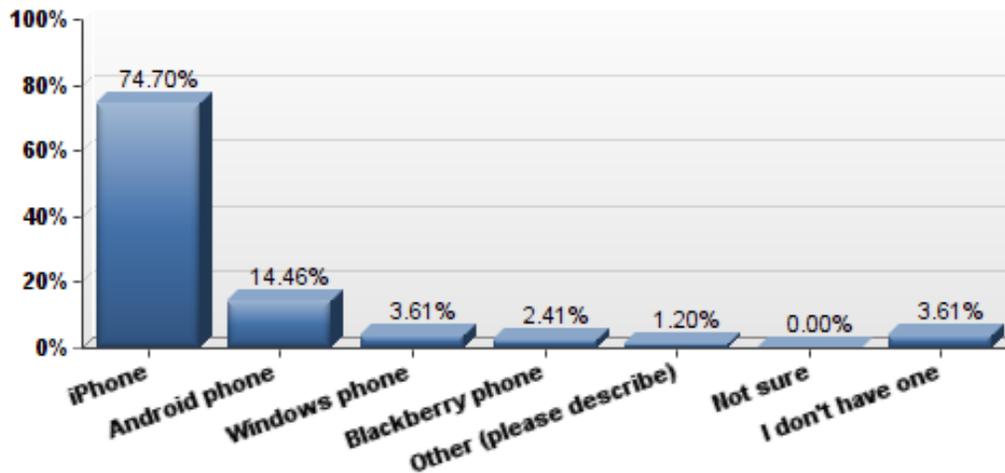


Figure 3. Smartphone Ownership.

Usage of Mobile Devices for Learning Activities

Participants were asked how often they had used mobile devices for school-related activities in the past four weeks (survey item 8, n=77). This item was used to measure the use behavior construct. As shown in Figure 4, only 3% of the participants had never used any

mobile devices for school-related activities in the past 4 weeks; 8% had rarely used mobile devices for learning; 21% had used mobile devices for learning sometimes; 25% had often used mobile devices for learning; and 44% had used mobile devices for learning very often.

Survey item 9 (n=77) asked participants what mobile devices they used in class regularly. From this sample, 55% used smartphones in class regularly; 43% used tablets or iPads in class regularly; 1% used e-readers in class regularly; 1% used MP3 or MP4 players in class regularly; and 25% did not use any mobile device in class regularly. The results are presented in Figure 5.

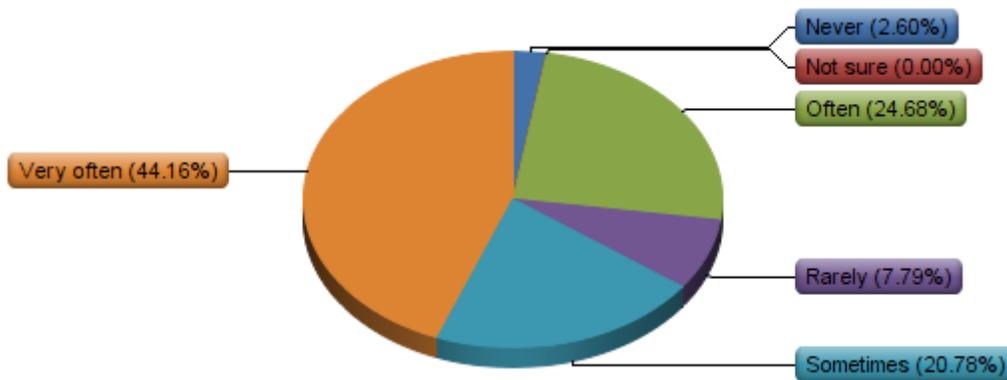


Figure 4. The Frequency of Using Mobile Devices for School-related Activities.

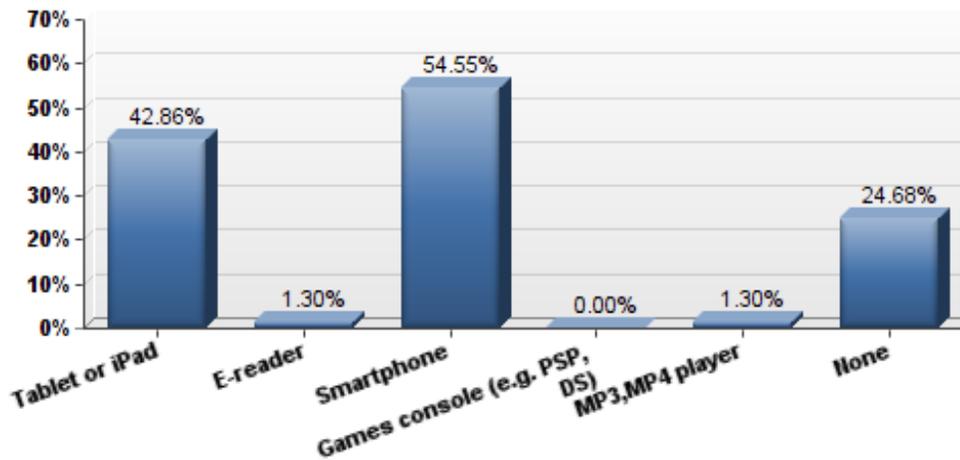


Figure 5. Mobile Devices Used in Class Regularly.

Survey item 10 investigated participants' usage of mobile devices regardless of whether they owned one. As depicted in Table 7, the majority of the participants used tablets or iPads for school-related work and other purposes; 10% had not used them in the past year; 3% used them for school related work only; and 16% used them for other purposes only. As for e-readers, more than half had not used them in the past year; 11% used them for school-related work and other purposes; 5% used them for school-related work only; and 23% used them for other purposes only. As for smartphones, the majority used them for school-related work and other purposes; only 1% of the participants had not used them in the past year; 2% used them for school-related work only; 19% used them for other purposes only. Meanwhile, more than half of the participants had not used games consoles in the past year; only 2% used them for school-related work and other purposes; and 40% used them for other purposes only. As for MP3 or MP4 players, nearly half of the participants had not used them in the past year; 6% used them for school-related work and other purposes; and 46% used them for other purposes only.

Table 7

Purposes of Using Mobile Devices

Device	Responses	n	%
Tablet or iPad	Have not used in the past year.	8	10
	Use for school-related work and other purposes.	54	71
	Use for school-related work only.	2	3
	Use for other purposes only.	12	16
E-reader	Have not used in the past year.	38	61
	Use for school-related work and other purposes.	7	11
	Use for school-related work only.	31	5
	Use for other purposes only.	4	23
Smartphone	Have not used in the past year.	1	1
	Use for school-related work and other purposes.	63	78
	Use for school-related work only.	2	2
	Use for other purposes only.	15	19
Games Console	Have not used in the past year.	38	58
	Use for school-related work and other purposes.	1	2
	Use for school-related work only.	0	0
	Use for other purposes only.	26	40
MP3 or MP4 Player	Have not used in the past year.	31	48
	Use for school-related work and other purposes.	4	6
	Use for school-related work only.	0	0
	Use for other purposes only.	30	46

Additionally, participants listed the specific school-related activities for which they used mobile devices (survey item 11). As shown in Table 8, “read or send school-related email” (79%), “check class schedules” (77%), “check assignments” (70%), “check grades” (62%), and “read digital textbooks” (52%) were the most popular school-related activities for which participants used mobile devices, followed by “do research” (38%), “use the course or learning management system” (38%), “access information about events, student activities, clubs and

organizations” (36%), and “take notes in class” (31%). Only 1% of the participants did not use mobile devices for any school-related activities; 8% used mobile devices to order transcripts; 9% used mobile devices to take quizzes and exams; 13% used mobile devices to access financial aid information; 21% used mobile devices to do assignments; 22% used mobile devices to join a discussion about school work; 29% used mobile devices to access library resources; 29% used mobile devices to register for courses; 29% used mobile devices to schedule appointments.

Table 8

School-related Activities for which the Participants Used Mobile Devices

Responses	n	%
None	1	1
Check assignments	54	70
Do assignments	16	21
Do research	29	38
Take notes in class	24	31
Read digital textbooks	40	52
Take quizzes and exams	7	9
Read or send school-related email	61	79
Check class schedule	59	77
Join a discussion about school work	17	22
Access library resources	22	29
Check grades	48	62
Register for courses	22	29
Use the course or learning management system	29	38
Access financial aid information	10	13
Schedule appointments	22	29
Order transcripts	6	8
Access information about events, students activities, clubs and organizations	28	36

Research Question 2

The second research question is “Is there a significant difference between Chinese male students and female students on their behavioral intention to use mobile learning?” This research question is related to two UTAUT constructs: gender (survey item 30) and behavioral intention to use mobile learning (survey items 27-29).

