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Examining Teachers' Acceptance and Use of Mobile Applications and Ipads in Instruction through the Technology Acceptance Model: A Mixed Methods Study

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Abstract

With the addition of new technologies and the shift from digital learning to mobile learning, districts are rushing to purchase the latest mobile devices for their campuses. Despite this rush, as indicated by the growing number of pilot programs and 13 million iPads sold to education customers globally (Maestri, 2014), there is little research on the factors teachers consider when selecting mobile applications or the factors that impact their acceptance of the new technology. When implementing new technologies, teachers' acceptance of the technology must be examined to ensure proper use.

This dissertation explored, through sequential mixed methods, teachers' acceptance of mobile applications and the iPad device through two phases. The first phase of the study determined, through quantitative statistics, the factors that impact the selection of mobile applications by teachers. Teachers' acceptance of the device was explored through ease of use and perceived usefulness, predictors from the Technology Acceptance Model (TAM), which is the theoretical framework that guided the study. The second phase further investigated, through qualitative interviews and grounded theory, the two predictors as well as the affordances and challenges of students and teachers through various uses of the device.

The participants in both phases of the study were teachers, from various levels and subjects, who taught in two school districts in a border town in west Texas. The participants varied in terms of their number of years teaching, number of years using the device and the frequency of their use.

The results of both phases of this study indicate that overall, teachers accept the device in instruction as indicated by the predictors of ease of use and perceived usefulness from the TAM model. The quantitative results of this study indicated that the number of years teaching, the time using the device, and the frequency in which the device was used were not factors impacting teachers' acceptance of the device through the predictors of ease of use and perceived usefulness. There was a noted difference between elementary and high school teachers in terms

of ease of use through audio ease and perceived usefulness through teacher support. Several factors of ease of use (audio and visual ease) represented the highest means of fifteen factors which indicated that teachers rated these factors important when selecting applications for instruction. The qualitative results validated these findings when the majority (95%) of teachers stated they were very likely to keep using the device and noted that it was easier to use than a computer. Participants indicated their students already knew how to use the device and were helping them with their ease of use. Teachers also reported several factors such as an increase in learning and growth in technology that would enhance their job performance.

The findings of this study add to the ongoing research of user acceptance of mobile technologies and offer an extension to the TAM model by exploring the acceptance of the iPad, with a unique population. This dissertation provides teachers with the factors that are important in their selection of mobile applications for use in their classrooms. School districts can utilize the findings of this dissertation to guide teachers in the selection and purchasing of mobile applications as well as provide technical support and training. Additionally, the findings can inform mobile application developers as to what factors teachers rate important and details about student motivation engagement that can guide their development while keeping the student in mind.

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Chapter 1: Introduction

A teacher sits across a kidney shaped table and begins describing her most successful experience using iPads in her elementary classroom. She states, "It's just learning with the students on how to navigate. This is the first time I am using iPads so I'm learning with them. They are showing me and just learning from each other". This statement, like others in this study, illustrates how using the device in instruction is benefitting both students and teachers. By exploring the affordances and challenges of using the device in instruction, we are able to understand a teachers' acceptance of mobile technology which leads to their use.

Another teacher shares her successful experience, "Students are very knowledgeable when it comes to technology so therefore, the success has come when a student can go to a specific application and use it as an interactive lesson and then apply their work or practice or even do online features such as tests and assessments". This participant illustrates a common thread of student empowerment which is described later in the study.

Yet another participant describes how the device benefits her, "As a teacher, I find that iPads are easy to use. Once you are connected and you're at the website, it is friendlier versus a computer". This participant illustrates the concept of ease of use, which is defined later in the study. Another teacher demonstrates how the iPad improves her job performance through the success of her students, "It has improved test scores dramatically. My kids have higher retention of the material. They will remember the answers to various questions. They're getting the concepts better because there are a lot of visuals that go with it and they are making the association".

An exploration into teachers' acceptance of mobile applications and devices follows with the problem statement, purpose of the study and research questions. An overview of the research design, significance, researcher stance and outline of the study are presented.

Problem Statement

With the addition of new technologies and the shift from digital learning to mobile learning, districts are rushing to purchase the latest mobile devices for their campuses. The purchasing of mobile devices is just the first step. When implementing new technologies, teachers' acceptance of the technology must be examined to ensure proper use. Murray and Olcese (2011) state "what makes a difference in how devices are adopted is how and what applications are developed to take advantage of the hardware specifications" (p.45).

Despite the growing number of pilot programs and 13 million iPads sold to education customers globally (Maestri, 2014), there is a lack of research that focuses on teachers' selection of applications and their acceptance of mobile technology devices for use in instruction.

Purpose

This sequential mixed method study explored teachers' acceptance of mobile devices and applications through two phases. The first phase of the study determined, through quantitative statistics, the factors that impact the selection of mobile applications by teachers and explored the two predictors of ease of use and perceived usefulness, which impact teachers' acceptance of mobile devices. The second phase further investigated, through qualitative interviews, the two predictors as well as the affordances and challenges of students and teachers through various uses of the device. The reason for following up with qualitative research in the second phase was to capture the teachers' perspective on their acceptance of the device.

The study was conducted with participants teaching at various levels in two school districts in a west Texas borderland city. The study generated a list of the most important factors in the selection of applications and which of those factors impact use of the device. The findings of the study aid teachers in the purchasing of appropriate mobile applications for use in their classrooms as well as the factors that may increase their use of mobile devices. Additionally, the study informs teachers and school districts of challenges to consider when implementing the devices in the classroom.

Research Questions

Due to the sequential mixed methods design, this study was driven by both quantitative (Question 1) and qualitative (Question 2) questions. The third question addresses the nature of the integration of both questions. This structure follows the approach developed by Creswell and Clark (2007) where separate quantitative and qualitative questions are followed by a question about the integration of both questions. The three questions follow:

1. Which factors impact teachers' selection of mobile applications for use in instruction? Is there a difference between the ease of use and perceived usefulness of groups of teachers depending on how long they have been teaching, the level they teach, the frequency or time they have been using the device in instruction?
2. What are the student and teacher affordances and challenges associated with ease of use and perceived usefulness?
3. What do both phases indicate about teachers' acceptance of the device through the predictors of ease of use and perceived usefulness?

Research Design Overview

This study follows a mixed methods approach with two phases which utilize quantitative and qualitative measures to fully examine the acceptance of mobile technologies. During the first phase of the study, participants used a 5 point Likert scale to rate their level of agreement with factors when selecting applications. The computer based survey asked to what extent each factor was important in the selection of iPad applications for instruction purposes. Each participant chose a rating of 0 to 4 with a rating of 0 responding to "not at all", 1 responding to "slightly important", 2 responding to "moderately important", 3 responding to "very important" and 4 responding to "extremely important". Data from the survey were recorded to determine, through quantitative analysis, the overall mean of each factor. Data regarding the predictors of user acceptance were analyzed. Then, data regarding the participants' frequency of use of the iPad in instruction helped to select the participants for the second phase of the study.

The second phase consisted of an interview with participants who indicated they use the device frequently in phase one. Questions include the logistics of using the device, such as amount of time and number of devices, as well as how the device is used and the affordances and challenges to both the teacher and students.

The target population, in both phases, was all teachers from two school districts (who have been assigned pseudonyms) in a borderland area in west Texas which is represented by a sample of adult elementary, middle and high school teachers from the Yellow Rose and Sunshine Independent School Districts (also pseudonyms). The sample was teachers from 7 high schools and 7 middle schools in the Yellow Rose district and from 3 elementary schools in the Sunshine district for a total number of 70 participants. The participants in the second phase were chosen, through purposeful sampling, by their answer to the question in the first phase of the study. Participants who indicated they used the device 1 to 2 times a week, 3 to 4 times a week or daily. The sample was teachers from 2 middle schools in the Yellow Rose district and teachers from 3 different elementary schools in the Sunshine district for a total number of 20 participants.

Researcher Assumptions and Stance

My assumption was that all participants answered the phase one survey to the best of their ability by using their previous knowledge of the concepts in the survey such as vocabulary and Bloom's Taxonomy as well as technological features of the device. I also assumed that the participants were comfortable with the computer based survey mode and were using mobile applications in their classrooms and instruction, as indicated by the open ended response in phase one. I anticipated the frequency for the factors that were closely related to student learning outcomes and content, such as the factors specific to vocabulary and critical thinking were rated as very important or extremely important. This assumption comes from the participants being teachers who are naturally concerned with student achievement. Additionally, since the survey was distributed online through Survey Monkey, I anticipated the participants had some level of technology knowledge which may have contributed to their responses.

My assumption for phase two was that all participants felt comfortable with the interviewing technique in order to give honest responses to the questions. I anticipated that the majority of the participants indicated that using the device in the instruction benefitted students as well as themselves. I anticipated most of the challenges they encountered would be technical in manner as those are the complications I have encountered as a power user of the device.

Being a consumer and regular power user of several devices by Apple (iPod, iPhone and iPad), there are some biases that I bring to the study. In my current instructional coaching position I work with iPads on a daily basis which includes training teachers at the elementary level. By using the device on a regular basis and being familiar with the functionality, I prefer this device to others. Additionally, being an educator for over 14 years, I am familiar with the challenges that teachers face and the factors that impact student achievement.

Significance of the Study

With the amount of money that is being spent on mobile technology by districts across the nation and the lack of research on the impact this device has on instruction, this study is needed to determine the factors which teachers value most in applications, which affects their selection and use. Additionally, teacher and student affordances and challenges from the teachers' perspective are needed to inform future use of mobile learning in K-12 schools. This study has implications not only for teachers who use mobile applications in their classrooms but also for companies who are developing educational applications for instruction.

Organization of the Study

This study is organized in five chapters beginning with a review of related literature in chapter 2. This chapter begins with a description of the national push for the application of advanced technologies to improve student learning. A description of the development of mobile learning using various devices follows with a focus on the iPad and mobile applications. Recent literature about the use of the device in instruction along with a list of local pilot programs is

provided. The chapter concludes with a detailed explanation of the theoretical framework which drives the study.

In Chapter 3, the methodology of both phases of the study is presented. The quantitative and qualitative instruments of measure are described along with the sampling procedures. The participant demographic information is described in detail and presented in a table. The analysis and synthesis of both phases of the study is presented along with issues of validity and limitations of the study. Limitations are also included in this chapter.

Chapter 4 presents the results of both phases of the study through the predictors of the Technology Acceptance Model (TAM). Results are organized around ease of use and perceived usefulness through quantitative statistical tests and qualitative participants' responses. Student and teacher affordances and challenges of using the device in instruction are embedded within these results.

The dissertation ends with chapter 5, which presents a discussion of how the results of the study extend the TAM model to include mobile applications and technology. The chapter ends with recommendations for teachers, school districts and mobile application developers as well as recommendations for future research.

Chapter 2: Literature Review

This review of literature begins with an overview of the national push for the improvement of student learning through the application of advanced technologies. Literature about the development of mobile learning along with a definition of mobile learning, description of the iPad device and mobile applications are provided. Recent research of the use of iPads in instruction along with iPad pilot programs in Texas school districts are presented to identify the knowledge that is currently developing in this field. This section ends with an explanation of the theoretical framework followed throughout the study.

National Educational Technology Plan

Studies conducted by the US Department of Education have determined that technology can help improve students' education by differentiating instruction to meet student diverse and unique educational needs as well as by engaging students in new ways of learning (US Department of Education, "National Study," 2004, as cited in Al-Bataineh, Anderson, Toledo, & Wellinski, 2008). The global focus on creating 21st century learners who are technology literate is clearly stated in the national plan.

President Obama's vision of leading the nation by increasing college completion rates by the year 2020 brought rise to the National Education Technology Plan (NETP), Transforming American Education: Learning Powered by Technology, presented in November 2010 by Arne Duncan, the current U.S Secretary of Education. The plan, developed by the Department of Education's Office of Educational Technology, calls for improvement of student learning by applying advanced technologies (most often used in our personal and professional lives) to our education system. The plan, which gives recommendations for states, districts, the federal government, and other stakeholders, includes the following components: learning, assessment, teaching, infrastructure, and productivity (National Education Technology Plan, 2010, Executive Summary). Goal 1.3 indicates that districts should develop and implement "learning resources that exploit the flexibility and power of technology to reach all learners anytime and anywhere"

(p.14). This includes the use of mobile devices in instruction which would provide learning opportunities to all students including those with disabilities and those who are gifted and talented.

Development of Mobile Technology

The addition of new technologies has created a shift in digital learning and the effect they have on learning in the classroom. Distance learning has changed as evident in its evolution which is characterized as a paradigm shift from "d-learning (distance) to e-learning (electronic); and from e-learning to m-learning (mobile)" (Guy, 2009, p. 79). Though there is a shift toward mobile learning, distance and electronic learning are still being utilized. There are various definitions of mobile learning that have been proposed, depending on whether the focus is on the mobile or the learning part of the term. For the purposes of this study, I will use the following definition where mobile learning involves "any sort of learning that happens when a learner is not at a fixed, predetermined location, or learning that happens when a learner takes advantage of learning opportunities offered by mobile technologies" (O'Malley et al, 2003, p.6).

The increase in m-learning in the classroom is evident in classrooms across the nation as new technologies, such as mobile phones and tablets, are readily accessible. Keskin and Metcalf (2011) stated that there is increased interest in mobile learning because the devices are "portable, ubiquitous, easily accessible and used by many people" (p.6). These innovative technologies have the potential to "fundamentally change the ways that learning and teaching are carried out, greatly favoring constructivist and collaborative approaches to learning, and flexible and adaptive approaches to teaching" (Manuguerra, 2011, p.61). Results from Virginia State's Beyond Textbooks initiative demonstrated that "most students at all grade levels showed an increased interest in learning when using mobile learning devices" (Virginia Department of Education, 2011, p.5) and credited the interactivity of the e-book on the device as the reason for their increased engagement with the material.