According to the results, 45% (n=30) of the participants are male, and 55% (n=37) are female. Using a five-point Likert scale, participants were asked to select a value that best indicates their behavioral intention to use mobile learning. This Likert scale contains five values: strongly disagree = 1, disagree = 2, neutral = 3, agree = 4, and strongly agree = 5. Item 27 is “I intend to use mobile devices for school-related activities in the next semester.” Approximately 24% of the participants strongly agreed with this statement; 38% agreed; 7% disagreed; 3% strongly disagreed; and 28% took a neutral stance. Item 28 is “I predict I will use mobile devices for school-related activities in my courses in the next semester.” Nearly 22% of the participants strongly agreed with this statement; 44% agreed; 11% disagreed; 3% strongly disagreed; and 21% took a neutral stance. Item 29 is “I have a plan to use mobile devices for school-related activities in the near future.” Nearly 21% of the participants strongly agreed with this statement; 39% agreed; only 7% disagreed; 1% strongly disagreed; and 32% took a neutral stance. The composite mean of each participant’s responses was calculated, which was the average score of item 27, item 28, and item 29. Then the composite mean for the behavioral intention construct was calculated, which was the average of the participants’ composite means: 3.73. This number indicates that participants held between a neutral and positive attitude toward the intention to use mobile devices for learning. Table 9 presents the descriptive statistics of behavioral intention to use mobile devices for learning.

Table 9

Descriptive Statistics of Behavioral Intention to Use Mobile Devices for Learning

Items	Responses	n	%	Mean	Composite Mean	Std. Deviation
Item 27	Strongly Disagree	2	3	3.72	3.73	.87
	Disagree	5	7			
	Neutral	19	28			
	Agree	26	38			
	Strongly Agree	16	24			
Item 28	Strongly Disagree	2	3	3.72	3.73	.87
	Disagree	7	10			
	Neutral	14	21			
	Agree	30	44			
	Strongly Agree	15	22			
Item 29	Strongly Disagree	1	1	3.70		
	Disagree	5	7			
	Neutral	21	32			
	Agree	26	39			
	Strongly Agree	14	21			

An independent samples t-test was conducted to determine if there was a significant difference between male and female students on their behavioral intention to use mobile learning. A significance level of 0.05 was used for this test. Table 10 gives the means and standard deviation by gender, which shows that the composite mean of the female participants was slightly higher than the overall composite mean for behavioral intention. Meanwhile, the composite mean of the male participants was slightly lower than the overall composite mean. The t-test results (see Table 11) reveal that there was no significant difference, $t(66) = -1.15$, $p > 0.05$, between Chinese male students ($M=3.57$, $SD=0.93$) and Chinese female students ($M=3.83$, $SD=0.86$), on their behavioral intention to use mobile learning.

Table 10

Means and Standard Deviations of Intention to Use Scores by Gender

Group	N	M	SD
Male	29	3.57	0.93
Female	37	3.83	0.86

Table 11

Independent Samples t-test on Behavioral Intention to Use Mobile Learning by Gender

Dependent Variable	t	df	Sig.	Mean Difference	SE of Difference
Behavioral Intention to Use Mobile Learning	-1.15	64	0.762	-0.25	0.22

Research Question 3

The third research question is “is there a significant difference between the participants’ ages and their intention to use mobile learning?” Two UTAUT constructs, age (survey item 31) and behavioral intention to use mobile learning (survey items 27-29), were used for this research question. According to the participants’ responses, they were categorized into two age groups: 18 to 25 years old (62%) and 26 to 33 years old (38%). The former age group represented the group of younger participants. The latter age group represented the group of older participants.

An independent samples t-test was used to determine if there was a significant difference between participants’ ages and their intention to use mobile learning. A significant level of 0.05 was used for this test. Table 12 gives the means and standard deviation by gender. The composite mean of the participants in the 18 to 25 years old age group was slightly lower than the overall composite mean. The composite mean of the participants in the 26-33 years old age group was slightly higher than the overall composite mean. The t-test results (see Table 13)

indicate that there was no significant difference, $t(65) = -1.30, p > 0.05$, between 18 to 25 years old age group ($M=3.62, SD=0.94$) and 26 to 33 years old age group ($M=3.92, SD=0.81$), on their behavioral intention to use mobile learning.

Table 12

Means and Standard Deviations of Intention to Use Scores by Age

Age Group	N	M	SD
18-25	41	3.62	0.94
26-33	24	3.92	0.81

Table 13

Independent Samples t-test on Behavioral Intention to Use Mobile Learning by Age Group

Dependent Variable	t	df	Sig.	Mean Difference	SE of Difference
Behavioral Intention to Use Mobile Learning	-1.30	63	0.89	-0.30	0.23

Research Question 4

The fourth research question is “Is there a significant difference between participants’ levels of experience and their intention to use mobile learning?” This research question is related to two UTAUT constructs: experience (survey item 13) and behavioral intention to use mobile learning (survey items 27-29). The participants were asked to identify their experience with mobile learning. Each level was assigned a numerical value from one to four: none=1, novice=2, intermediate=3, advanced=4. Eighteen percent of the participants identified themselves as novice users; 47% identified themselves as intermediate users; 35% identified themselves as advanced users. Table 14 gives the means and standard deviation by experience level. The composite mean of novice level participants and advanced level participants was

slightly lower than the overall composite mean. The composite mean of intermediate level participants was slightly higher than the overall composite mean.

Table 14

Means and Standard Deviations of Intention to Use Scores by Experience Level

Experience Level	N	M	SD
Novice	12	3.58	0.85
Intermediate	32	3.92	0.87
Advanced	22	3.52	0.93

A one-way analysis of variance (ANOVA) was conducted to determine if there is a significant difference between participants' levels of experience and their behavioral intention to use mobile learning. A significance level of 0.05 was used for this test. Very unequal sample sizes can affect the homogeneity of variance assumption in ANOVA. According to Lomax and Hahs-Vaughn (2013), "Homogeneity of variance is met when the variances of the dependent variable for the two samples are the same...the effect of heterogeneity is minimal when the sizes of the two samples...are equal" (p.172). Since the experience level group sizes were very unequal (12, 32, 22), the weighted mean for each group was calculated in order to make the groups to be equally represented. According to Investopedia, weighted mean is an average in which each quantity to be averaged is assigned a weight. Table 15 presents the weighted means and standard deviation. The one-way ANOVA results (see Table 16) indicate that no significant difference was found between participants' level of experience and their behavioral intention to use mobile learning, $F(2, 62) = 1.28, p = .29$.

Table 15

Weighted Means and Standard Deviations of Intention to Use Scores by Experience Level

Experience Level	N	M	SD
Novice	22	3.58	0.84
Intermediate	22	3.92	0.88
Advanced	22	3.52	0.93

Table 16

A One-way Analysis of Variance on Behavioral Intention by Level of Experience

	Sum of Square	df	Mean Square	F	Sig.
Between Groups	2.00	2	1.00	1.28	0.286
Within Groups	48.67	62	0.79		
Total	50.68	64			

Research Question 5

The fifth research question is “Is there a significant difference between the following two groups on their behavioral intention to use mobile learning: Chinese international students who feel that using mobile learning is voluntary, and Chinese international students who feel that using mobile learning is required by professors?” This research question is related to two UTAUT constructs: voluntariness of use (survey item 12) and behavioral intention to use mobile learning (survey items 27-29). Eighty-three percent (n=55) of the participants stated that using mobile devices for school-related activities was not required by any of their professors, while only 17% (n=11) indicated that it was required by at least one of their professors.

An independent samples t-test was conducted to determine if there was significant difference between these two groups on their behavioral intention to use mobile learning. A significance level of 0.05 was used for this test. Table 17 presents the mean and standard

deviation of each group, which shows that the composite mean for the participants who felt that using mobile learning was voluntary was slightly higher than the overall composite mean.

Meanwhile, the composite mean for the participants who felt using mobile learning was required by their professors was slightly lower than the overall composite mean. The independent samples t-test results (see Table 18) show that no significant difference was found, $t(66) = 0.59, p > 0.05$, between Chinese international students who felt that using mobile learning was voluntary ($M = 3.75, SD = 0.88$) and Chinese international students who felt that using mobile learning was required by professors ($M = 3.58, SD = 1.01$), on their behavioral intention to use mobile learning.

Table 17

Means and Standard Deviations of Intention to Use Scores by Voluntariness of Use

Voluntariness of Use	N	M	SD
Using mobile devices for school-related activities is not required by any of my professors.	55	3.75	0.88
Using mobile devices for school-related activities is required by at least one of my professors.	11	3.58	1.01

Table 18

Independent Samples t-test on Behavioral Intention to Use Mobile Learning by Voluntariness of Use

Dependent Variable	t	df	Sig.	Mean Difference	SE of Difference
Behavioral Intention to Use Mobile Learning	.59	64	0.77	0.18	0.30

Research Question 6

The sixth research question is “Are the following independent variables significant predictors of Chinese international students’ behavioral intention to use mobile learning: performance expectancy, effort expectancy, social influence, and facilitating conditions?” Five UTAUT constructs-behavioral intention to use mobile learning (survey items 27-29), performance expectancy (survey items 14-16), effort expectancy (survey items 17-19), social influence (survey items 20-23), and facilitating conditions (survey items 24-26)-were used for this research question.

Using a five-point Likert scale, the participants were asked to select a value that best indicates their opinions on the items regarding each construct. This Likert scale contains five values: strongly disagree = 1, disagree = 2, neutral = 3, agree = 4, and strongly agree = 5. The composite mean of each participant’s responses for each construct was calculated first. Then the composite mean for each construct was calculated, which was the average score of the participants’ composite means.

Survey items 14 through 16 measured participants’ performance expectancy. As presented in Table 19, almost 31% of the participants strongly agreed that mobile devices were useful in their school-related activities; 44% agreed; 6% strongly disagreed; 6% disagreed; and 13% chose neutral. Nearly 28% of the participants strongly agreed that using mobile devices enabled them to accomplish school-related activities more quickly; 37% agreed; 4% disagreed; 7% strongly disagreed; and 24% chose neutral. However, only 8% of the participants strongly agreed that using mobile devices for school-related activities would increase their chances of getting a better grade; 19% agreed; 22% disagreed; 4% strongly disagreed; and 47% chose neutral. The composite mean for performance expectancy was 3.58. This indicates that the

participants' attitudes on whether using mobile devices for learning can or cannot improve their academic performances fell between neutral and positive.

Table 19

Descriptive Statistics for Performance Expectancy

Items	Responses	n	%	Mean	Composite Mean	Std. Deviation
Item 14	Strongly Disagree	4	6	3.88		
	Disagree	4	6			
	Neutral	9	13			
	Agree	30	44			
	Strongly Agree	21	31			
Item 15	Strongly Disagree	5	7	3.74	3.58	.84
	Disagree	3	4			
	Neutral	16	24			
	Agree	25	37			
	Strongly Agree	19	28			
Item 16	Strongly Disagree	3	4	3.03		
	Disagree	15	22			
	Neutral	32	47			
	Agree	13	19			
	Strongly Agree	5	8			

Survey items 17 through 19 measured effort expectancy. Table 20 depicts the descriptive statistics for these three items. Approximately 29% of the participants strongly agreed that mobile devices were easy to use for school-related activities; 43% agreed; only 6% disagreed with this statement; 3% strongly disagreed; and 19% chose neutral. Nearly 21% of the participants strongly agreed that features in mobile devices for school-related activities were easy to use; 46% agreed; only 4% disagreed; 6% strongly disagreed; and 23% chose neutral. In addition, 24% strongly agreed that learning to use mobile devices for school-related activities was easy; 46% agreed; only 4% disagreed; 1% strongly disagreed; and 25% chose neutral. The composite mean for the effort expectancy construct was 3.81. This indicates that the

participants' attitudes fell between neutral and positive toward the ease associated with the use of mobile devices for learning activities.

Table 20

Descriptive Statistics for Effort Expectancy

Items	Responses	n	%	Mean	Composite Mean	Std. Deviation
Item 17	Strongly Disagree	2	3	3.88		
	Disagree	4	6			
	Neutral	13	19			
	Agree	29	43			
	Strongly Agree	19	29			
Item 18	Strongly Disagree	4	6	3.71	3.81	.85
	Disagree	3	4			
	Neutral	16	23			
	Agree	31	46			
	Strongly Agree	14	21			
Item 19	Strongly Disagree	1	1	3.85		
	Disagree	3	4			
	Neutral	17	25			
	Agree	31	46			
	Strongly Agree	16	24			

Items 20 through 23 measured social influence. As shown in Table 21, only 5% of the participants strongly agreed that people who influenced their behavior believed they should use mobile devices for learning; 25% agreed; 12% disagreed; 7% strongly disagreed; and 51% took a neutral stance. Only 6% of the participants strongly agreed that people who are important to them thought they should use mobile devices for learning; 18% agreed; 19% disagreed; 7% strongly disagreed; and 50% chose neutral. Only 4% strongly agreed that their professors had been helpful in the use of mobile devices for learning; 22% agreed; 18% disagreed; 6% strongly disagreed; and 50% chose neutral. Meanwhile, 41% agreed their university had supported the use of mobile devices for learning; 6% strongly agreed; 10% disagreed; 2% strongly disagreed;

and 41% chose neutral. The composite mean for the social influence construct was 3.12. This means the participants held almost neutral attitudes toward the importance of whether or not others who are important to them believed they should use mobile devices for learning.

Table 21

Descriptive Statistics for Social Influence

Items	Responses	n	%	Mean	Composite Mean	Std. Deviation
Item 20	Strongly Disagree	5	7	3.07	3.12	.71
	Disagree	8	12			
	Neutral	35	51			
	Agree	17	25			
	Strongly Agree	3	5			
Item 21	Strongly Disagree	5	7	2.96	3.12	.71
	Disagree	13	19			
	Neutral	34	50			
	Agree	12	18			
	Strongly Agree	4	6			
Item 22	Strongly Disagree	4	6	3.01	3.12	.71
	Disagree	12	18			
	Neutral	34	50			
	Agree	15	22			
	Strongly Agree	3	4			
Item 23	Strongly Disagree	1	2	3.40	3.12	.71
	Disagree	7	10			
	Neutral	28	41			
	Agree	28	41			
	Strongly Agree	4	6			

Survey items 24 through 26 measured facilitating conditions. Almost 6% of the participants strongly agreed that they had the resources necessary to use mobile devices for learning; 43% agreed with the statement; 12% disagreed; 5% strongly disagreed; and 34% chose neutral. Half of the participants agreed that they had the knowledge necessary to use mobile devices for learning; 10% strongly agreed; 7% disagreed; 4% strongly disagreed; 28% chose

neutral. Moreover, only 3% of the participants strongly agreed that support from an individual or group was available when they encountered difficulties in using mobile devices for learning; 31% agreed; 19% disagreed; 4% strongly disagreed; and 43% took a neutral stance. The composite mean for the facilitating conditions construct was 3.34. Therefore, the participants' attitudes fell between neutral and positive toward whether an organizational and technical infrastructure existed to support the use of the mobile devices for learning. Table 22 presents the descriptive statistics for facilitating conditions.

Table 22

Descriptive Statistics for Facilitating Conditions

Item	Responses	n	%	Mean	Composite Mean	Std. Deviation
Item 24	Strongly Disagree	3	5	3.34	3.34	.77
	Disagree	8	12			
	Neutral	23	34			
	Agree	29	43			
	Strongly Agree	4	6			
Item 25	Strongly Disagree	3	4	3.54		
	Disagree	5	7			
	Neutral	19	28			
	Agree	34	51			
	Strongly Agree	7	10			
Item 26	Strongly Disagree	3	4	3.09		
	Disagree	13	19			
	Neutral	29	43			
	Agree	21	31			
	Strongly Agree	2	3			

A standard multiple regression was conducted to address this research question. The linear combination of performance expectancy, effort expectancy, social influence and facilitating conditions was significantly related to participants' behavioral intention to use mobile learning, $F(4, 60) = 29.75, p < 0.001$ (see Table 23). The multiple correlation coefficient was 0.815,

indicating that 66.5% of the variance of the behavioral intention to use mobile learning can be accounted for by the linear combination of performance expectancy, effort expectancy, social influence and facilitating conditions. The coefficients (see Table 24) indicate effort expectancy and facilitating conditions were significant predictors of participants' behavioral intention to use mobile learning. However, performance expectancy and social influence were not significant predictors.