Mobile Learning

At its start, the focus of m-learning was on the delivery of material by mobile devices such as mobile phones, PDAs, digital audio players, digital cameras, voice recorders, pen scanners, etc. (Keskin & Metcalf, 2011). Since the increase of m-learning, there have been a large number of studies using these different devices with a variety of users (most from higher education). According to Wu et al. (2012), studies on mobile learning (which greatly expanded between 2006 and 2010) include research on the effectiveness of mobile learning and/or the design of mobile learning systems. A summary of the literature on the effectiveness and attitudes towards mobile learning follows.

Most studies on the effectiveness of mobile learning found positive outcomes. For example, a longitudinal study involving 800 university students conducted by Vogel, Kennedy & Kwok (2009) focused on the use of applications on mobile devices such as PDA and mobile phones. This study found that students who downloaded Tatoes, a quiz application, scored significantly higher on the midterm exam than students that didn't participate.

Several studies have explored users' attitudes toward mobile learning as in a study of 152 university students who completed a questionnaire on their attitudes of operating skills and a mobile PDA learning system. Liaw, Hatala & Huang (2010) found that user satisfaction with the m-learning system resulted positively in the acceptance of that system. Similarly, a study of 186 higher education students' attitudes and perceptions towards the effectiveness of mobile learning was conducted. Al-Fahad (2009) found that, when using their cellphones as mobile devices, students strongly agreed that mobile learning is an effective method of learning because of the flexibility and the immediate support it can provide. Participants also indicated that mobile learning will improve communication between the teacher and student.

Apple IPad

The Apple iPad tablet, referred to as a "post-PC devices or PPDs" by Murphy (2011), is equipped with a high resolution 9 by 7inch multi-touch screen and weighs less than 2 lbs. The

user is able to manipulate the screen in various ways (pinch, stretch and flick). It includes a 5 megapixel camera which records HD video, a photo manager and a front facing camera which can be used for face time. It has a built in microphone and speaker with a virtual keyboard for inputting text. Additional functions include GPS with a maps application, notes application and a 10 hour battery life (Murray & Olcese, 2011). With the first version being released in 2010, this mobile device represents an emerging new technology in the classroom.

Mobile Applications

A software application, referred to as an "app", is designed to run on a mobile operating system which powers mobile devices. They are available, either free or for purchase, from an application store and are immediately downloaded to the mobile device. Applications can work on multiple devices within the same account, such as on the iPad, iPhone and iPad. There are some applications that are designed specifically to work on one device.

Apple's iOS mobile operation system, which powers all generations of iPads, offers applications through the Apple App Store. As of March 2015, there were 1.5 million free and paid applications made for all Apple products (including iPhones and iPods), according to App Annie, an application analytics website. Of those applications about 158,000 are categorized as educational applications according to pocketgamer.biz. In September 2014, educational applications were ranked second with a 10% share with the category of games ranking 20% of the share in that month (statista.com). In the October 2014 quarterly report, Apple reported that app downloads were topped at75 billion (Maestri, 2014).

IPads Pilot Programs

In education, the iPad remains the tablet of choice with 94% share of the U.S. education tablet market (Koetsier, 2013) as districts are rushing to join the newest technology trend of purchasing these devices for their classrooms and students. Philip Schiller, Apple's senior vice president of Worldwide Marketing, states "with 1.5 million iPads already in use in education institutions in the United States, including over 1,000 one-to-one deployments, (the) iPad is

rapidly being adopted by schools across the US and around the world" (Apple Press Info, 2012). Apple has sold a total of 4.5 million iPads direct to U.S. education institutions which is double the number sold in 2012 (Kahn, 2013). The increase is due, in part, to the drop in price and discounts given to educational institutes. This brings the total of iPads sold directly into educational institutions to about 8 million worldwide. As of November 2013, there were a total of at least 26 school districts in Texas who have bought a combined 81,000 iPads for education (Michaels, 2013). The uses of these iPads range from replacing textbooks with digital versions to interactive classroom lessons. Below are iPad pilot programs currently taking place in Texas public schools.

The McAllen Independent School District, located in a largely poor region on the Texas and Mexico border, implemented the Transforming Learning in the Classroom, Campus and Community (TLC 3) project which fitted approximately 27,000 students and teachers with iPads and iPod Touches. The purchase of approximately 20 million dollars was "the largest yet of public school districts in Texas — likely one of the largest in the nation" (Brezosky, 2012, p.1).

The Cotulla Independent School District, a predominately Hispanic district located between Laredo and San Antonio, outfitted all 1,300 of its students with new iPads. The goal was to begin a project-based learning program where students would use educational apps on their iPads as lessons. Mrs. Ochoa, a teacher at the district commented that by using the iPads, her students were "more engaged and excited to be wired in, and they've even taught her a few things about iPads and apps" (Jervis, 2014).

Locally, the El Paso Independent School District spent $2.8 million of their grant funds toward the purchase of 7,200 iPads for 39 campuses for the 2013-2014 school years. The campuses were chosen by their socio-economic status, at-risk factors and standardized test results according to EPISD. Joseph Lopez, EPISD's associate superintendent of curriculum and instruction stated "(iPads) have been proven successful in terms of design, with longevity of about eight years. They're very versatile and flexible. There are so many applications in terms of teaching and learning" (Kappes, 2012).

IPads in Education

Emerging literature in mobile learning includes exploring the effectiveness of the iPad in supporting various academic settings with various users. Many studies have investigated the use of the device opposed to traditional teaching methods such as worksheets, as well as student engagement. An overview of such studies is detailed below.

Hutchinson, Beschorner & Schmidt-Crawford (2012) explored the effectiveness of the iPad to support and enhance literacy instruction. The study followed a teacher who integrated the device into her literacy instruction daily for three weeks. Although the teacher was not familiar with the iPad prior to the study, she was able to meet her literacy goals by using the device, achieving curricular integration. As a result, students were highly engaged and demonstrated creative ways to respond to text. The researchers included a list of considerations for teachers who want to integrate iPads into literacy instruction. This list included easy differentiation of assignments because of a wide variety of applications, students working together to solve problems that arose and information that could be displayed in different languages.

Neely, Rispoli, Camargo, Davis & Boles (2013) also found higher student engagement when two students with autism used handwriting and flash card applications on the iPad to complete academic demands. The sound on the application was turned down and no praise or reinforcement was provided. The researchers compared this with traditional academic demands and found that the participants demonstrated no challenging behaviors when using the activities on the iPad. Additionally, an increase in academic responses was noted.

Haydon, et al (2012) compared the results of the effects of a worksheet and iPad on math fluency and engagement in a high school math class with students with emotional disturbance (ED). The three students in the study answered more math problems correctly in less time with higher levels of engagement while using the iPad compared to completing the worksheet. One explanation of the students' active learning was the ability of the iPad to provide corrective and immediate feedback to the student. The app provided scores at each session informing students

of their progress. This allowed students more effective practice resulting in higher rates of success. Students were excited to use the iPads and demonstrated more concentration and less frustration when using the device. Additionally, the teacher states that the iPads were easy to implement and they would be using them in the future.

Another study on the use of iPads in Math by Risconscente (2013) was conducted with fourth graders in the concept of fractions. The study found that when exposed to an application called Motion Math daily for a week, students demonstrated an improvement in fractions knowledge with an increase in fraction self-efficacy. As with the study mentioned above, a possible factor to the improvement was the instant feedback and scaffolding from the game. The participants were presented with a large amount of fraction practice and, since the game was engaging, it created motivation and persistence to complete the large amount of problems.

Overall, researchers found the use of iPads in instruction effective through the inclusion of immediate feedback and demonstrated an improvement in engagement but there is still a lack of understanding of what teachers perceive as effective and useful.

High Access and Low Use

Despite the few studies listed above, there is still little research detailing the actual use of mobile devices in instruction and much less indicated the effectiveness of its use. It was well documented that the number of iPads in education is growing across the nation, but according to Warschauer & Matuchaniak (2010) "access alone will not overcome inequity in use and outcomes. A critical step toward that end will be transforming teaching and learning in schools" (p.215). These researchers found that schools with one-to-one laptop initiatives resulted in positive outcomes when learning objectives were clearly defined. With issues of high access and low use, as stated by Cuban, Kirkpatrick & Peck (2001), it is important to determine the factors that impact teachers' acceptance of mobile applications and mobile devices in instruction so their use is increased.

Theoretical Framework

The Technology Acceptance Model (TAM), based on Ajzen and Fishbein's 1980 Theory of Reasoned Action (TRA) and first proposed by Davis in 1986, seeks to explain the determinants of computer acceptance which explains user behavior through two main predictors: perceived usefulness and perceived ease of use (Davis, Bagozzi & Warshaw, 1989). Davis (1989) stated that people will choose to use, or not use, a technology depending on whether they believe it will help them. Furthermore, even if users believe that the technology is useful, they may believe the system or device is too hard to use and that the benefits of using the technology outweighs the effort. According to Davis (1989), perceived usefulness is defined as "the degree to which a person believes that using a particular system would enhance his or her job performance" (p.320). Ease of use is defined as "the degree to which a person believes that using a particular system will be free of effort" (p.320).

These two factors impact a user's attitude and behavior toward actual use of a certain technology. According to the model (Davis, Bagozzi & Warshaw, 1989), as shown in the figure 2.1 below, the two factors are represented as separate constructs which allow the researcher to "trace the influence of external variables, such as system features, user characteristics and the like, on ultimate behavior" (Davis, Bagozzi & Warshaw, 1989 p.988). Attitude is determined jointly by perceived usefulness and ease of use because a user's attitude toward a particular technology is determined by the beliefs presented in two factors. Additionally, perceived usefulness has a direct effect on behavioral intention to use which is over and above attitude because users will be more likely to use (or intend to use) a technology if they believe it will enhance their performance despite their overall attitude toward the technology.

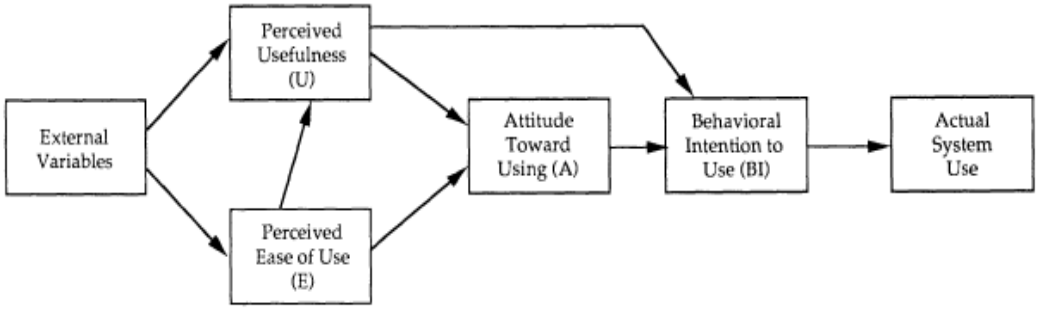

Figure 2.1: Technology Acceptance Model (TAM) (Davis, Bagozzi & Warshaw, 1989)

In this study, TAM is used to explore the factors affecting user acceptance of mobile learning applications in educational settings. Perceived ease of use is defined as the degree to which a user believes that using mobile applications and the iPad device would be free of effort. Perceived usefulness is defined as the degree to which a user believes that using mobile applications and the iPad device in instruction would enhance his or her performance or the performance of his or her students.

The original TAM model was expanded to include the determinants of subjective norm and computer self-efficacy which explores teacher acceptance of digital technology (Yuen & Ma, 2008). Subjective norm, proposed by Ajen and Fishbein in 1980, is the users' perception that people important to him/her think he/she should or should or should not perform the behavior. In other words, the more others who are important to the user (e.g., an administrator) think he or she should perform the behavior, the more he/she will intend to do so. Computer self-efficacy, proposed by Venkatesh and Davis in 1996, is defined as "the judgment of one's capability to use computer technology" (Yuen & Ma, 2008 p.233), which acts as a determinant of perceived ease of use. The level of confidence that a user has regarding his or her ability to perform certain tasks using the technology affects their acceptance of that technology.

While the TAM model is found in hundreds of studies, it is only in recent literature that studies focus on the use of the model to determine the acceptance of digital technologies in educational contexts.

Pynoo et al (2010) examined the factors that contributed to 90 Belgium secondary school teachers' acceptance of a digital learning environment called Smart school in which teachers set up learning paths, created exercises and communicated with their students. It was found that the teachers had a positive attitude toward Smart school because it was useful and easy to use and they reported that they would use it more because their administrators expected them to use it.

Similarly, in a survey among 239 pre service teachers in Singapore, Teo (2010) studied the teachers' attitudes toward computer use by looking at the environmental and technical variables. Analysis of the TAM model showed that perceived usefulness and perceived ease of use were the key determinants, with a direct significant effect, on the teachers' attitude toward computer use. The external factors of subjective norm, facilitating conditions and technological complexity were also significant in predicting use.

A national project STEEL (systems enabling technologies and methods for online learning) was studied by Perisco, Manca & Pozzi (2014) on 8 teachers in an Italian online university from 2007 to 2011. The researchers found the activities within the e-learning system concerned with instructional design courses were considered relatively easy to preform and quite useful to teachers. They proposed a three-dimensional model (phases of use, users and components) as an extension of TAM.