Table 23

Multiple Regression Analysis for Variables Predicting Behavioral Intention

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	32.09	4	8.02	29.75	.000
	Residual	16.18	60	.27		
	Total	48.27	64			

Table 24

Regression Coefficients for Research Question 6

Predictor	B	SE	β	t	Sig.
(Constant)	0.05	0.36		0.13	0.898
Performance Expectancy	0.19	0.13	0.19	1.55	0.126
Effort Expectancy	0.42	0.12	0.42	3.47	0.001
Social Influence	0.07	0.11	0.05	0.58	0.562
Facilitating Conditions	0.35	0.11	0.31	3.18	0.002

Research Question 7

Research Question 7 is “are Chinese international students’ behavioral intention to use mobile learning and facilitating conditions significant predictors of Chinese international students’ use behavior?” Three UTAUT constructs, behavioral intention to use mobile learning (survey items 27-29), facilitating conditions (survey items 24-26) and use behavior (survey items 8), were used for this research question.

Survey item 8 was used to measure use behavior for this research question. Participants were asked how often they had used mobile devices for school-related activities in the past four weeks. Only 3% of the participants had never used mobile devices for school-related activities in the past four weeks; 8% had rarely used mobile devices for learning; 21% had used mobile devices for learning sometimes; 25% had often used mobile devices for learning; and 44% had used mobile devices for learning very often. Each response was assigned a numerical value from one to five: never=1, rarely=2, sometimes=3, often=4, very often=5. As stated in the previous research questions, survey items 24 through 26 measured facilitating conditions; survey items 27 through 29 measured behavior intention to use mobile devices for learning.

A standard multiple regression was conducted to determine how behavioral intention to use mobile learning and facilitating conditions predict use behavior. In research question 6, facilitating conditions were proved to be a significant predictor of behavioral intention to use mobile learning. Therefore, the interaction between these two variables needs to be considered in the analysis. It was calculated and added to the analysis as an extra independent variable. The coefficients (see Table 25) indicate facilitating conditions and behavioral intention were not significant predictors of use behavior. There was slight interaction between behavioral intention and facilitating conditions.

Table 25

Regression Coefficients for Research Question 7 When Considering All Three Variables

Predictor	B	SE	β	t	Sig.
(Constant)	4.78	1.34		3.56	0.001
Behavioral Intention to Use Mobile Learning (BI)	-0.45	0.44	-0.37	-1.02	0.314
Facilitating Conditions (FC)	-0.74	0.50	-0.54	-1.47	0.146
BI and FC Interaction	0.26	0.14	1.15	1.89	0.064

However, when considering solely behavioral intention or facilitating conditions in the test model, the results suggest that they were both significant predictors of use behavior. Behavioral intention only explained 9.4% of the variance of use behavior, and facilitating conditions only explained 6.3% of the variance of use behavior. The researcher then further investigated how the interaction between behavioral intention and facilitating conditions affected use behavior. Behavioral intention, facilitation conditions and their interaction were entered in sequence as independent variables. As a result, three regression models were created. As shown in Table 26, the first model only included facilitating conditions as an independent variable; the second model included both facilitating conditions and behavioral intention; the third model included facilitating conditions, behavioral intention and the interaction. The first model has only facilitating conditions and explained 6.3% of variance of use behavior; the second model has behavioral intention added explained a further 3.5% of variance of use behavior; the third model has both variables and the interaction which explained another 4.9% of variance of the use behavior. These results confirm that there was slight interaction between facilitating conditions and behavioral intention. Facilitating conditions and behavioral intention were not significant predictors of use behavior.

Table 26

Regression Coefficients for Research Question 7 When Entering Three Variables in Sequence

Model	B	SE	β	t	Sig.
Model 1					
Facilitating Conditions	0.35	0.17	0.25	2.07	0.042
Model 2					
Facilitating Conditions	0.12	0.22	0.09	0.53	0.600
Behavioral Intention	0.30	0.19	0.25	1.55	0.125
Model 3					
Facilitating Conditions	-0.74	0.50	-0.54	-1.47	0.146
Behavioral Intention	-0.45	0.44	-0.37	-1.02	0.314
Behavioral Intention and Facilitating Conditions Interactions	0.26	0.14	1.15	1.89	0.064

Summary

This chapter presents the findings of exploring Chinese international students' acceptance of mobile learning at a southeastern public university. It was found that smartphones, tablets, iPads, MP3 or MP4 players were the popular mobile devices the participants owned. Moreover, a large majority of the participants used mobile devices for school-related activities. The t-test analysis reveals that there was no significant difference of Chinese international students' behavioral intention to use mobile learning based on gender, age, level of experience, and voluntariness of use. The results of multiple regression analysis imply that effort expectancy and facilitating conditions were significant predictors of Chinese international students' behavioral intention to use mobile learning. Also, facilitation conditions and behavioral intention were not significant predictors of Chinese international students' use behavior of mobile learning. However, there was slight interaction between facilitating conditions and behavioral intention.

CHAPTER V: DISCUSSION OF RESULTS

This study explored Chinese international students' acceptance of mobile learning at a public university in the southeast region of the United States. Besides Chinese international students' mobile device ownership and their actual usage of mobile devices for learning, this study also examined whether the UTAUT determinants-performance expectancy, effort expectancy, social influence, and facilitating conditions-affect Chinese international students' behavioral intention to use mobile devices for learning. This chapter provides a discussion of the results in Chapter IV.

Theoretical Framework

The Unified Theory of Acceptance and Use of Technology (UTAUT) provided the conceptual framework for this study. UTAUT was created by Venkatesh, Morris, Davis, and Davis in 2003. It aims to explain user intentions to use a technology and the subsequent usage behavior. The UTAUT survey instrument (see Appendix A) and Donaldson's (2011) survey instrument (see Appendix B) were adopted for this study. The UTAUT survey was modified to make the questions relevant to the context of mobile learning and the Chinese participant population. One additional item regarding voluntariness of use in Donaldson's survey instrument, demographic questions, and questions regarding experience, mobile device ownership and usage were added to the original UTAUT instrument. This survey includes the following sections: mobile device ownership, usage of mobile devices, performance expectancy,

effort expectancy, social influence, facilitating conditions, behavioral intention, and demographic items.

Research Question 1

What is Chinese international students' use of mobile learning? The majority of the participants owned mobile devices such as smartphones, tablets, iPads, MP3 or MP4 players. iPhones were the dominant smartphones these participants owned. These results are consistent with Salisbury, Laincz, and Smith's (2015) findings that mobile devices have become widely common and popular, with a majority of respondents owning at least one small mobile device. Most of the participants often used smartphones, tablets or iPads for school-related work. They used mobile devices to take notes, check school-related emails, and access course information such as assignments, digital textbooks, learning management system, and class schedule. They also used mobile devices to access academic services such as library resources, grades, registration, campus events, and financial aid information.

For this study, use behavior of mobile learning is the actual behaviors of using mobile technology for learning by a student. Survey item 8 measured the use behavior construct. It was found that only 3% of the participants had never used any mobile devices for school-related activities in the past four weeks; 8% had rarely used mobile devices for learning; 21% had used mobile devices for learning sometimes; 25% had often used mobile devices for learning; and 44% had used mobile devices for learning very often. The large majority of the participants had frequently used mobile devices for school-related activities. Mobile learning was popular among the participants.

These findings indicate that college students, including Chinese international students, bring their own devices, favoring small, portable ones, and desire access to academic progress

information and course material via their mobile devices (Dahlstrom, 2012). Universities should utilize smartphones, tablets and iPads when implementing mobile learning. They should also consider developing or adopting mobile learning systems and mobile learning applications that are compatible with these popular mobile devices.

Research Question 2

Is there a significant difference between Chinese male students and female students on their behavioral intention to use mobile learning? Behavioral intention to use mobile learning means a student's subjective probability that he or she will use mobile technology for learning. It is used to measure a student's acceptance of mobile learning. The composite mean for the behavioral intention construct was 3.73. This number indicates that participants held between a neutral and positive attitude toward the intention to use mobile devices for learning. The composite mean of the female participants ($M=3.83$) was slightly higher than the overall composite mean for behavioral intention. Meanwhile, the composite mean of the male participants ($M=3.57$) was slightly lower than the overall composite mean.

The t-test results in Chapter IV indicate that there was no significant difference between Chinese male students and Chinese female students on their behavioral intention to use mobile devices for learning. In other words, Chinese male students and female students had the same subjective probability that he or she would use mobile technology for learning. This finding supports the claim that there were no significant differences between males and females and intended use of mobile learning (Donaldson, 2011; Wu et al., 2012; Williams, 2009). Some prior studies focused on examining the moderating effect of gender on user's behavioral intention. According to Wang, Wu, and Wang (2009), gender differences moderated the effects of self-management on users' behavioral intention to use mobile learning. There were significant

gender differences in terms of the effects of the determinants on behavioral intention to use mobile Internet. For example, effort expectancy was a stronger determinant for women than for men (Wang & Wang, 2010). However, this study only investigated the gender differences on Chinese international students' behavioral intention to use mobile devices for learning, not the moderating effect of gender.

Research Question 3

Is there a significant difference between the participants' ages and their intention to use mobile learning? The participants were categorized into two age groups: 18 to 25 years old (63%), and 26 to 33 years old (37%). The composite mean of the participants in the 18 to 25 years old age group ($M=3.62$) was slightly lower than the overall composite mean. The composite mean of the participants in the 26-33 years old age group ($M=3.92$) was slightly higher than the overall composite mean.

The t-test results in Chapter IV indicate that there was no significant difference between Chinese international students' ages and their intention to use mobile learning. In other words, age did not affect Chinese international students' subjective probability that they would use mobile devices for learning. This finding is consistent with Donaldson's (2011) statement, that age did not have a relationship with the behavioral intention to use mobile learning. Besides mobile learning, a prior study also inferred that there was no significant difference between the age groups and their intention to use an electronic ticket system in Taiwan (Wu et al., 2012). Meanwhile, some prior research studied the moderating effect of age on the determinants on behavioral intention to use mobile learning and other types of technologies. It was found that age differences moderated the effect of effort expectancy and social influence on an individual's behavioral intention to use mobile devices for learning (Wang et al., 2009). This study only

examined the age difference between the Chinese international students on their behavioral intention to use mobile learning, not the moderating effect of age on behavioral intention.

Research Question 4

Is there a significant difference between participants' levels of experience and their intention to use mobile learning? The participants were categorized into three groups of level of experience: novice, intermediate and advanced. The composite mean of novice level participants ($M=3.58$) and advanced level participants ($M=3.52$) was slightly lower than the overall composite mean. The composite mean of intermediate level participants ($M=3.92$) was slightly higher than the overall composite mean.

The one-way analysis of variance test results imply that there was no significant difference between Chinese international students' levels of experience and their behavioral intention to use mobile learning. Therefore, experience did not have a relationship with Chinese international students' behavioral intention to use mobile devices for learning activities. In other words, Chinese international students with different levels of experience had the same subjective probability that they would use mobile technology for learning. When implementing mobile learning, universities may not need to consider Chinese international students' experiences with mobile learning, since experiences will not affect their behavioral intention. This finding is consistent with Wu, Yu, and Weng's (2012) study, which revealed that there was no significant difference in behavioral intention to use an electronic ticket system among respondents having different experiences. However, the majority of the previous studies mainly focused on investigating the moderating effects of users' experience on the determinants for behavioral intention. For example, mobile devices experience did moderate the effect of the determinants on behavioral intention (Liew et al., 2013). Moreover, experience was a significant moderating

factor for social influence on behavioral intention to use electronic-government services (Awuah, 2013). Some other studies obtained different results. According to Barnes (2012), experience did not have the effect on any of the independent variables that affected the acceptance of information technology among laboratory science students. The effort expectancy-behavioral intentions relationship, social influence-behavioral intention relationship, and the facilitation conditions-user behavior relationship were not significantly moderated by experience with the technology system (Keeton, 2008). However, this dissertation study only probed into the differences between participants' levels of experience and their behavioral intention to use mobile learning, not the moderating effect of experience on behavioral intention.

Research Question 5

Is there a significant difference between the following two groups on their behavioral intention to use mobile learning: Chinese international students who feel that using mobile learning is voluntary, Chinese international students who feel that using mobile learning is required by professors? The composite mean for the participants who felt that using mobile learning was voluntary ($M=3.75$) was slightly higher than the overall composite mean. Meanwhile, the composite mean for the participants who felt using mobile learning was required by their professors ($M=3.58$) was slightly lower than the overall composite mean.

The t-test results reveal that there was no difference between these two groups on their behavioral intention to use mobile learning. In other words, Chinese international students had the same subjective probability that they would use mobile technology for learning, no matter if it was required by their professors or not. When universities decide policies for mobile learning, it may be unnecessary to make it mandatory for students. This finding is different from Donaldson's (2011) study, which suggested that voluntariness was a significant negative

predictor of behavioral intention to use mobile learning: the less instructors require students to use mobile learning, the less students use mobile devices for learning. This difference may be due to the small sample size of this dissertation research. In addition, the majority of the participants (83%) of the present study were not required by their professors to use mobile devices for learning, which might affect the test results as well. Meanwhile, some prior studies examined the moderating effect of voluntariness of use on behavioral intention. Respondents who were voluntary to use a technology were more concerned about performance expectancy than those who were required to use this technology (Wu et al., 2012). Voluntariness of use also moderated the effect of social influence on behavioral intention to use mobile devices for learning (Williams, 2008). However, this dissertation only examined the differences between these two groups and their behavioral intention to use mobile learning, not the moderating effect of voluntariness of use on behavioral intention.

Research Question 6

Are the following independent variables significant predictors of Chinese international students' behavioral intention to use mobile learning: performance expectancy, effort expectancy, social influence, and facilitating conditions? The multiple regression test results indicate that the linear combination of these four independent variables was significantly related to participants' behavioral intention to use mobile learning. It was found that effort expectancy and facilitating conditions were significant predictors of behavioral intention, while performance expectancy and social influence were not significant predictors.

Performance expectancy is “the degree to which an individual believes that using the system will help him or her to attain gains in job” (Venkatesh et al., 2003, p. 447). For this study, it means the degree to which a student believes that using mobile devices for learning will

help him or her to improve academic outcomes. The composite mean for the performance expectancy construct was 3.58. This indicates that the participants' attitudes on whether using mobile devices for learning can or cannot improve their academic performances fell between neutral and positive. The results obtained from this study suggest that performance expectancy was not a significant predictor of behavioral intention to use mobile learning. In other words, the degree to which the participants believed that using mobile devices for learning would help them to improve their academic performance did not affect their behavioral intention. This finding is different from the previous studies, which revealed that performance expectancy to be significant predictor of college students' behavioral intention to use mobile learning (Wang et al., 2009; Liew et al., 2013; Love & Abu-Al-Aish, 2013; Donalson, 2011). However, this finding is consistent with the studies that examined users' acceptance of other types of technologies. According to Tibenderana et al. (2011), performance expectancy did not have an impact on acceptance and use of e-library services. Vanneste et al. (2013) also found performance expectancy did not have significant influence on behavioral intention to use a web application by health professionals in Belgium.

Effort expectancy is "the degree of ease associated with the use of the system" (Venkatesh et al., 2003, p. 450). For this study, it means the degree of ease associated with the use of mobile devices for learning. The composite mean for the effort expectancy construct was 3.81. This means that the participants' attitudes fell between neutral and positive toward the ease associated with the use of mobile devices for learning activities. The results obtained from this study indicate that effort expectancy was a significant predictor of behavioral intention to use mobile learning. Therefore, the degree of ease associated with the use of mobile devices for learning influenced participants' behavioral intention to use mobile devices for learning. This

finding is supported by the prior studies conducted by Wang et al. (2009), Love and Abu-Al-Aish (2013), Barnes (2013), Serben (2014), and Mandal and McQueen (2012), which found that effort expectancy had positive influence on user's behavioral intention to use a technology. This implies that Chinese international students who perceive a high degree of ease to use mobile devices for learning will have a high intention to use mobile devices for learning. Educators and administrators should consider adopting mobile learning systems and applications that are user-friendly and easier to use for Chinese international students. Before officially publishing a mobile learning system or application, universities may consider releasing a trail version to the Chinese international students, so that the students will have time to practice and become proficient in it. Universities will also have an opportunity to collect feedback from the students and make improvements on the system or application if needed.