Similarly, Cuhadar (2014) studied 8 pre-service teachers' acceptance of tablet PCs on personal, instructional and technical grounds in Turkey. He found that perceived usefulness and ease of use concerning tablet PCs had positive impact on acceptance. Portability, wireless access and multimedia were factors that had direct effects on both determinants. Additionally, the teachers' openness to innovation and interest toward new technology, to acquire professional experience, directly affected their perception of usefulness toward the tablet PC.

Yuen & Ma (2008) surveyed 152 pre-service teachers in a part-time postgraduate educational program in Hong Kong. They examined the teachers' technology use and acceptance toward an online learning platform. They found that subjective norm and computer self-efficacy were significant perception anchors in the TAM model. Perceived ease of use was

found significant and was the sole determinant in predicting future use of e-learning, whereas perceived usefulness was non-significant.

Although TAM has been widely used across many studies to test the acceptance of digital technologies, there is "wide variation in the predicted effects in various studies with different types of users and systems" (King & Hu, 2006 p.740). Despite the various research on the TAM model to describe teachers' use of technology (even in e-learning), few researchers have extended the model to understand the acceptance of mobile technologies by teachers. My study will contribute to the field by applying the TAM model in studying teachers' acceptance of mobile technology in a border town in Texas where the population is quite different from the studies already conducted. Additionally, my study focuses on teacher acceptance of a specific mobile technology, the iPad device in elementary and middle school instruction.

Conclusion

With the growing number of school districts purchasing mobile technology for their students and teachers, as illustrated in this chapter, there is a need to explore the factors that impact a teachers' acceptance of the new technology. By exploring the factors of perceived usefulness and ease of use of mobile applications through the TAM model, this study captures the teachers' perspective. Additionally, this study adds to the emerging literature on mobile technologies with a specific population.

Chapter 3: Research Methodology

The purpose of this study was to determine the factors teachers find important in the selection of mobile applications for use in instruction and how those factors impact their acceptance of new technology. Additionally, this study identified teacher and student affordances and challenges in using the device in instruction.

Introduction

This chapter describes the methodology I employed for both phases in the study. I conducted the study through a sequential mixed methods approach utilizing both quantitative and qualitative methodology to identify the factors that impact the selection and use of iPad applications as proposed. This section focused on the quantitative and qualitative instruments of measure, sampling procedures and the issue of validity. A description of the participant demographic data including the sample population was included. A detailed explanation of the methods I utilized in the analysis and synthesis of the results was also included. This chapter will end with the issues of validity of my study.

Research Design

In order to thoroughly understand how teachers select iPad applications for instruction and the factors that affect their acceptance and use of the device, I employed a mixed methods (MM) where "the investigator collects and analyzes data, integrates the findings, and draws inference using both qualitative and quantitative approaches or methods in a single study or program of inquiry" (Tashakkori & Creswell, 2007 p.4). Specifically, I employed a sequential mixed design where procedures in the qualitative phase of the study are dependent on the results in the quantitative of the studies (Teddlie & Tashakkori, 2009 p.27). The results from the participants in the first phase informed participation in the second phase. Additionally, the findings in the second phase further explained the predictors of acceptance indicated in the first phase through the affordances and challenges experienced by the students and teachers. This

approach allows for multiple data-collection methods (both quantitative and qualitative) which will contribute to the trustworthiness of the study and triangulation of the data.

Quantitative Participant Data

The phase one survey (Appendix A) was sent through Survey Monkey, a web based Survey Company, to all math and science middle school and high school teachers in the Yellow Rose Independent School District. This included a total of 342 participants from 11 middle schools and 7 high schools. When the response rate was low, I expanded the survey to include all English and technology teachers from the same middle and high schools which added an additional 205 participants for a total of 547. After receiving only 20 total responses, I expanded to the Sunshine Independent School District by sending the survey to a total of 178 teachers from three elementary schools for a grand total of 725 teachers. The participants were chosen by convenience sampling where a researcher "selects a sample that suits the purposes of the study and that is convenient" (Gall, Gall & Borg, 2007, p.175). Due to the low response rate, all participants who took the survey were included in the study.

The sample in phase one, as demonstrated in table 3.1, is represented by a total of 70 participants with 56 (80%) females and 14 (20%) males. The teachers were from 7 middle schools and 7 high schools from the Yellow Rose Independent School District and from three elementary schools in the Sunshine Independent School District. There were a total of 44 (63%) elementary teachers from both districts while 10 (14%) were middle school teachers and 16 (23%) were from high schools. Most of the participants, 29 (42%) have been teaching for fifteen years or more with only 6 (8 %) having taught less than three years. Sixteen teachers (23%) have been teaching for seven to nine years. The majority of the participants 53 (75%) teach math, with 43 (61%) teaching science, followed by 41 (59%) teaching English language arts, 34 (49%) teaching social studies, with 12 (17%) being special education teachers and a total of 4 (5%) participants teaching other subjects such as technology and physical education. Participants were asked to select all the subject areas they taught which is included in the data.

Table 3.1: Phase One Participant Demographics

Measure	Items	Percent	Population
Gender	Female	80%	56
	Male	20%	14
			70
Grade Level	Elementary school	63%	44
	Middle school	23%	10
	High school	14%	16
Teaching Experience	0-3 years	8%	6
	4-6 years	10%	7
	7-9 years	23%	16
	10-12 years	4%	3
	13-15 years	13%	9
	More than 15 years	42%	29
Subject Area	Math	75%	53
	Science	61%	43
	English Language Arts (ELAR)	59%	41
	Social Studies	49%	34
	SPED	17%	12
	Other	5%	4

Quantitative Instrument and Data Collection

The quantitative phase (phase one) of the study began with the development of an online survey which included fifteen criteria or factors used in the selection of mobile applications that participants would rate. These factors were adapted from a rubric developed from Harry Walker (2010), for use in an iPod pilot program, which contains six domains with corresponding criteria and ratings of 1 to 4. This rubric was chosen because it is widely used by schools, universities and organizations in eight countries and 26 states (Walker, 2010). The rubric has since been revised by Kathy Schrock and Tony Vincent. The factors in the survey fit within four broad categories which are shown in table 3.2 and detailed below.

The curriculum category includes criteria related to age appropriateness, alignment, vocabulary, critical thinking, and assessment. These factors show how well the application is matched to the level of the skills and vocabulary listed in the state standards for that particular grade level, as well as the level of critical thinking (as determined by Bloom's Taxonomy) and

an assessment that is aligned. Additionally, this category contains accuracy which takes the source of the application into consideration. The interaction category includes the factor of student interaction which indicates whether the user is able to manipulate the data in the application. The support category includes immediate feedback and self-correction which indicates if the application provides an explanation of why the answer selected is incorrect and the criteria of self-correction where the application offers support for the user to self-correct as they work. This category also includes teacher support where the application provides background content knowledge for the teacher. The last category, usability, includes ease of use which indicates if the application provides clear directions that are easy to follow, visual and audio ease which indicate that the information in the application is easy to view and hear. Additionally, this category includes visual distractibility and audio distractibility which states that the application does not have any visual or audio elements that distracts from the task.

Table 3.2: Categories of Factors from Phase One Survey

Curriculum	Interaction	Support	Usability
• Age Appropriateness • Alignment • Vocabulary • Critical thinking • Assessment	• Student interaction	• Immediate feedback • Self-correction • Teacher support	• Ease of use • Audio ease • Visual ease • Audio distractibility • Visual distractibility

The criteria I utilized roughly align with the domains proposed by Walker with the exception of the domains of authenticity and differentiation, which are not included in my criteria. I chose not to include the criterion of authenticity because it excludes the use of games to practice skills and I did not want to limit the reporting of this feature. Additionally, the criterion of differentiation was not included because choosing an application based on the factor of age appropriateness (developmentally appropriate) would ensure the skills and vocabulary were at the students level so the differentiation would be done during the selection of the application rather than a feature of the application. The criteria I used, however, include several

factors per category where Walkers' rubric only has one factor per domain for a total of six. Together, these factors capture how effective the application will be when used in a learning environment.

Several items in the phase one survey align to the factors in the TAM model. As seen in table 2.1 below, survey question number 10, about teacher support, determines whether the application provides background knowledge for teachers which align with perceived usefulness where a user believes that the technology will enhance their job performance. Survey question 11, about ease of use, determines whether the application provides clear instructions that are easy to follow which aligns with ease of use where users believe that a particular technology will be free of effort. Questions 12 and 13, on visual and audio ease, determine whether the application is easy to view and hear which also aligns with ease of use. Similarly, questions 14 and 15, on visual and audio distractibility, determine whether the application has any visual or audio elements that distract from the task which is also linked to ease of use.

Table 3.3: Phase One Survey Questions on Perceived Usefulness and Ease of Use

Number	Survey question	Survey Category	Study Category
10	The application provides background content knowledge for teachers	Teacher support	Perceived usefulness
11	The application provides very clear instructions that are easy to follow	Ease of use	Ease of use
12	The information in the application is easy to follow	Visual Ease	Ease of use
13	The information in the application is easy to hear	Audio Ease	Ease of use
14	The application does not have any visual elements which distract from the task	Visual Distractibility	Ease of use
15	The application does not have any audio elements which distract from the task	Audio Distractibility	Ease of use

Teachers used a 5 point Likert scale (which includes the following five responses: 4-extremely important, 3-very important, 2-moderatly important, 1-slightly important, and 0-not at all important) to indicate which criterion they deem important when selecting applications. A Likert scale is a well-known scale and was chosen because it involves a matrix of choices which

shows their agreement or disagreement toward each factor. The survey concluded with four demographic questions which included information about the participants' gender, years of teaching, subjects and grade levels they teach. Two additional questions captured how long and how often the participant had been using the iPad in the classroom which determined participation in the second phase of the study. The survey ended with two open ended questions about the applications the participants were currently using and any other criteria they think was important when selecting applications. Following Lietz's (2010) questionnaire design, I ensured the survey questions were simple, specific and include common terminology. I also considered the flow of questions to ensure they followed a logical and orderly manner.

Quantitative Data Analysis

All phase one data collected from Survey Monkey were downloaded and entered into SPSS for data analysis. First, descriptive statistics were run to determine the percentages of demographic information such as gender, number of years teaching, number of years using the device and number of times a week the device is used for instruction. Then, the mean of occurrence of each factor was calculated to determine the factors that teachers rated most important and least important. A comparison between the factors with the highest means and the predictors of ease of use and perceived usefulness was made.

Several T tests were run to compare the results of the factors of ease of use and perceived usefulness between different participant groups. As part of the independent t tests, an assumption of homogeneity of variance was used because the participants were "selected from a single population and then randomly assigned to two treatment groups" (Hinkle, Wiersma & Jurs, 2003, p.237). The participants were selected from the population of all teachers and the groups they were randomly assigned to depend on the level they teach, the number of years they have been teaching and/or frequency of using the device. The Levene test for equality of variances was used to test the assumption of homogeneity of variances. This test, originally

developed by Howard Levene in 1960, uses an F value and looks for significance less or more than .05.

Additional simple analysis of variance (ANOVA) tests were run to test the "difference between the means of more than two groups on one factor or dimension" (Salkind, 2011, p.225). Groups of participants, such as those who have been using the device for less than a year and those who have been using the device for three years or more, were compared to the factors of ease of use and perceived usefulness. Both tests utilized degrees of freedom which depend on the number of sample observations.

Qualitative Participant Data

Demographic information from the phase one survey determined the participants who participated in the second phase. These were the participants who indicated they used the device two to three times a week, three to four times a week or daily, which was a total of 17 participants (7 from Yellow Rose ISD and 10 from Sunshine ISD). After obtaining a low response rate of 9 participants (2 from Yellow Rose ISD and 7 from Sunshine ISD), I revisited the data and added participants who indicated they used the device one to two times a week which resulted in an additional 17 participants (4 from Yellow Rose ISD and 13 from Sunshine ISD). Two participants who indicated they used the device less than one time a week and three participants who didn't take the phase one survey were included.

The sample in phase two, as demonstrated in table 3.3, was represented by a total of 20 participants with 17 (85%) females and 3 (15%) males. The teachers were from two middle schools in Yellow Rose ISD and three elementary schools in Sunshine ISD. This included 12 participants from one elementary school, four from a different elementary school and two from yet another elementary school in the Sunshine district. It also included two participants from two different middle schools in the Yellow Rose district. Elementary teachers from both districts represented 18 (90%) of the population while 2 (10%) were middle school teachers. The majority of participants 6 (30%) have been teaching for more than fifteen years with only 1 (5%)

participant who has been teaching less than three years and 1 (5%) participant who has been teaching between ten and twelve years. Five teachers (25%) have been teaching between seven to nine years, followed by two (10%) who have taught between four and six years and two (10%) who have been teaching between thirteen and fifteen years. There were 3 participants that were missing data for how long they have been teaching because they didn't participate in the first survey, so that data was not collected. A variety of grade levels were represented, as seen in table 4.2, including SPED and GT populations. The most participants 4 (20%) were represented by second grade teachers.

Table 3.4: Phase Two Participant Demographics

Measure	**Items**	**Percent**	**Population**
Gender	Female	85%	17
	Male	15%	3
			20
Level	Elementary school	90%	18
	Middle school	10%	2
Teaching Experience	0-3 years	5%	1
	4-6 years	10%	2
	7-9 years	25%	5
	10-12 years	5%	1
	13-15 years	10%	2
	More than 15 years	30%	6
Grade	Pre-Kindergarten	5%	1
	Kindergarten	10%	2
	1st Grade	5%	1
	2nd Grade	20%	4
	3rd Grade	5%	1
	4th Grade	15%	3
	5th Grade	10%	2
	7th Grade	10%	2
	SPED	15%	3
	GT	5%	1

The demographic information obtained during interviews, and shown in figure 3.1, indicated that 6 participants have been using the iPad for four years, 5 have used it for three years, 4 have used it for two years and a total of 5 participants have been using the device for less than one year.