Social influence is "the degree to which an individual perceives that important others believe he or she should use the new system" (Venkatesh et al., 2003, p. 451). For this study, it means the degree to which a student perceives that important others believe he or she should use mobile devices for learning. The composite mean for the social influence construct was 3.12. This means the participants held almost neutral attitudes toward the importance of whether or not others who are important to them believed they should use mobile devices for learning. The literature suggested that social influence had positive influence on behavioral intention (Keller, 2006; Tibenderana et al., 2010; Foon & Fah, 2011; Donaldson, 2011; Martins et al., 2014). The more students think faculty, university, peers and individuals important to them believe they should use mobile learning, the more likely they will engage in mobile learning (Donaldson, 2011). In contrast, the results from the present study suggested that social influence was not a significant predictor of behavioral intention. In other words, the degree to which Chinese

international students perceived that important others believed they should use mobile devices for learning did not affect their behavioral intention. This finding is consistent with the studies conducted by Anderson et al. (2006), Barnes (2013), and Madal and McQueen's (2012), which suggested that social influence had no significant relationships with behavioral intention. In this dissertation study, almost half of the participants took a neutral stance when they were asked for their opinions on the influence of their professors as well as the individuals important to them on their intention to use mobile learning. This could have affected the predictive power of social influence.

Facilitating conditions is "the degree to which an individual believes that an organizational and technical infrastructure exists to support use of the system" (Venkatesh et al., 2003, p. 453). For this study, it means the degree to which a student believes an organizational and technical infrastructure exists to support the use of the mobile devices for learning. The composite mean for the facilitating conditions construct was 3.34. The participants' attitudes fell between neutral and positive toward whether an organizational and technical infrastructure existed to support the use of the mobile devices for learning. The results obtained from this study indicate that facilitating conditions was a significant predictor of the behavioral intention to use mobile learning. In other words, the degree to which the participants believed an organizational and technical infrastructure exists to support their use of the mobile devices for learning influenced their behavioral intention. This finding is supported by the literature on the acceptance of mobile learning (Donaldson, 2011; Jairak et al., 2009; Williams, 2009). This finding is also consistent with the literature on the acceptance of other types of technologies (Keeton, 2008; Serban, 2014). For example, Serban (2014) found that there was a positive relationship between facilitating conditions and users' behavioral intention to use social media

by African American small business owner. The more students perceive an organizational and technical infrastructure is provided to support their use of the mobile devices for learning, the more likely they will engage in mobile learning (Donaldson, 2011). In order to encourage Chinese international students to engage in mobile learning, universities should provide necessary organizational and technical support to Chinese international students, such as customized training, workshops, technical support service, and any other helpful resources for mobile learning.

Research Question 7

Are Chinese international students' behavioral intention to use mobile learning and facilitating conditions significant predictors of Chinese international students' use behavior?

Prior studies suggested that facilitating conditions had a significant relationship with use behavior (Barnes, 2013; Keeton, 2008; Serban, 2014). The initial UTAUT study also claimed that facilitating conditions and behavioral intention were two direct determinants of use behavior (Venkatesh et al., 2003). In contrast to the previous studies, the results from the present study reveal that facilitating conditions and behavioral intention were not significant predictors of use behavior, but there was slight interaction between these two variables. Therefore, neither facilitating conditions nor behavioral intention can determine Chinese international students' use behavior. In other words, the degree to which Chinese international students believed that an organizational and technical infrastructure existed to support their use of mobile learning, or the subjective probability that they would use mobile learning, did not affect their use behaviors.

Limitations of the Study

The key limitation of this study is the small sample size used for the study. Large sample size coupled with considerable statistical power and effect size usually yields more statistically significant results (Awuah, 2012). Because of the small sample size, this study may have missed important differences that were actually existed. Moreover, the small sample size could affect the generalization of this study to a larger sample population. Therefore, the findings obtained from this study may not be generalizable.

Additionally, this study is geographically limited to the southeast region of the United States. The participants of this study are all from one single public university. Thus, the findings may not be generalized to other public universities in other regions. Lastly, since the main purpose of this study was to examine whether the UTAUT determinants (performance expectancy, effort expectancy, social influence, and facilitating conditions) affect Chinese international students' behavioral intention to use mobile devices for learning, the impacts of the moderators (experience, gender, age, and voluntariness) were not included in the test.

Conclusions

Acceptance of a technology can be crucial to its use and success. Understanding students' acceptance of mobile learning is essential to the successful delivery of academic, organizational, and instructional information (Donaldson, 2010). Many researchers have started to apply UTAUT model to their research on students' acceptance of mobile learning. Because of the increasing enrollment of Chinese international students in American universities, the group of Chinese international students has gradually become a more significant part in American universities. However, most of the previous studies have only focused on American students' or college students' acceptance of mobile learning in general. There remains a lack of research on

Chinese international students' acceptance of mobile learning. Therefore, this study fills the gap in studying minority students, specifically Chinese international students' acceptance of mobile learning. Seven conclusions can be drawn from the study's findings.

Respondents are already using mobile devices for learning. The results of this study revealed that the majority of the respondents owned mobile devices such as smartphones, tablets, iPads, MP3 or MP4 players. iPhones were the dominant smartphones they owned. Most of the respondents frequently used these mobile devices for a wide variety of school-related activities, such as taking notes, checking school-related emails, accessing course information, and academic services.

Both the male respondents and female respondents intend to use mobile devices for learning in the near future. The results of this study implied that there was no significant difference between the male respondents and female respondents on their behavioral intention to use mobile learning. Moreover, the findings indicated that there was no significant difference of the respondents' behavioral intention to use mobile learning based on age. Therefore, the respondents of different ages have the same subjective possibility that they will use mobile devices for learning.

Respondents plan to use mobile devices for learning in the near future even if they are not required to do so by their instructors. The results indicated that voluntariness of use did not affect the respondents' behavioral intention to use mobile learning. No matter if mobile learning is required by the instructors or not, the respondents have the same subjective probability that they will use mobile devices for learning.

Respondents plan to use mobile devices for learning in the near future even if they are not experienced in it. The results revealed that experience did not have a relationship with the

respondents' behavioral intention to use mobile learning. Respondents with different levels of experience have the same subjective probability that they will use mobile devices for learning.

Respondents who find mobile devices easy to use are more likely to use them for learning. The results indicated that effort expectancy was significant predictor of the respondents' behavioral intention to use mobile learning. Respondents who perceive a high degree of ease to use mobile devices for learning will have a high intention to use mobile devices for learning.

Respondents are more likely to engage in mobile learning in the near future if they have the necessary organizational and technical support. The results revealed that facilitating conditions was significant predictor of the respondents' behavioral intention to use mobile learning. The degree to which the respondents believe an organizational and technical infrastructure exists to support their use of the mobile devices for learning does affect their behavioral intention.

In addition, the UTAUT model is an effective tool for measuring the factors that affect the respondents' behavioral intention to use mobile learning. The results from this study indicated that the linear combination of the four UTAUT determinants-performance expectancy, effort expectancy, social influence, and facilitating conditions-was significantly related to the respondents' behavioral intention to use mobile learning. However, the results did not provide adequate support for all the relationships specified in this model. Only effort expectancy and facilitating conditions were proved to be significant predictors.