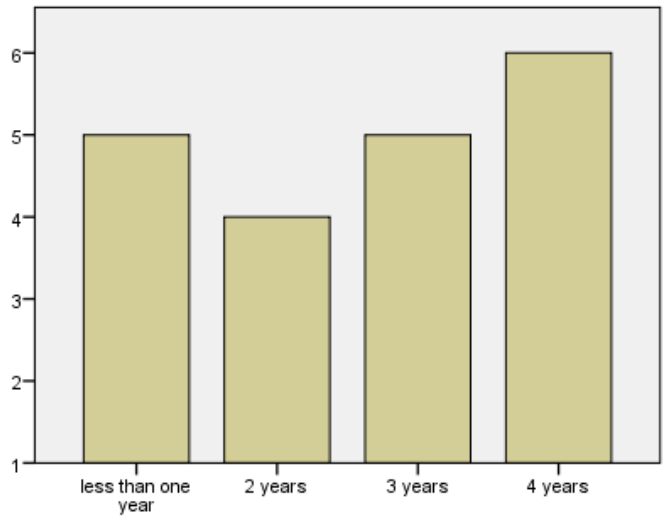

Figure 3.1: Phase Two: Time using the Device

In terms of frequency of use, as shown in figure 3.2, 7 participants indicated they used the device daily in their instruction, 5 used the device three to four times a week in instruction, 3 used it twice a week in instruction and a total of 5 participants used the device once a week in their instruction. Most participants (9) only had one iPad which included a total of three personal devices being used in the classroom.

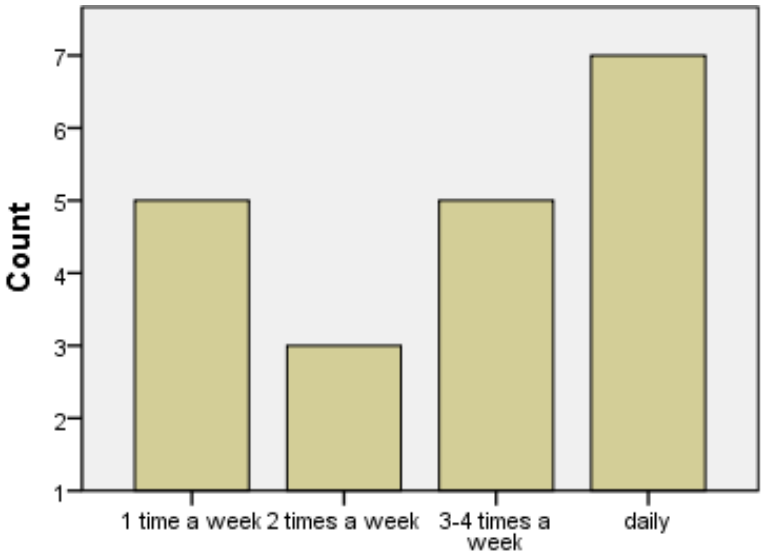

Figure 3.2: Phase Two: Frequency of Use in Instruction

The majority of teachers (9) only had one iPad for use in their classrooms with a total of 2 teachers which had two iPads, 2 teachers which had three iPads and 3 teachers who had four iPads. A total of 4 teachers indicated that they had access to 15-30 iPads through a check-out system at their campus. Those teachers indicated that they checked out the devices at least once a month or more depending on how they were using the device. Several teachers reported that they used their own personal device, which in some cases was the only device available to them.

Qualitative Instrument and Data Collection

The second phase of the study included an interview with the participants who indicated they use the iPad most frequently as determined by question #21 in the phase one survey. The interviews followed a semi-structured interview format where a set of predetermined and structured questions are asked while "probing more deeply with open-ended questions to obtain additional information' (Gall, Gall & Borg, 2007, p.246). Probing questions were used to clarify answers, extend or elaborate topics to add to the depth of the response and to obtain a range of responses (Cohen, Manion & Morrison, 2007).

Interview questions (Appendix B) were carefully constructed around the affordances and challenges of teachers and students using the device in instruction, while following the question stems presented by Cuhadar, (2014, p.745). The interview began with basic questions to obtain how long and often the participant had been using iPads in the classroom. I asked how many devices they currently have and how they are using them. Questions about their most successful experience and benefits of the device for them and their students informed me of the affordances of using the device in instruction. Similarly, questions about their worst experience and the challenges they and their students face while using the device informed me of the challenges. Additional questions on the factors that motivate students and the types of students who benefit from using the device captured the features that motivate and engage students.

A small scale pilot study with a two participants with similar backgrounds was completed in order to minimize bias. A set of predetermined interview questions were asked to determine

wording, sequence of questions and to test the recording methods. As a result, questions about how long the participant had been using the device and how many devices they have were added to the beginning of the interview. Additionally, two questions about benefits to the teacher and student were re-worded and a question asking if they would like to add anything else to the interview was added at the end.

All interviews took place at the participants' school with the exception of five interviews which were done via email. Interviews were held between December 2014 and February 2015 with a total interview time for 15 participants of 2 hours and 45 minutes. Interview time was not documented for those interviews that took place over email (5 interviews). Audio from the interviews were recorded and transcribed into individual Word documents. Participants' names were replaced with sequential numbers (and later with pseudonyms), in the order they were recorded, to preserve the participants' anonymity. For ease of counting the frequency of codes, each transcript was transferred into a separate worksheet on an Excel document.

Qualitative Data Analysis

The transcripts were first analyzed line by line and initial ideas were written in the margins. Following the analytic process of grounded theory, I began the open coding process where a researcher would "classify like with like and separate out that which we perceive as dissimilar" (Strauss & Corbin, 1998, p.105). A code system was generated which consisted of the letters of the alphabet followed by a number (e.g.A1). When I came across an idea that was identified as having a common characteristic with other codes, it was included in numerical order under that letter (e.g.A2, A3). As a result of open coding, I identified a total of fifteen categories which were roughly aligned with each interview question. After calculating the frequency of occurrence of the codes, codes with low numbers were carefully analyzed and added to existing codes or excluded if they were not relevant. A separate worksheet for each category was created which included the participants' number with their transcript which was related to that category. Analysis within each category resulted in several subcategories which provided clarification for

the category. Through axial or selective coding, I began to reassemble my categories based on common relationships within the subcategories. This stage is termed axial because "coding occurs around the axis of a category, linking categories at the level of properties and dimensions" (Strauss & Corbin, 1998, p.123).

Research Validity

The issue of research validity was confronted by the use of Institutional Review Board (IRB) approval, data triangulation, and through a clear statement of my research bias. IRB approval for the study through the Mountain University (pseudonym) was granted on December 16, 2013 under number 432640-1. IRB approval through the Yellow Rose Independent School District followed on February 19, 2014 under number 598. Approval through the Sunshine Independent School District was granted later on October 15, 2014 under approval number 160. These approvals were obtained prior to any correspondence with the participants and were secured to ensure their protection. Proper consent from all participants in both phases of the study was secured through an informed consent form (Appendix C), in the form of an invitation email, which was sent to all participants prior to their participation. The consent form provided the purpose, risks and benefits of the study as well as outlined their confidentiality and voluntary participation in both phases of the study. Completion of the phase one survey indicated their consent to participate in the study. Prior to participation in the phase two, participants were sent an additional email which informed them about the second phase of the study and that they could decline to answer a question if they wished. Before each interview, I informed participants that audio from the interview was going to be recorded and that I would use quotes from their interview in my findings but their name, school's name and/or district's name would not be included as to protect their anonymity. Additionally, I considered the risk-benefit ratio which is "the balance between how much risk the participants will be exposed to and how much good is likely to result from the study" (Gall, Gall & Borg, 2007, p. 80).

The use of multiple-data collection methods, including a computer based survey to determine the most important factors in phase one along with interview data regarding the use of the device in phase two added to triangulation of the data. A clear statement and clarification of my researcher's bias informed the use of subjectivity throughout the study.

Limitations of the Study

The small sample size of 70 participants in the first phase and 20 in the second phase from only two school districts in the borderland area may result in constraints on generalizability of the study. Also, I may not have captured all the information in phase two due to the interview setting and limitations on time. Because of the large number of school districts across the nation who are currently utilizing the iPad device in instruction, this study focused solely on this device. There are other mobile technologies that can be investigated by following the same methods presented in this study. Furthermore, since I work with teachers at the elementary level, most of the interviews in the second phase were conducted with teachers from this level due to ease of access and convenience. Because this study was conducted with teachers, the student affordances and challenges of using the device are reported from the teachers' perspective. Additionally, this study did not determine the home use of the device by students or teachers which may impact their ease of use and perceived usefulness.

Conclusion

At a time of increased mobile learning and the surge of iPad devices being used in the classroom, the results of this study are essential in helping educators determine the effective use of the device in classroom instruction. The results from this study will inform teachers, instructional coaches and school districts of the factors that affect teachers' selection of mobile applications for use in their classrooms as well as their acceptance of the device. This will impact teachers' practice and use of the device for student learning. The results can also be used by application design companies so they can use the criteria to improve their design for educational applications.

Chapter 4: Research Results

This chapter will present the findings from both the quantitative and qualitative phases of the study through the predictors of ease of use and perceived usefulness from the TAM model. The quantitative results will be presented through the overall means of the factors teachers indicated were important when selecting applications for instruction. Statistical tests will compare the two predictors with different groups of teachers to examine their acceptance of the device. Next, the qualitative results further explore the predictors through common affordances and challenges experienced by teachers and students when using the device.

Phase One: Quantitative Results

Descriptive analysis was used to determine the number of years the teachers had been using the iPad device in instruction. The results, displayed in figure 4.1, show the largest group were those who have been using the device for less than a year which was 26 (38.8%) with 17 (25.4%) never using the device, 11 (16.4%) teachers using the device one to two years, 8 (11.9%) using the device two to three years and 5 (7.5%) teachers using the device for three years or more.

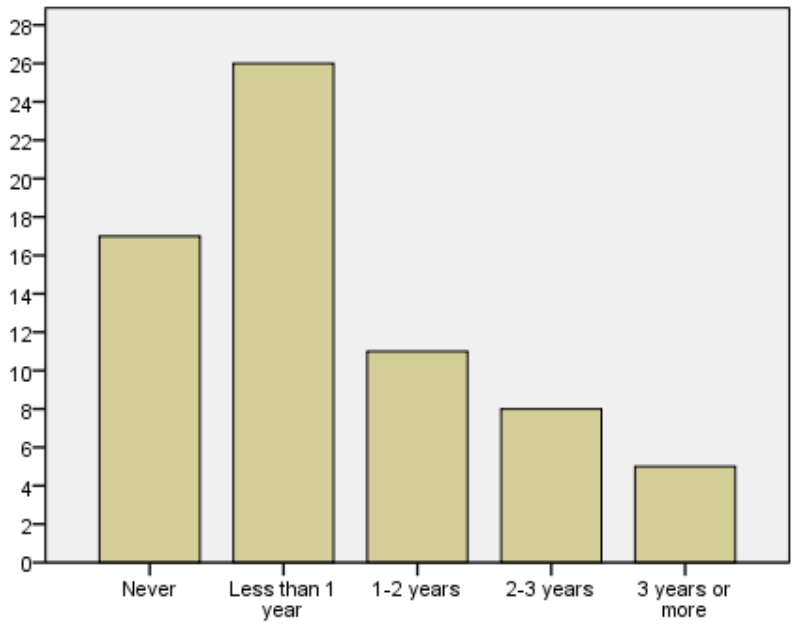

Figure 4.1: Phase One: Time using the Device

Descriptive analysis was also used to calculate how many times a week the teacher used the device in instruction. The largest group, as seen in figure 4.2, were 20 teachers (29.9%) who used the device less than one time a week with 17 (25.4%) who never used the device. This is followed by 13 (18.3%) who used the device one to two times a week, 7 (10.4%) who used the device three to four times a week and 7 (10.4%) who used the device daily. Three teachers (4.5%) used the device two to three times a week. There was a total of 4 missing data pieces for this information.

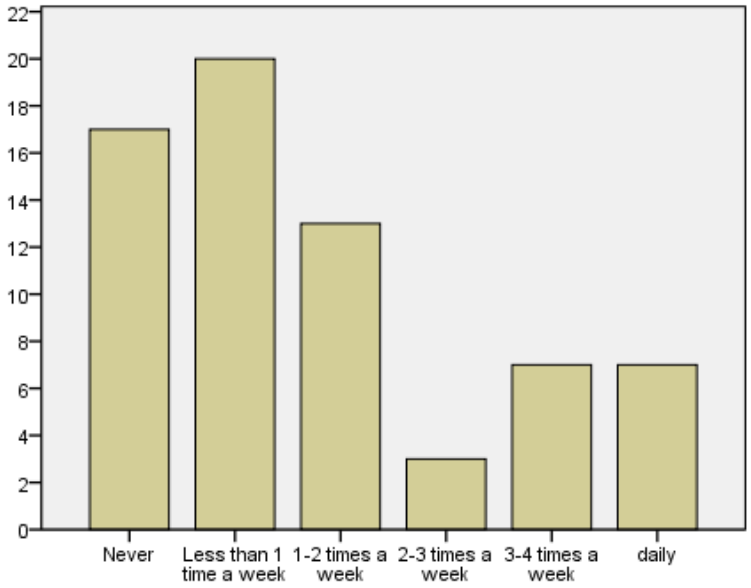

Figure 4.2: Phase One: Frequency of using the Device

The mean of each factor was calculated through SPSS to determine the factors teachers rated most and least important. The results, displayed in table 4.1, show that visual ease had the highest mean of 3.48 which was rated extremely important. Next was ease of use with a mean of 3.47 and audio ease with a mean of 3.46. This is followed by age appropriate and student interaction which have the same mean of 3.33. Next are alignment with a mean of 3.31 and accuracy right behind with a mean of 3.30. Immediate feedback and self-correction had the same mean of 3.29 followed by vocabulary (3.23) and assessment (3.19). Next were critical

thinking (3.16) and teacher support (3.00). The lowest means were visual and audio distractibility with 2.90 and 2.80 respectively.