Recommendations for Practice

The findings from this study provide university administrators and educators with information on Chinese international students' usage of mobile learning and the factors influencing their acceptance of mobile learning. This information will help administrators and educators make the best decisions and policies on the implementation of mobile learning. The results obtained from this study suggest the following:

1. Universities should utilize smartphones, tablets, and iPads when implementing mobile learning since Chinese international students already own and are using these devices. They should also develop or adopt mobile learning systems and mobile learning applications that are compatible with all of these mobile technologies;
2. When implementing mobile learning, universities may not need to consider Chinese international students' age or gender;
3. When administrators or educators decide policies for mobile learning, it may be unnecessary to make it mandatory for Chinese international students;
4. When implementing mobile learning, universities may not need to worry about the acceptance of mobile learning among the Chinese international students who have little or even no experience with it;
5. Administrators and educators should consider adopting mobile technologies, mobile learning systems, and mobile learning applications that are user-friendly and easier to use for Chinese international students. For example, universities can adopt a mobile learning application or a system that has Chinese language in the language settings. Before officially publishing a mobile learning system or

application, universities may consider releasing a trial version to the Chinese international students, so that they will have time to practice and become proficient in it. This will also provide universities an opportunity to collect feedback and make improvements on that system or application;

6. In order to encourage Chinese international students to engage in mobile learning, universities should provide necessary organizational and technical support to Chinese international students, such as customized training, workshops, technical support service, and any other helpful resources for mobile learning. Universities may consider recruit trainers and technical support staff who can speak Chinese. Therefore, they can provide Chinese international students customized trainings, workshops, and resources delivered in Chinese; and
7. On the one hand, administrators should provide Chinese international students with convenient mobile applications to access the academic services, such as the mobile applications for utilizing library resources and learning management system. On the other hand, educators should identify ways in which mobile devices can be utilized to support classroom and online learning, and provide academic content and information on resources formatted for mobile devices (Donaldson, 2011).

Recommendations for Future Research

The following are the recommendations for future research on the acceptance of mobile learning:

1. To extend the generalizability of the findings, future research could duplicate the instrument of this study and randomly sample Chinese international students at public universities in the United States;
2. Instead of exploring the acceptance of mobile learning in general, future research could also investigate student' acceptance of using a specific mobile technology for learning, such as smartphones, tablets, and mobile apps;
3. This study focused solely on Chinese international students' acceptance of mobile learning at public universities in America. Future research could study the acceptance of mobile learning by the international students from other countries;
4. Besides public universities, future research could study international students' acceptance of mobile learning in private universities, community colleges or other types of higher education institutions;
5. Future research could compare American students' and Chinese international students' acceptance of mobile learning, and exam whether there is significant difference between these two groups on their behavioral attention to use mobile devices for learning;
6. This study only utilized a quantitative approach. Future studies may use both qualitative and quantitative research in order to obtain more detailed results on Chinese international students' acceptance of mobile learning;

7. Further research is needed to validate the following four groups of relationships: performance expectancy and behavioral intention to use, social influence and behavioral intention to use, facilitating conditions and use behavior, behavioral intention to use and use behavior; and
8. This study did not examine the moderating effect of age, gender, experience, and voluntariness of use on behavioral intention. Future studies may further investigate the impacts of these four moderators in the UTAUT model.

Summary

Using UTAUT as the theoretical framework, this study gained understanding of Chinese international students' acceptance of mobile learning. The descriptive data indicated that the majority of the Chinese international students owned mobile devices such as smartphones, tablets, iPads, MP3 or MP4 players. They used these mobile devices for all kinds of school-related activities, such as access library resources and learning management system, take notes, check assignments and grades, read digital textbooks, and register for courses. The findings implied that the mobile learning was popular among the Chinese international students.

The results obtained from this study indicated that age, gender and experience of using mobile devices for learning did not have significant influence on respondents' behavioral intention to use mobile learning. A multiple regression analysis was conducted to examine whether performance expectancy, effort expectancy, social influence and facilitating conditions were significant predictors of Chinese international students' behavioral intention to use mobile devices for learning. The findings suggested that only effort expectancy and facilitating conditions were significant predictors. Facilitating conditions and behavioral intention were found to be non-significant predictors of use behavior. However, there was slight interaction

between these two constructs. Overall, this study has significant implications on the implementation of mobile learning in universities. It also expands the existing body of knowledge in the fields of mobile learning and the UTAUT model.

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APPENDIX A: ORIGINAL UTAUT SURVEY ITEMS

Performance expectancy

I would find the system useful in my job.

Using the system enables me to accomplish tasks more quickly.

Using the system increases my productivity.

If I use the system, I will increase my chances of getting a raise

Effort expectancy

My interaction with the system would be clear and understandable.

It would be easy for me to become skillful at using the system.

I would find the system easy to use.

Learning to operate the system is easy for me.

Attitude toward using technology

Using the system is a bad/good idea.

The system makes work more interesting.

Working with the system is fun.

I like working with the system.

Social influence

People who influence my behavior think that I should use the system.

People who are important to me think that I should use the system.

The senior management of this business has been helpful in the use of the system.

In general, the organization has supported the use of the system.

Facilitating conditions

I have the resources necessary to use the system.

I have the knowledge necessary to use the system.

The system is not compatible with other systems I use.

A specific person (or group) is available for assistance with system difficulties.

Self-efficacy

I could complete a job or task using the system...

If there was no one around to tell me what to do as I go.

If I could call someone for help if I got stuck.

If I had a lot of time to complete the job for which the software was provided.

If I had just the built-in help facility for assistance.

Anxiety

I feel apprehensive about using the system.

It scares me to think that I could lose a lot of information using the system by hitting the wrong key.

I hesitate to use the system for fear of making mistakes I cannot correct.

The system is somewhat intimidating to me.

Behavioral intention to use the system

I intend to use the system in the next <n> months.

I predict I would use the system in the next <n> months.

I plan to use the system in the next <n> months.

APPENDIX B: DONALDSON'S SURVEY INSTRUMENT

Performance Expectancy

I would find mobile learning useful in my learning.

Using mobile learning enables me to accomplish learning activities more quickly.

Using mobile learning increases my learning productivity.

If I use mobile learning, I will increase my chances of getting a better grade.

Effort Expectancy

My interaction with mobile learning would be clear and understandable.

It would be easy for me to become skillful at using mobile learning.

I would find mobile learning easy to use.

Learning to operate mobile learning is easy for me.

Perceived Playfulness

When using mobile learning, I will not realize the time elapsed.

When using mobile learning, I will forget the work I must do.

Using mobile learning will give enjoyment to me for my learning.

Using mobile learning will stimulate my curiosity.

Using mobile learning will lead to my exploration.

When it comes to learning and studying, I am a self-directed person.

Self-Management of Learning

In my studies, I am self-disciplined and find it easy to set aside reading and homework time.

I am able to manage my study time effectively and easily complete assignments on time.

In my studies, I set goals and have a high degree of initiative.

Behavioral Intention to Use Mobile Learning

I intend to use mobile learning in the next 12 months.

I predict I would use mobile learning in the next 12 months.

I plan to use mobile learning in the next 12 months.

How often do you access the Internet from your handheld mobile device?

Social Influence

People who influence my behavior will think that I should use mobile learning.

People who are important to me will think that I should use mobile learning.

The professors have been helpful in the use of mobile learning.

In general, my college has supported the use of mobile learning.

Voluntariness of Use

Although it might be helpful, using mobile learning is certainly not compulsory.

My professor does not require me to use mobile learning.

My professors expect me to use mobile learning.

The use of mobile learning would be voluntary.

Facilitating Conditions

I have the resource necessary to use mobile learning.

I have the knowledge necessary to use mobile learning.

A specific person or group is available for assistance with mobile learning difficulties.

APPENDIX C: SURVEY INSTRUMENT

Section 1: Ownership and Use of Mobile Devices

1. Do you own any of these devices?

	No, and I don't plan to purchase one within the next 12 months	No, but I plan to purchase one within the next 12 months	Yes, I currently own one.
Tablet or iPad			
E-reader			
Smartphone			
Games console (e.g.PSP, DS)			
MP3, MP4 player (e.g.iPod, Zune, iPod touch)			

2. What type of e-reader do you have? If you have more than one e-reader, please select the one you use most often for school-related work. (Display question 3 if “I don’t have one” is selected)
Kindle Nook Sony Reader Other (please describe) Not sure I don’t have one

3. If you don’t have an e-reader, do you plan to buy one in the future? (Display question 4 if “Yes” is selected)
Yes No Not sure

4. If you plan to buy an e-reader in the future, which one do you plan to buy?
Kindle Nook Sony Reader Other (Please describe) Not sure

5. What type of smartphone do you have? If you have more than one smartphone, please select the one you use most often for school-related work. (Display question 6 if “I don’t have one” is selected)
iPhone Android phone Windows phone Blackberry phone
Other (please describe) Not sure I don’t have one

6. If you don’t have a smartphone, do you plan to buy one in the future? (Display question 7 if “Yes” is selected)
Yes No Not sure