Table 4.1: Phase One Means

	Mean
Visual ease	3.48
Ease of Use	3.47
Audio ease	3.46
Student Interaction	3.33
Age Appropriate	3.33
Alignment	3.31
Accuracy	3.30
Self Correction	3.29
Immediate Feedback	3.29
Vocabulary	3.23
Assessment	3.19
Critical Thinking	3.16
Teacher support	3.00
Visual Distractibility	2.90
Audio Distractibility	2.80

Phase One Results and the TAM Model

In comparing the data from the phase one survey with the predictors of the TAM model, the top three factors with the highest means validated the construct of ease of use which was defined in this study as the degree to which a user believes that using mobile applications be free of effort. The factor with the highest mean (3.48) was visual ease, as seen in table 4.2 which indicates that the majority 38 (54.2%) teachers felt that it was extremely important that the information in the application was easy to view. The next highest mean (3.47) was ease of use which indicates that the majority 37 (52.8%) teachers felt that it was extremely important that the application provided very clear instructions that were easy to follow. Audio ease followed with a mean of 3.46 showing that the majority 40 (57.1%) teachers felt that it was extremely important that the information in the application was easy to hear. Through their ratings, the majority of

teachers rated these factors the highest which demonstrates these features make using mobile applications free of effort, thus easy to use.

The other two factors related to ease of use, visual distractibility and audio distractibility had the lowest means, 2.90 and 2.80 respectively. This demonstrates that 24 (34.7%) teachers rated visual distractibility or the fact that the application does not have any visual elements which distract from the task as extremely important while 21 (30%) teachers rated audio distractibility or the fact that the application does not have any audio elements which distract from the task as extremely important.

When comparing the data for the construct of perceived usefulness, the survey question about teacher support yielded a mean of 3.00 which was toward the bottom of the hierarchy list of means with only 23 (33.8%) teachers indicating that it was extremely important that the application provide background content knowledge for teachers. In the list of means, this factor fell right above visual distractibility. This aligns with the factor of perceived usefulness where a user believes that the technology will enhance their job performance, which was previously defined.

Table 4.2: Phase One Survey Results on Perceived Usefulness and Ease of Use

Number	Survey question	Category on survey	Category on Study	Mean	Survey Rating
10	The application provides background content knowledge for teachers	Teacher support	Perceived usefulness	3.00	33.8% (23/68)
11	The application provides very clear instructions that are easy to follow	Ease of use	Ease of use	3.47	52.8% (37/70)
12	The information in the application is easy to follow	Visual Ease	Ease of use	3.48	55.0% (63/69)
13	The information in the application is easy to hear	Audio Ease	Ease of use	3.46	57% (40/70)
14	The application does not have any visual elements which distract from the task	Visual Distractibility	Ease of use	2.90	34.7% (24/69)
15	The application does not have any audio elements which distract from the task	Audio Distractibility	Ease of use	2.80	30.0% (21/70)

Independent T Tests of Ease of Use

Several independent t tests were conducted, using SPSS, to explore the factors of ease of use (ease of use, audio ease and visual ease) by comparing the means of two groups. An independent t test was conducted to compare ease of use in beginning teachers (teaching 0-3 years) and veteran teachers (teaching 15 years or more). As seen in table 4.3, there was no significant difference in the scores for beginning or veteran teachers; t (33) =.290, p=.593. An independent t test was conducted to compare audio ease in beginning teachers and veteran teachers. There was no significant difference in the scores for beginning or veteran teachers; t (33) =.010, p=.176. An independent t test was conducted to compare visual ease in beginning and veteran teachers. There was no significant difference in the scores for beginning or veteran teachers; t (33) = .014, p=.151. The results suggest there is no difference between beginning or veteran teachers in terms of ease of use, audio ease or visual ease.

Table 4.3: T Test Comparing Ease of Use with Number of Years Teaching (beginning teachers vs. veteran teachers)

		Levene's Test for Equality of Variances		t-test for Equality of Means		
		F	Sig.	t	df	Sig. (2-tailed)
Ease of Use	Equal variances assumed	1.154	.290	.540	33	.593
	Equal variances not assumed			.619	8.454	.552
Audio ease	Equal variances assumed	7.565	.010	1.384	33	.176
	Equal variances not assumed			2.062	13.865	.059
Visual ease	Equal variances assumed	6.717	.014	1.469	33	.151
	Equal variances not assumed			2.116	12.751	.055

An independent t test was conducted to compare ease of use in elementary teachers and middle school teachers. As seen in table 4.4, there was no significant difference in the scores for elementary or middle school teachers; t (51) = 1.285, p=.205. An independent t test was conducted to compare visual ease in elementary and middle school teachers. There was no significant difference in the scores for these two groups; t (50) = 1.747, p=.087. An independent

t test was conducted to compare audio ease in elementary and middle school teachers. There was a significant difference in these two groups; t (51) = 2.346, p=.023. The results suggest there is no difference between these teachers in terms of ease of use ease of use or visual ease. There was a difference between these groups in terms of audio ease.

Table 4.4: T Test Comparing Ease of Use between Elementary and Middle School Techers

		Levene's Test for Equality of Variances		t-test for Equality of Means		
		F	Sig.	t	df	Sig. (2-tailed)
Ease of Use	Equal variances assumed	.398	.531	1.285	51	.205
	Equal variances not assumed			1.126	11.909	.282
Visual ease	Equal variances assumed	4.817	.033	1.747	50	.087
	Equal variances not assumed			1.320	9.458	.218
Audio ease	Equal variances assumed	3.992	.051	2.346	51	.023
	Equal variances not assumed			1.817	10.895	.097

An independent t test was conducted to compare ease of use in elementary and high school teachers. As seen in table 4.5, there was no significant difference in the scores for elementary and high school teachers; t (55) = 1.571, p= .122. An independent t test was conducted to compare visual ease in elementary and high school teachers. There was no significant difference in the scores for elementary and high school teachers; t (17) = 1.700, p = .107. An independent t test was conducted to compare audio ease in elementary and high school teachers. There was a significant difference in the scores for elementary and high school teachers; t (55) = 2.106, p=.040. The results suggest there is no difference between elementary or high school teachers in terms of ease of use ease of use or visual ease. There was a difference between these groups in terms of audio ease.

Table 4.5: T Test Comparing Ease of Use between Elementary and High School Teachers

		Levene's Test for Equality of Variances		t-test for Equality of Means		
		F	Sig.	t	df	Sig. (2-tailed)
Ease of Use	Equal variances assumed	.003	.956	1.571	55	.122
	Equal variances not assumed			1.485	20.260	.153
Visual ease	Equal variances assumed	4.935	.030	2.071	55	.043
	Equal variances not assumed			1.700	17.019	.107
Audio ease	Equal variances assumed	3.274	.076	2.106	55	.040
	Equal variances not assumed			1.785	17.620	.091

An independent t test was conducted to compare ease of use in low frequency use (using the device less than one time a week) with high frequency use (using the device daily). As seen in table 4.6, there was no significant difference in the scores for low frequency and high frequency use; t (7) = .718, p=.495. An independent t test was conducted to compare audio ease in low and high frequency use. There was no significant difference in the scores for low or high frequency use; t (25) = .792, p = .436. An independent t test was conducted to compare visual ease in low and high frequency use. There was no significant difference in the scores for these two groups; t (24) = .686, p = .499. The results suggest there is no difference between low and high frequency use in terms ease of use, audio or visual ease.

Table 4.6: T Test Comparing Ease of Use with Frequency of Use

		Levene's Test for Equality of Variances		t-test for Equality of Means		
		F	Sig.	t	df	Sig. (2-tailed)
Ease of Use	Equal variances assumed	6.617	.016	.942	25	.355
	Equal variances not assumed			.718	7.355	.495
Audio ease	Equal variances assumed	.878	.358	.792	25	.436
	Equal variances not assumed			.690	8.535	.508
Visual ease	Equal variances assumed	.846	.367	.686	24	.499
	Equal variances not assumed			.602	8.696	.562

An independent t test was conducted to compare ease of use in teachers who just started using the device (less than one year) with those who have been using the device for a couple of years (three years or more). As seen in table 4.7, there was no significant difference in the scores for these two groups; t (29) = -1.090, p=.284. An independent t test was conducted to compare audio ease in teachers who just started using the device and those who have been using the device for a couple of years. There was no significant difference in the scores for these two groups; t (29) = .357, p = .724. An independent t test was conducted to compare visual ease in teachers who just started using the device and those who have been using the device for a couple of years. There was no significant difference in the scores for these two groups; t (28) = -.916, p =.368. The results suggest there is no difference between those who just started using the device and those who have been using the device for a couple of years in terms ease of use, audio or visual ease.

Table 4.7: T Test Comparing Ease of Use with Time of Using the Device

		Levene's Test for Equality of Variances		t-test for Equality of Means			
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference
Ease of Use	Equal variances assumed	.000	.995	-1.090	29	.284	-.292
	Equal variances not assumed			-1.092	5.662	.319	-.292
Audio ease	Equal variances assumed	1.381	.249	-.357	29	.724	-.131
	Equal variances not assumed			-.453	7.521	.663	-.131
Visual ease	Equal variances assumed	.902	.350	-.916	28	.368	-.320
	Equal variances not assumed			-1.119	7.264	.299	-.320

Independent T Tests of Perceived Usefulness

Several independent t tests were run, using SPSS, to explore the factor of perceived usefulness by comparing the means of two groups. An independent t test was conducted to compare teacher support in beginning teachers (teaching 0-3 years) with veteran teachers (teaching 15 years or more) As seen in table 4.8, there was no significant difference in the scores for these two groups; t (33) = 1.632, p=.112.

Table 4.8: T Test Comparing Perceived Usefulness with Number of Years Teaching

		Levene's Test for Equality of Variances		t-test for Equality of Means			
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference
Teacher support	Equal variances assumed	2.091	.158	1.632	33	.112	.701
	Equal variances not assumed			2.477	14.571	.026	.701

An independent t test was conducted to compare teacher support in elementary and middle school teachers. As seen in table 4.9, there was no significant difference in the scores for these two groups; t (50) = .560, p=.578.

Table 4.9: T Test Comparing Perceived Usefulness between Elementary and Middle School Teachers

		Levene's Test for Equality of Variances		t-test for Equality of Means		
		F	Sig.	t	df	Sig. (2-tailed)
Teacher support	Equal variances assumed	3.115	.084	.560	50	.578
	Equal variances not assumed			.664	17.384	.515

An independent t test was conducted to compare teacher support in elementary and high school teachers. As seen in table 4.10, there was a significant difference in the scores for these two groups; t (54) = 2.260, p=.028.

Table 4.10: T Test Comparing Perceived Usefulness between Elementary and High School Teachers

		Levene's Test for Equality of Variances		t-test for Equality of Means		
		F	Sig.	t	df	Sig. (2-tailed)
Teacher support	Equal variances assumed	1.644	.205	2.260	54	.028
	Equal variances not assumed			1.969	18.265	.064

An independent t test was conducted to compare teacher support in low frequency use (using the device less than one time a week) with high frequency use (using the device daily). As seen in table 4.11, there was no significant difference in the scores for these two groups; t (25) = -.286, p=.777.

Table 4.11: T Test Comparing Perceived Usefulness with Frequency of Use

		Levene's Test for Equality of Variances		t-test for Equality of Means			
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference
Teacher support	Equal variances assumed	.147	.705	-.286	25	.777	-.100
	Equal variances not assumed			-.281	10.208	.784	-.100

An independent t test was conducted to compare teacher support in teachers who just started using the device (less than one year) with those who have been using the device for a couple of years (three years or more). As seen in table 4.12, there was no significant difference in the scores for these two groups; t (29) = -.065, p=.949.

Table 4.12: T Test Comparing Perceived Usefulness with Time using the Device

		Levene's Test for Equality of Variances		t-test for Equality of Means			
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference
Teacher support	Equal variances assumed	.944	.339	-.065	29	.949	-.031
	Equal variances not assumed			-.059	5.226	.955	-.031

Analysis of Covariance (ANOVA) Tests of Ease of Use

Several ANOVA or analysis of variance tests were run, using SPSS, to test the difference between the means of different groups of teachers with the factors of ease of use and perceived usefulness. A one-way between groups ANOVA was conducted to compare the effect of ease of use on teachers who have been teaching for zero to six years, seven to fourteen years and fifteen years or more. As seen in table 4.13, there was no significant effect of ease of use at the $p<.05$ level for the three teacher groups [$F(2, 64) = .102$, $p = .903$].

Table 4.13: ANOVA comparing Ease of Use with Number of Years Teaching

Ease of Use

	N	Mean	Std. Deviation	Std. Error
0-6 years	11	3.45	.688	.207
7-14 years	28	3.43	.504	.095
15 years or more	28	3.50	.638	.121
Total	67	3.46	.586	.072

Ease of Use

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.072	2	.036	.102	.903
Within Groups	22.584	64	.353		
Total	22.657	66			

A one-way between groups ANOVA was conducted to compare the effect of ease of use on teachers who never used the device or used it less than one time a week, teachers who used the device one to three times a week and teachers who used the device three to four times a week or daily in instruction. As seen in table 4.14, there was a significant effect of ease of use at the $p<.05$ level for the three teacher groups [$F(2, 64) = .002$, $p = .998$]. However, post hoc comparisons using the Tukey HSD test indicated the mean score of the three groups did not differ significantly.

Table 4.14: ANOVA comparing Ease of Use with Frequency of Use

Ease of Use

	N	Mean	Std. Deviation	Std. Error
Never or less than 1 time a week	37	3.46	.558	.092
1-3 times a week	17	3.47	.514	.125
3-4 times a week or daily	13	3.46	.776	.215
Total	67	3.46	.586	.072

Ease of Use

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.001	2	.001	.002	.998
Within Groups	22.655	64	.354		
Total	22.657	66			

Dependent Variable Ease of Use

	(I) Frequency of using the ipad	(J) Frequency of using the ipad	Mean Difference (I-J)	Std. Error	Sig.
Tukey HSD	Never or less than 1 time a week	1-3 times a week	-.011	.174	.998
		3-4 times a week or daily	-.002	.192	1.000
	1-3 times a week	Never or less than 1 time a week	.011	.174	.998
		3-4 times a week or daily	.009	.219	.999
	3-4 times a week or daily	Never or less than 1 time a week	.002	.192	1.000
		1-3 times a week	-.009	.219	.999

A one-way between groups ANOVA was conducted to compare the effect of ease of use on teachers who have never used the device or have used the device for less than one year, teachers who have used the device for one to two years and teachers who have used the device for three or more years. As seen in table 4.15, there was no significant effect of ease of use at the $p<.05$ level for the three teacher groups [$F(2, 64) = .790$, $p = .458$].

Table 4.15: ANOVA comparing Ease of Use with Time using the Device

Ease of Use

	N	Mean	Std. Deviation	Std. Error
Never or less than one year	43	3.40	.583	.089
1-2 years	19	3.58	.607	.139
3 years or more	5	3.60	.548	.245
Total	67	3.46	.586	.072

Ease of Use

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.546	2	.273	.790	.458
Within Groups	22.111	64	.345		
Total	22.657	66			

A one-way between groups ANOVA was conducted to compare the effect of ease of use on elementary, middle and high school teachers. As seen in table 4.16, there was no significant effect of ease of use at the $p<.05$ level for the three teacher groups [$F(2, 64) = 1.625$, $p = .205$].

Table 4.16: ANOVA comparing Ease of Use with Level of Teaching

Ease of Use

	N	Mean
Elementary school	43	3.56
Middle School	10	3.30
High School	14	3.29
Total	67	3.46

Ease of Use

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1.095	2	.547	1.625	.205
Within Groups	21.562	64	.337		
Total	22.657	66			

Analysis of Covariance (ANOVA) Tests of Perceived Usefulness

A one-way between groups ANOVA was conducted to compare the effect of perceived usefulness on teachers who have been teaching for zero to six years, seven to fourteen years and fifteen years or more. As seen in table 4.17, there was no significant effect of ease of use at the $p<.05$ level for the three teacher groups [$F(2, 63) = 1.567$, $p = .217$].

Table 4.17: ANOVA comparing Perceived Usefulness with Number of Years Teaching

Teacher support

	N	Mean	Std. Deviation	Std. Error
0-6 years	11	3.45	.688	.207
7-14 years	27	2.89	.934	.180
15 years or more	28	2.93	1.016	.192
Total	66	3.00	.945	.116

Teacher support

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	2.749	2	1.374	1.567	.217
Within Groups	55.251	63	.877		
Total	58.000	65			

A one-way between groups ANOVA was conducted to compare the effect of perceived usefulness on teachers who never used the device or used it less than one time a week, teachers who used the device one to three times a week and teachers who used the device three to four times a week or daily in instruction. As seen in table 4.18, there was no significant effect of ease of use at the $p<.05$ level for the three teacher groups [$F(2, 63) = .338$, $p = .714$].

Table 4.18: ANOVA comparing Perceived Usefulness with Frequency of Use

Teacher support

	N	Mean	Std. Deviation	Std. Error
Never or less than 1 time a week	36	3.08	.874	.146
1-3 times a week	17	2.94	.899	.218
3-4 times a week or daily	13	2.85	1.214	.337
Total	66	3.00	.945	.116

Teacher support

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.617	2	.308	.338	.714
Within Groups	57.383	63	.911		
Total	58.000	65			

A one-way between groups ANOVA was conducted to compare the effect of perceived usefulness on teachers who have never used the device or have used the device for less than one year, teachers who have used the device for one to two years and teachers who have used the device for three or more years. As seen in table 4.19, there was no significant effect of ease of use at the $p<.05$ level for the three teacher groups [$F(2, 63) = .238$, $p = .789$].

Table 4.19: ANOVA comparing Perceived Usefulness with Time using the Device

Teacher support

	N	Mean	Std. Deviation	Std. Error
Never or less than one year	42	2.98	.975	.150
1-2 years	19	3.11	.875	.201
3 years or more	5	2.80	1.095	.490
Total	66	3.00	.945	.116

Teacher support

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.434	2	.217	.238	.789
Within Groups	57.566	63	.914		
Total	58.000	65			

A one-way between groups ANOVA was conducted to compare the effect of perceived usefulness on elementary, middle and high school teachers. As seen in table 4.20, there was no significant effect of ease of use at the $p<.05$ level for the three teacher groups [$F(2, 63) = 2.756$, $p = .071$].

Table 4.20: ANOVA comparing Perceived Usefulness with Level of Teaching

Teacher support

	N	Mean
Elementary school	42	3.17
Middle School	10	3.00
High School	14	2.50
Total	66	3.00

Teacher support

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	4.667	2	2.333	2.756	.071
Within Groups	53.333	63	.847		
Total	58.000	65			

Phase Two: Qualitative Results

The results from the phase two interviews, captured through coding, resulted in several themes which further explained the acceptance of mobile applications and technology. This section begins with a description of the various ways teachers are using the device in their classroom and follows with a list of student and teacher affordances and challenges through the lens of the predictors of ease of use and perceived usefulness from the TAM model. The results from this phase in the study are listed in table 4.21 below.

Table 4.21: Teacher and Student Affordances and Challenges

Affordances	**Teachers**	**Students**
Ease of Use	• Continue using the device (19) • Features: Mobile, user-friendly, email, music (5)	• Aware of technology (10) • Helping teachers and other students use the device (6)
Perceived Usefulness	• Less dependency on teacher (4) • Extra support with resources to reinforce learning (3) • Learn a new technology and awareness of applications (2) • Provides feedback on student progress • Accommodates learning needs in a limited time (differentiation)	• Highly engaging (17) • Prefer device over a computer (5) • A different way of learning (7) • Increases learning with reinforcement, retention and repetition (6) • Features: mobile, user-friendly, lightweight, graphics and music (5) • Learning through game-like play (5) • Monitors progress and provides instant feedback (4) • Finds new information through research (4) • Work independently at own pace (differentiation) (2)
Challenges	**Teachers**	**Students**
	• Hardware: Not having enough devices (14) • Software: Finding, purchasing, downloading and updating appropriate applications (14) • Wireless fidelity (Wi-Fi) - not strong enough or very slow (8) • Functionality: Educational websites blocked by filters, flash not supported, inability to print (6) • Battery life (3)	• Hardware: Not enough devices and students fight over them (7) • Discipline problems, off-task, don't take care of them (5) • Lack of understanding (5) • Not a novelty and get bored (2) • Students with visual and tactile issues (2)

Note: the number in parenthesis represent the total number of teachers who made the statement.

Uses of the device

Interview questions were coded to determine if students used the device individually or if they used them in groups. The majority, 14 participants (70%) had students use the device one-to-one for taking assessments such as quizzes on Accelerated Reading, Istation (a reading screener), or as a way to review for assessments. Additional ways the device was used one-to-one was demonstrated by 5 participants (4%) where students used the device for researching. A total of 13 participants (65%) used the device with groups of two or more students where they quizzed each other, read together or used a splitter to listen to an audio book together. Several participants indicated their students used the device one-to-one as well as in groups depending on which application they were using, as seen in the overlap of percentages. The following participants illustrate the many ways students used the device in the classroom.

> Missy: If they are going over their sight words, they might quiz each other and read them together. If it's a passage, like a nonfiction passage on the iPad, they might do it as a group of 3.
>
> Katie: With my special education students, I have a splitter and they can put the headphones in together and they can listen to a lot of things on audio that they may have missed when they are out of class.

A total of 7 (35%) out of the 20 participants indicated that the device is used as part of a technology center or math or reading station where multiple students used the same device as cooperative learning. Four participants (20%) indicated that if they had more devices, they would create a technology station where students could work with the device collaboratively in a group.

> Dora: I can put it (iPad) in stations. I think I need to get at least a couple more to do that for a station.
>
> Heather: I really think a class will really benefit from at least five iPads per class so you can set up like a station as opposed to just one and then the kids are fighting over it.

Nicole: I am hoping to get a couple more because I did another program where I should be getting 4 more mini iPads. So I plan on setting them up more temporary like in centers. Put more books to get them (students) more involved instead of just doing the games (so they are) doing more things with what they can do themselves.

Olive: If I had more iPads, it would be a technology station and they can just go in there and work, even if they have the same game.

A total of 13 participants (65%) used the device for reading, math or science by using applications for sight words, reading passages, grammar, audio books, math problems and flashcards, Brain pop and United Streaming (science online resources). A total of 12 participants (60%) used the device as a way to review for assessments such as using the application Kahoot or to take assessments. Only 6 participants (30%) indicated they used web based applications such as video streaming, online dictionaries or google for research purposes.

Ease of Use and Teacher Affordances

When applying the TAM predictor of ease of use (the degree to which teachers believe using the iPad would be free of effort) to the phase two results, almost all the participants (95%) indicated they will continue using the device and wanted more devices for the students to use. A small percentage (25%) of the participants, however, reported specific factors that contributed to their ease of using the device. Participants reported that the device was easier to use than a desktop or laptop computer because of its flexibility and mobility.

Elise: As a teacher, I find that iPads are easy to use. Once you are connected and you're at the website, it is friendlier versus a computer.

Missy: It is more hands-on then having to be on the laptop or having to be on my desktop computer.

Dora: I can do all sorts of things that I don't have to sit behind a computer to do.

Gabby: I have access instantly and I can walk around with it and I can go anywhere with it. When I do testing, it is an online test and I can see where the students are and

approve their status or pause the test for them. I don't have to go back to my desktop. I like the mobility of it, the portability of it.

Several participants noted the functionality of the device through the features such as the camera, music and email.

Dora: On the iPad, I can download music. I can go on there and get into my email.

Nicole: I was using them to take pictures of what they were doing when we were doing project lead the way stuff so I was going around taking their pictures so that I can put them like into a little portfolio thing too. So I'm using it also to just record and stuff.

Ease of Use and Student Affordances

In terms of the ease of use for students, half (50%) of the participants indicated their students were aware of technology and already knew how to use the device from experience with their phones, game consoles and tablets. Several participants reported that their students love using the device and know how to use it better than a computer.

Frank: The kids already come with the knowledge of how to use the iPad so it takes very little instruction. They know what to do.

Dora: A lot of my kids already know how to maneuver it. They can get in there and they can tell me how to pull the apps out or where to go or what different programs.

Ivan: They are accustomed to it from their phones, to their game stations and tablets at home.

Students used the device so well that a total of 6 participants (30%) discussed how their students were helping them use the device. For example, some students showed their teachers how to navigate, open and close apps. Not only were students teaching their teachers, but there were several instances where students were sharing ideas and teaching their fellow students how to maneuver the device.

Betty: This is the first time I am using iPads period, so I am learning with them. They are showing me and just learning from each other.

Laura: I think some of my kids actually helped me learn because I was not an apple person before and so when they gave me the iPad I had kids that said "I can show you" and I think that created more motivation as well. Because they became the teacher for the teacher and that was pretty neat.

Stephanie: They were teaching me how to do some things.

Terry: They have the innate desire to share with their classmates what they've created, discovered or learned. They take that knowledge to their friends and become a teacher themselves.

In addition, students were often solving their own problems, which were problems that their teachers didn't know how to fix. This illustrates the students helping their teachers through ease of use.

Patty: The kids run into problems and it's been good because the kids themselves have been like "Oh, this is how you do it Miss". Then I would say "okay, go explain it to someone else or sit with someone and show them how to use it".

Gabby: They fix problems that I don't even know how to fix. They are in there before I can even get to them. They're like "No, we got it, got it solved" and I don't know what they did.

Teacher Challenges in using the iPad

Although there are factors that aid in the ease of using the device (for students and teachers), there are some factors that make using the device difficult, which discourages use. For example, the majority (70%) of teachers stated the lack of access to the devices as their biggest challenge. This becomes an issue when students are at different levels and cannot use the same applications when sharing devices.

Ann: It's good for them to work in pairs and learn that sharing and back and forth concept but sometimes they're at such different levels that I can't have them work together because they're not anywhere near the same level.

Laura: I think the biggest challenge is that there is only one issued to me and the kids absolutely love it so if we had more, I think it would be more beneficial for our class.

Elise: I think not having a lot of them hinders the process.

Dora: Maybe if I had more, as a classroom set, they could benefit. So maybe not having would be a worst.

Katie: I would love to have one for everybody and we could do eBooks. It would be endless what I could do if I had more so I guess that would be an obstacle.

An equally common challenge (70%), which affects the use of the device, were software issues such as finding, purchasing, downloading and updating applications. A total of 6 participants explained that the challenge of purchasing the applications is due to the cost and the laborious purchasing process set up by their school districts. Additionally, they explained that many applications have trial periods or require additional application purchases that don't allow the student full access to the content, which limits use. Some participants were unable to update applications because the device was outdated or they didn't have the right access. These issues increased when teachers were not given the same device they had been using the previous year.