7. If you plan to buy a smartphone in the future, which one do you plan to buy?
iPhone Android phone Windows phone Blackberry phone
Other (Please describe) Not sure

8. How often have you used mobile devices for school-related activities in the past 4 weeks?
 Never Rarely Sometimes Often Very often Not sure

9. Which of the following do you use in class regularly? You may check more than one.

Tablet or iPad E-reader Smartphone
 Games console (e.g. PSP, DS) MP3,MP4 player None

10. Regardless of whether you own one, please tell us how you use each device.

	Haven't used in the past year	Use for school-related work and other purposes	Use for school-related work only	Use for other purposes only
Tablet or iPad				
E-reader				
Smartphone				
Games console (e.g.PSP, DS)				
MP3, MP4 player (e.g.iPod, Zune,iPod touch)				

11. Choose all the school-related activities for which you have used mobile devices.

None/ Check assignments/ do assignments/ do research/ take notes in class/ read digital textbooks/ take quizzes and exams/ read or send school-related email/ check class schedules/ Join a discussion about school work/ access library resources/check grades/ registering for courses/ use the course or learning management system (e.g., Moodle, Blackboard)/ Accessing financial aid information/ Scheduling appointments (e.g., academic advising, student health, counseling, etc.)/ Ordering transcripts/ Accessing information about events, student activities, and clubs/ organizations

12. Select the statement that best describes your use of mobile devices for school-related activities.

Using mobile devices for school-related activities is not required by any of my professors
 Using mobile devices for school-related activities is required by at least one of my professors

13. How would you describe your level of experience using mobile devices for school-related activities?

None (Have no experience)
 Novice (Use mobile devices for school-related activities one to three times a week)
 Intermediate (Use mobile devices for school-related activities once a day)
 Advanced (Use mobile devices for school-related activities many times per day)

Section 2: Opinion on Using Mobile Devices for School-Related Activities

Please choose your response following each statement, using a Strongly Disagree, Disagree, Neutral, Agree, or Strongly Agree scale.

	Strongly	Disagree	Neutral	Agree	Strongly
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	Disagree				Agree
14. I find mobile devices useful in my school-related activities in general.					
15. Using mobile devices enables me to accomplish school-related activities more quickly.					
16. Using mobile devices for school-related activities will increase my chances of getting a better grade.					
17. Mobile devices are easy to use for school-related activities.					
18. Finding or using features in mobile devices for school-related activities is easy.					
19. Learning to operate the mobile devices for school-related activities is easy for me.					
20. People who influence my behavior think that I should use mobile devices for school-related activities.					
21. People who are important to me think that I should use mobile devices for school-related activities.					
22. Professors in my classes have been helpful in the use of mobile devices for school-related activities.					
23. In general, my university has supported the use of mobile devices for school-related activities.					
24. I have the resources necessary to use mobile devices for school-related activities.					
25. I have the knowledge necessary to use mobile devices for school-related activities.					
26. Support from an individual or group is available when I encounter difficulties in using mobile devices for school-related activities.					
27. I intend to use mobile devices for school-related activities in the next semester.					
28. I predict I will use mobile devices for school-related activities in my courses in the next semester.					
29. I have a plan to use mobile devices for school-related activities in the near future.					

Section 3: Demographic Information

30. What is your gender?

Male Female

31. Please write down your age:

32. What is your current or intended major? Pick one that best fits your primary interests.

Agriculture and natural resources

Biological/life sciences

Business, management, marketing

Communication/journalism

Computer and information sciences

Education, including physical education

Engineering and architecture

Fine and performing arts

Health sciences, including professional programs

Humanities

Liberal arts/general studies

Manufacturing, construction, repair or transportation

Physical sciences, including mathematical sciences

Public administration, legal, social, and protective services

Social sciences, including history and psychology

Undecided

Other (Please describe)

33. What is your academic rank?

Freshman or first-year student

Sophomore or second-year student

Junior or third-year student

Senior or fourth-year student

Master's or EdS student

Doctoral student

Other type student (Please describe)

APPENDIX D: INFORMATION SHEET (SURVEY)

Dear Potential Participant:

You are invited to participate in a research study conducted by Zhetao Guo from The University of Alabama, Department of Educational Leadership, Policy and Technology Studies. I hope to learn about Chinese international students' acceptance of mobile learning in American universities. You were selected as a possible participant in this study because you are a Chinese student enrolled in The University of Alabama. This survey consisting of 33 questions will take approximately 5-7 minutes.

There are no known risks or discomforts associated with your participation in this study. This research will study your usage and acceptance of mobile learning. Your responses will provide university administrators and educators with information on Chinese students' acceptance of mobile learning. The results will be references for the mobile learning study in the future. However, I cannot guarantee that you personally will receive any benefits from this research.

Subject identities will be anonymous. No names will be used. Survey results will be saved in the investigator's Qualtrics account. Only the investigator has access to the results. The survey and associated responses will be deleted after the results are analyzed.

Your participation is voluntary. Your decision whether or not to participate will not affect your relationship with The University of Alabama. If you decide to participate, you are free to withdraw your consent and discontinue participation at any time without penalty.

If you have questions about your rights as a person in a research study, call Ms. Tanta Myles, the Research Compliance Officer of the University, at 205-348-8461 or toll-free at 1-877-820-3066. You may also ask questions, make suggestions, or file complaints and concerns through the IRB Outreach website at http://osp.ua.edu/site/PRCO_Welcome.html or email the Research Compliance office at participantoutreach@bama.ua.edu.

After you participate, you are encouraged to complete the survey for research participants that is online at the outreach website or you may ask the investigator for a copy of it and mail it to the University Office for Research Compliance, Box 870127, 358 Rose Administration Building, Tuscaloosa, AL 35487-0127.

UA IRB Approved Document
Approval date: 1-30-15
Expiration date: 1-29-16

APPENDIX E: INVITATION LETTER (Email)

My name is Zhetao Guo and I am a Ph.D. student in the Department of Educational Leadership, Policy, and Technology Studies at The University of Alabama. I request Chinese International Students at The University of Alabama to participate in my doctoral thesis study “Exploring Chinese students’ acceptance of mobile learning”. This study has been approved by the Institutional Review Board at The University of Alabama (IRB Number: 15-0R-025).

Your answers will provide valuable information and insight on Chinese international students’ usage and acceptance of mobile learning in the United States.

The questionnaire contains 33 items, and should take less than 5-7 minutes to complete. If you are willing to participate, please click on this link to complete the survey:

https://universityofalabama.sz1.qualtrics.com/SE/?SID=SV_cZ3FDJt3m112V13

All information gathered will be anonymous. There will be no record of respondents, and upon completion of the survey there is no way for researchers to contact or identify individual participants.

If you have questions or are interested in the results of the study, please contact me at zguo4@crimson.ua.edu.

Thank you.

Zhetao Guo

APPENDIX F: IRB APPROVAL



January 30, 2015

Zhetao Guo
ELPTS
College of Education
Box 870302

Re: IRB # 15-OR-025, "Exploring Chinese Students' Acceptance of Mobile Learning"

Dear Ms. Guo:

The University of Alabama Institutional Review Board has granted approval for your proposed research.

Your application has been given expedited approval according to 45 CFR part 46. You have also been granted the requested waiver of informed consent. Approval has been given under expedited review category 7 as outlined below:

(7) Research on individual or group characteristics or behavior (including, but not limited to, research on perception, cognition, motivation, identity, language, communication, cultural beliefs or practices, and social behavior) or research employing survey, interview, oral history, focus group, program evaluation, human factors evaluation, or quality assurance methodologies.

Your application will expire on January 29, 2016. If your research will continue beyond this date, please complete the relevant portions of the IRB Renewal Application. If you wish to modify the application, please complete the Modification of an Approved Protocol Form. Changes in this study cannot be initiated without IRB approval, except when necessary to eliminate apparent immediate hazards to participants. When the study closes, please complete the Request for Study Closure Form.

Should you need to submit any further correspondence regarding this proposal, please include the above application number.

Good luck with your research.

Sincerely,



358 Rose Administration Building
Box 870127
Tuscaloosa, Alabama 35487-0127
(205) 348-8461
FAX (205) 348-7189
TOLL FREE (877) 820-3066

Carpanato F. Myles, MSM, CIM, CIP
Director & Research Compliance Officer
Office for Research Compliance
The University of Alabama