Laura: The worst experience I've had is not necessarily using the iPad but the limitations of not having the finances to purchase other apps. We were limited to only free apps and so if you would find something really cool you were not able to use it unless you paid out of pocket.

Nicole: Finding stuff that's appropriate for them that's free and that will go into more depth is a challenge because those I download are free and they only touch the surface.

Heather: They give you a trial period and then after that they want you to pay or they put in a lot of the push notifications or the in application purchases. So it really doesn't let you play the game because it is trying to sell you other stuff.

Robert: The problem I encounter is being able to find apps to use. I have first generation iPads and many apps no longer work on these iPads.

Elise: On some of the iPads, we have don't have the capability of updates, therefore we're not able to download certain features that allow the students to continue with specific apps.

Additionally, the lack of training and knowledge of appropriate applications for their grade level was shared by five participants which further affects their use of the device. A total of eight participants indicated weak wireless fidelity (Wi-Fi) which caused devices to work slowly or not connect at all. Again, teachers are discouraged to use the device when these issues occur.

Heather: Sometimes the Wi-Fi signal is not strong enough or it's very slow so the apps get stuck loading and then we are unable to shut it down because it is in the middle of loading. So it is kind of like the device freezes.

Stephanie: Lack of Internet, when it goes out and we have to reset them again.

Robert: I would have to say the first time using kahoot.it was my worst experience. The kids were so eager to use the website and of course the iPads chose not to connect to the Internet that day.

Gabby: I took them up to a fourth grade teacher's classroom all the way at the end (of the hall) and we had to sit in the hall for the Wi-Fi to work. In her classroom, it wasn't available.

Additional issues that affect use of the device included websites that were blocked by district filters and the inability to utilize applications that required Flash. Issues with the battery such as the device turning off by itself and forgetting to plug the devices in were also reported.

Student Challenges in using the iPad

Teachers (35%) reported the most common challenge for students was that they got upset or fought over the device because there were not enough. This lack of devices greatly impacts the use of the device by students as illustrated below.

Nicole: They fight over them. I am scared that they are going to mistreat them or break them.

Heather: A lot of tantrums when someone gets the iPad so that center is full and they can't go. Then sometimes they cry and go home and say "My teacher didn't let me use the iPad and I never get to use it.

Teachers reported that, as a result of a lack of understanding, students just clicked their way through an application or got off-task and switched to something else. Students with visual impairments who lack the ability to see the device or those with tactile issues would not benefit from using the device. These factors discourage the use of the device because of the difficulty experienced.

Ann: They don't always understand a lot of it all the time so sometimes they are not motivated to use it even the lowest of some of the games are challenging to them.

Additionally students who don't take care of the devices or those with discipline problems who lose the privilege to them add to the difficulties. Several teachers explained that students, who have the device at home and are very familiar with it and use it all the time, are not motivated to use it at school. In this case, a high level of home use is acting as a negative factor.

Dora: The ones that would not benefit that much from it is the ones that have them at home already and they're very familiar with it. It's not something new, not something exciting. They've already don't that so it doesn't benefit them.

Perceived Usefulness and Teacher and Student Affordances

When applying the TAM predictor of perceived usefulness to the phase two results, almost all (85%) of the participants reported that several factors of using the iPad, along with student use of the device, would enhance their job performance. These factors include the motivation and engagement of the student, less dependency on the teacher and a different way of learning. Additional factors include increased learning, immediate feedback, ability to research

topics and student empowerment. Participants indicated that all students benefit from using the device which, in turn, benefits the teacher.

When asked how the device benefited them as teachers, many participants immediately began describing how the device benefits their students. Therefore, teachers' increase in their job performance (perceived usefulness) is demonstrated through the success of their students as shown below. Seventeen out of twenty (85%) teachers indicated that students were highly engaged to use the iPad as it held their attention and focus and kept them involved and entertained. The iPad is such a highly motivating device that teachers (25%) stated that students will choose to use it, wait to use it and prefer to use it over a computer. Several participants contributed this motivation to the novelty of the device. One motivational factor for the students is finishing their work so they could use the device. Teachers stated that students get excited and really enjoy using the device.

> Jessica: It doesn't matter what we're doing. If I have the iPads the kids are engaged and they love doing it. They just think its fun.
>
> Nicole: I will give them a choice of playing with Play-doh or using the iPads and of course they always choose the iPads.
>
> Frank: They all want it and sometimes they will even wait just to use the iPad. They get excited and want to quiz and the computers will be open but they prefer my iPad.
>
> Heather: It's hard to compete. When I read a book to them, it doesn't get their attention as much as if I show them a book that's on YouTube. Even though it is the same book and somebody reading it because it is on the iPad, it is more interesting to them.
>
> Missy: You integrate technology to the kids and it's like heaven to them. They love it so you always have to have that for them.

Several participants indicated that motivation to use the device is created by the privilege the students feel by being able to use them and described the motivation as being "built in".

Nicole: Its fun and it's limited so they feel special because they are one of the only ones that get to use it especially since there are only two to four.

Jessica: Students require very little motivation to use them. They are excited to be using them. They are very much highly engaging. I don't have to work to make the students do their work. They love using them.

Teachers reported various factors that contributed to students' engagement while using the device. Several participants (25%) expressed that students were engaged by learning through play and the game-like features of the applications. They expressed how the device held the students' attention and how interactive the device was.

Nicole: I like them because they're (the applications) educational, they're (students) having fun. They think they are playing but yet they are still learning.

Katie: It makes our job way more exciting and just better for the kids that they are so driven. Their attention is so focused when they have that tool.

Jessica: I have a student who, particular hard case, won't do any work whatsoever. However, you get the iPads out and he is totally engaged and will do anything you ask him to do.

Teachers also reported the colorful and bright graphics, sound and motion increased engagement. A last factor in engagement was the ability to differentiate the application for each student's learning style by finding the correct level of application.

Nicole: The upper ones get to go to a more advanced app and they can go further and the ones that are struggling, they've got that support.

Heather: I think once you find those apps that work for your students, year to year, they will benefit from it.

Since the device is highly motivating, students were less dependent on the teacher and were on-task, which allowed the teacher uninterrupted time to work with other students. The teacher was able to differentiate learning tasks through the varying levels of applications in order to accommodate a variety of learning needs in a limited amount of time. This factor increases

the teachers' job performance since the device acts like another intervention or resource for the teacher to use.

> Heather: It helps a lot especially with the students that are struggling. It acts like another intervention so that I can work with my higher kids. We focus a lot on our lower kids and I don't think we focus enough on our higher kids. I will put the students who are struggling the most on it so that I can focus on the kids that are doing very well. So it's just like another intervention or tutor that I have in class.
>
> Patty: I can work with my other kids. It freed me up and gave me time to work with the kids who needed it.
>
> Ann: It gives me a chance to let the kids still be doing something educational and focus on my small (group) or one-on-one interventions with kids on certain things. It also gives me some interventions that I can use with the kids.
>
> Nicole: It helps us as a supplement, you know as an extra resource to help me with whatever, taking the pictures, the extra centers you know that are boxed or whatever, I can find it on an iPad and do the thing but it's electronic and it calls their attention.

Another factor that increases student achievement and teacher performance is that the device provided a different way of learning concepts which were taught in class as indicated by 35% of the participants. Several teachers stated that the device provided a different approach to learning as opposed to traditional paper and pencil activities.

> Robert: Students benefit from being able to access technology and are able to be presented information in a different new age way.
>
> Ann: They get a different way to learn a concept that you are teaching.
>
> Betty: It's probably something different from the way that I'm teaching something like a math skill or concept. It's just they're seeing it in another way.
>
> Laura: The kids are really motivated to use it and we are hitting skills in a new way so it's not just paper and pencil. It's not just drill and kill. It's a different approach to teaching foundational skills.

Nicole: It's something different from pen and paper. It's something that they're used to that calls more to them then just sitting in their chair, writing, cutting or pasting.

Patty: I think even now the way we teach is minimum paper and pencil so everything is on technology so it's like a foundation they can move up to other technologies.

Yet another factor of teacher performance is the increased learning through reinforcement, retention and repetition as indicated by 30% of the participants. Several teachers mentioned the reinforcement of concepts through visuals.

Heather: It reinforces the learning that is going on in the classroom and it presents it in a different way. Maybe they didn't fully understand the way I presented something and they go onto the iPad and it clicks.

Jessica: It has improved test scores dramatically. My kids have higher retention of the material. They will remember the answers to various questions. They're getting the concepts better because there are a lot of visuals that go with it and they are making the association quite a bit better.

Ann: They get to learn a different way and there are definitely kids that have to have multiple avenues to learn a concept and it give them a lot of repetition too.

The ability of some applications to assess student learning and provide immediate feedback to the teacher enhances their performance by providing specific student progress which identifies the areas of need per student. Additionally, with corrective feedback, students have supported practice and are able to move onto the next level without waiting for the teacher.

Jessica: It gives me a pulse of how they're doing in the classroom. If they need a particular question or if they do not understand a particular concept, it allows me to know so that I can review it with them. It helps to know which kids had those questions so I can work with those kids particularly. Also, so I don't waste my time on concepts that the kids already know.

Laura: Depending on where my kids were I could pick if they were working on addition and subtraction facts, negative numbers, whole numbers, double digits, triple

digits and then it would keep a report card from there once they have mastered certain levels and then it would move them up.

Gabby: It's instant immediate feedback. They know whether they are doing well or not. They know whether they got the answer right or not. They know if they are on the right track if they are playing the games. They don't have to wait for someone to tell them, they can go onto the next level. It's like a little teacher in front of them

Terry: You are also able to do an informal assessment to see if the apps are helping the students. If not, you are able to switch up the apps.

The use of the iPad enhances teachers' performance, in yet another way, because it allows students to research the answers to questions they may have. This motivation encourages students to use the device which increases productivity and test scores.

Frank: The kids are able to go in and they're able to learn stuff that they are curious about. Like if they have a question for me about science, I can tell them "you know what, that is a really good question to like research". I'll hand them my iPad and they will research and then they become the teacher and they can teach the class we can have a class discussion about it.

Katie: It makes our jobs way more exciting and just better for the kids that they are so driven, their attention is so focused when they have that tool that is what encourages me to keep going with it.

Olive: What it benefits for me, is that I get to have more kids test on AR. There are more kids that have access to testing for AR so it increases our reading.

. Several participants illustrated their own growth in technology by learning how to use the device, having knowledge of the applications and finding teaching resources.

Betty: Well, it helps me grow in technology and it helps me be aware of what kinds of apps and educational games are out there so it just helps me to grow. It's just learning with the students on how to navigate.

Missy: I use it a lot for Pinterest. I find different things that I can use for the classroom.

The majority, 65% of participants reported that all students, regardless of their level, benefit from using the iPad in the classroom. They illustrate the importance of finding the right level of application for each student.

Gabby: I think every student benefits. You just have to find the right app for every kid.

Nicole: All of them because the upper ones they get to go to more advanced apps and they can go further and the ones that are struggling, they have that support. So I think all of them.

Missy: Well I think all my kids benefit, from my highs to lows. My lows, I have them on a first, second grade level of app and my highs I have them work on a research paper on a specific topic.

Heather: Honestly, I think all students benefit from it. I have apps for a three year old to a twelve year old. So my higher students, I don't let them go to the really easy apps. I will bring up the age to make it a little more challenging for them. The ones that are struggling, I have to scale back to an app that is focused for a three or four year old. So I think they all benefit from it.

Stephanie: Even from the very limited ones who don't have access to one at home are learning to use it and how to download apps.

Laura: I think all kids benefit from using the iPad. From your special education students to your gifted and talented students to you know, any and all and in between.

Several participants stated they didn't believe there was any type of student that wouldn't benefit from using the device. A total of five participants reported that using the iPad benefits reluctant students such as those with short attention spans and those who get bored easily. Furthermore, the device benefits students with discipline problems by acting as an incentive or

motivation to behave. Additionally, students with disabilities such as occupational therapy students or those having problems with their motor skills also benefit from using the iPad.

Conclusion

The purpose of this mixed methods study was to determine the factors that teachers indicate are important when selecting mobile applications for use in instruction. I explored the acceptance of the iPad device in instruction by teachers through the predictors of the TAM model and quantitative measures. I used qualitative interviews to further investigate these predictors and discovered the affordances and challenges of students and teachers when using the device in instruction.

The next chapter will summarize the findings described above within the context of the technology acceptance model and the research questions that drove this study. Implications for teachers, school districts and application designers will be presented along with future research that will further the study of mobile technology in instruction.

Chapter 5: Summary of Findings and Recommendations

The results of both phases of this study, as detailed in the previous chapter, indicate that overall, teachers accept the device in instruction as indicated by the predictors of ease of use and perceived usefulness from the TAM model.

The purpose of this study was to identify the factors that teachers indicated as important in the selection of mobile applications. Furthermore, this study examined the predictors of ease of use and perceived usefulness, through quantitative and qualitative means, to determine teachers' acceptance of mobile technology devices in instruction. The findings of this study add to the ongoing research of user acceptance through the TAM model. It offers a possible extension to this model by exploring the acceptance of mobile devices, specifically the iPad, with the unique population of elementary, middle school and high school teachers. The findings also add to the emerging literature of the effectiveness of mobile devices in instruction at this level.

This chapter summarizes these findings through the exploration of the research questions within the context of the TAM model. The chapter offers recommendations for several entities as well as for future research.

Research Question #1

Which factors impact teachers' selection of mobile applications for use in instruction?

Several factors of ease of use were investigated, through quantitative measures, to determine if teachers considered these factors when selecting mobile applications for use in their classrooms. The results were validated in phase one where the highest means were related to the predictor of ease of use. This included visual ease (3.48), ease of use (3.47) and audio ease (3.46). The high means of these factors, in relation to all other factors, suggests that teachers rated the factors related to ease of use as extremely important or very important when selecting applications. In other words, teachers value an application that provides very clear instructions

that are easy to follow. They also value an application that has information that is easy to view and hear. Visual distractibility and audio distractibility were the lowest in the list of means, 2.90 and 2.80 respectively, which suggests that teachers rated these factors as slightly or not at all important. In other words, it is not important to teachers if the application has visual or audio elements that distract students from the task. This may be due to the fact that teachers feel their students may be able to complete the task despite the visual or audio distractions. Teachers may also choose to turn down the volume on the device so audio distractions would not exist.

The predictor of perceived usefulness was also investigated, through quantitative measures, to determine if teachers considered the factor of teacher support when selecting mobile applications for use in their classrooms. The results showed that teacher support ranked low on the list of means (3.00), which was 13 out of the 15 total factors. The low mean of this factor, in relation to all other factors, suggests that teachers rated teacher support as slightly or not at all important when selecting applications. In other words, it is slightly or not important, to teachers, if the application provides background content knowledge for them. This may be due to the fact that teachers look to other educational resources for support in their content areas.

Is there a difference between the ease of use and perceived usefulness of groups of teachers depending on how long they have been teaching, the level they teach, the frequency or time they have been using the device in instruction?

The quantitative results of this study, through various tests, indicated that the number of years teaching (beginning and veteran teachers), the time of using the device (new users and users of three years or more), and the frequency (low and high) in which the device was used were not factors impacting teachers' acceptance of the device through the predictors of ease of use and perceived usefulness. There was a difference, however, in the level of teaching when compared to both predictors.

For example, there was a noted difference between elementary and middle school teachers in terms of ease of use through the factor of audio ease. There was also a noted difference between elementary and high school teachers in terms of the same factor of audio

ease. This result may be due to the fact that teachers at either level may choose to not use the volume on the application which would affect their rating of the factor of audio ease. There was also an effect of ease of use on three groups of teachers: those who never used the device or used it less than one time a week, those who used the device one to three times a week and those who used the device three to four times a week or daily in instruction. These results suggest that there was a slight difference between the means of these groups of teachers in terms of their ease of use but post hoc analysis was unable to determine which two groups. The plotted means suggest that those teachers who use the device one to three times a week ranked ease of use higher and thus important. This may be because the low frequency users who have never used the device or only use it once a week don't use it often enough to value ease of use. Similarly, the high frequency users or those who use the device three to four times a week or daily are already comfortable with using the device and do not require the ease of using the device.

Even though the factor of teacher support ranked low on the list of means, compared to other factors, there was a difference in teacher support between teachers at the elementary and high school levels. This is likely due to the fact that elementary teachers teach various subjects and may require additional content support while high school teachers teach one subject which affords them more knowledge in that subject.

Research Question #2

What are the student and teacher affordances and challenges associated with the predictors of ease of use and perceived usefulness?

Teachers illustrated the ease of using the device because of its mobility and functionality. The majority (95%) of teachers stated they were very likely to keep using the device with 85% of the participants indicated that having more devices would increase their use, even to using it daily, a factor mentioned by Haydon, et al (2012). In terms of the students' ease of use, from the teachers' perspective, seventeen out of twenty (85%) teachers indicated that their students were highly engaged to use the iPad because it kept them focused, involved and entertained as stated

in Hutchinson, Beschorner & Schmidt-Crawford (2012); Neely, Rispoli, Camargo, Davis & Boles (2012); and Haydon, et al (2012). The level of confidence that a user has regarding his or her ability to perform certain tasks using the technology affects their acceptance of that technology (Venkatesh & Davis, 1996). For example, half (50%) of the participants indicated that their students were aware of the technology and already knew how to use the device, which demonstrates their ease of use. Furthermore, there were several instances where students were aiding the teacher and fellow classmates in solving issues that arose as demonstrated in the study by Hutchinson, Beschorner & Schmidt-Crawford (2012). This illustrates the students helping their teachers through ease of use.

Teachers also illustrated the factor of perceived usefulness as 85% of the participants reported that several factors of using the iPad, along with student use of the device, would enhance their job performance. Because of the highly motivating nature of device, teachers were afforded time to work with other students. Participants indicated an increase in learning due to the immediate feedback as demonstrated in the studies by Haydon, et al (2012) and Risconscente (2013). Several participants illustrated their own growth in technology by learning how to use the device, having knowledge of the applications and finding teaching resources. Participants indicated that all students benefit from using the device which, in turn, benefits them as the teacher. The participants are more likely to continue to use the device, despite their overall attitude toward the device, because they have reported the ways it will enhance their performance.

Research Question #3

What do both phases indicate about teachers' acceptance of the device through the predictors of ease of use and perceived usefulness?

The results from phase one were validated by the qualitative results from the interviews conducted in phase two in terms of ease of use. The factors of ease of use were ranked high on the list of means compared to all other factors indicated that teachers value the ease of using the

device. This was demonstrated in the phase two results by 95% of teachers who indicated that they were very likely to continue to use the device and they found the device easier to use then computers. Teachers also indicated that students were already aware of the technology and were helping them with their ease of use. These results indicate that teachers accept the iPad in instruction as demonstrated by the factors of ease of use.

The results from the phase two interviews validated the predictor of perceived usefulness. The majority of teachers (85%) indicated several factors, such as time to work with other students, an increase in learning and growth in technology which illustrated that using the iPad in instruction would enhance their job performance. According to the TAM model this has a direct effect on their behavioral intention to use the device. The participants are more likely to use the device in instruction because they believe it will enhance their performance despite their attitude toward the technology. These results indicate teachers' acceptance of the iPad in instruction as demonstrated by the factor of perceived usefulness.

Recommendations

The results of this study have implications for all teachers, whether they currently use mobile technologies or not, as it presents relevant information about its positive impact on students. In order for teachers to accept mobile devices and use them in their instruction, the device needs to be easy to use and shown to improve their job performance and/or the achievement of their students. Teachers can use the factors reported in the first phase of the study in their selection of mobile applications for use in their classrooms.

The results of this study have implications for school districts across the nation who currently use mobile technologies or are considering using them. With the understanding of the factors that impact teachers' acceptance and use of mobile technology, school districts can put systems in place to support the use of such devices. Systems may range from guidance in the selection and purchasing of mobile applications to technical support and training.

The results of this study have implications for mobile application developers who are currently designing applications for educational purposes. The ranking of each factor in the first phase can inform these developers of what teachers rated as important when selecting applications for their students to use. Furthermore, the details about student motivation engagement in the participants' responses in the second phase can guide their development while keeping the student in mind.

Recommendations for Future Research

The present study offers findings about the predictors of teacher acceptance through the factors aligned with ease of use and perceived usefulness. Researchers can use these predictors to determine a teacher's user acceptance and compare that to their actual use of the device. How does the acceptance of the device (as indicated by the predictors in TAM) compare with actual use of the device? This will determine if users that accept the technology because of its ease or because it will increase their job performance ensuring they utilize the technology more frequently or effectively.

Researchers can follow the methodology outlined in this dissertation to investigate students' acceptance of mobile devices. At the same time, they can also evaluate the use of applications and the device in English Language Learners (ELL) as there are many applications that can be used in different languages. How do the predictors of ease of use and perceived usefulness explain an ELL's acceptance of a mobile application and the device?

Additionally, researchers can further extend the model, within the context of mobile learning, by investigating other factors linked to student achievement from the curriculum category such as alignment of the application to the state standards or accuracy of the information provided by the application which ranked high on the hierarchy list of means in the quantitative phase of this study. By exploring the factors that impact user acceptance of mobile technologies, we can begin to combat the issue of high access and low use as indicated in chapter two.

Conclusion

This study explored the factors that impact a teacher's selection of mobile applications and investigated their acceptance of mobile technology devices through the TAM model. Through quantitative measures, the study demonstrated that teachers rated the factors related to ease of use as most important when selecting mobile applications. There was a noted difference between different teaching levels in terms of audio ease and between groups of teachers use (frequency) and ease of use. These factors were further investigated, through the qualitative phase and were validated in the participants' responses related to the ease of using the device.

Even though teachers rated the facto r of teacher support, an indicator of perceived usefulness, low in the quantitative phase, there was a noted difference in teacher support between teachers at the elementary and high school levels. The qualitative phase of the study further explored this concept and demonstrated the various ways of using the device which enhanced the teachers' job performance.

The results in both phases indicate teachers' acceptance of the device through the predictors of ease of use and perceived usefulness. The results of this study contribute to the field of mobile learning in a border town in Texas. It offers recommendations for others as well as topics for future research.

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Appendix A: Phase One Survey via Survey Monkey

Directions:

To what extent is each of the criteria listed below important in selecting iPad® applications for instruction? Click on your choice (0-4) below each criteria. A brief description of each criteria is provided for you.

0 – not at all important
1 – slightly important
2 - moderately important
3 – very important
4 – extremely important

1. Age Appropriateness:

The correlated skills and vocabulary in the application are developmentally appropriate

0 - not at all important	1 – slightly important	2 - moderately important	3 – very important	4 – extremely important
○	○	○	○	○

2. Alignment:

The correlated skills and vocabulary in the application are aligned to state standards

0 – not at all important	1 – slightly important	2 - moderately important	3 – very important	4 – extremely important
○	○	○	○	○

3. Accuracy:

The source of the application is from a professional or credible source

0 – not at all important	1 – slightly important	2 - moderately important	3 – very important	4 – extremely important
○	○	○	○	○

4. Student Interaction:

The application includes a high level of interaction where students are able to manipulate data

0 – not at all important	1 – slightly important	2 - moderately important	3 – very important	4 – extremely important
○	○	○	○	○

5. Vocabulary:

Vocabulary in the application is clearly defined

0 – not at all important	1 – slightly important	2 - moderately important	3 – very important	4 – extremely important
○	○	○	○	○

6. Critical Thinking:

The application addresses the higher levels (evaluation and/or synthesis) of Bloom's taxonomy

0 – not at all important	1 – slightly important	2 - moderately important	3 – very important	4 – extremely important
○	○	○	○	○

7. Immediate Feedback:

The application provides an explanation of why the answer selected is incorrect

0 – not at all important	1 – slightly important	2 - moderately important	3 – very important	4 – extremely important
○	○	○	○	○

8. Self-Correction:

The application provides support for self-correction

0 – not at all important	1 – slightly important	2 - moderately important	3 – very important	4 – extremely important
○	○	○	○	○

9. Assessment:

The application provides an assessment that is aligned to content learned in the application

0 – not at all important	1 – slightly important	2 - moderately important	3 – very important	4 – extremely important
○	○	○	○	○

10. Teacher Support:

The application provides background content knowledge for teachers

0 – not at all important	1 – slightly important	2 - moderately important	3 – very important	4 – extremely important
○	○	○	○	○

11. Ease of Use:

The application provides very clear instructions that are easy to follow

0 – not at all important	1 – slightly important	2 - moderately important	3 – very important	4 – extremely important
○	○	○	○	○

12. Visual Ease:

The information in the application is easy to view

0 – not at all important	1 – slightly important	2 - moderately important	3 – very important	4 – extremely important
○	○	○	○	○

13. Audio Ease:

The information in the application is easy to hear

0 – not at all important	1 – slightly important	2 - moderately important	3 – very important	4 – extremely important
○	○	○	○	○

14. Visual Distractibility:

The application does not have any visual elements which distract from the task

0 – not at all important	1 – slightly important	2 - moderately important	3 – very important	4 – extremely important
○	○	○	○	○

15. Audio Distractibility:

The application does not have any audio elements which distract from the task

0 – not at all important	1 – slightly important	2 - moderately important	3 – very important	4 – extremely important
○	○	○	○	○

*16. What is your gender?

- Female
- Male

*17. How many years have you been teaching?

- 0-2 yrs
- 4 - 6 yrs
- 7 - 9 yrs
- 10 - 12 yrs
- 13 - 15 yrs
- More than 15 yrs

*18. What subject(s) do you teach? Click all that apply.

- math
- science

Other (please specify)

*19. What grade level(s) do you teach? Click all that apply.

- middle school
- high school

Other (please specify)

*20. How long have you been working with the IPad®?

- 0-3 yrs
- 4-6 yrs
- 7-9 yrs
- 10-12 yrs
- 13-15 yrs
- more than 15 yrs

*21. How often do you use the IPad® per week?

- 0 times/week
- 1 time/week
- 2 times/week
- 3 times/week
- 4 times/week
- daily

22. What applications are you currently using in your classrooms? Do you like them? Why?

23. In addition to the criterion in this survey, what other criteria is important in the selection of applications?

Appendix B: Phase Two Survey Questions

In this second phase of my study, I am looking at which factors impact a teacher's acceptance of mobile devices such as the iPad.

All questions in this interview will be related to the use of the iPad in instruction. You may decline to answer any questions you wish. I will be recording the interview so that I can transcribe it to capture everything that is shared. I may use quotes from your interview in my results but I will not use your name, school's name or the name of your district.

Do you have any questions before we begin?

1. How long have you been using iPads in your classroom?
2. How many iPads do you have for use in your classroom?
3. How often do you use iPads in your classroom?
4. How do you use iPads in your classroom?
5. So far, what has been your most successful experience in using iPads? Why was it successful?
6. So far, what has been your worst experience in using iPads? Why was it bad?
7. What kind of obstacles or challenges do you encounter when using iPads in the classroom?
8. What are some of your favorite apps you have used? Why are they your favorites?
9. How likely are you to continue using the iPad in your classroom?
10. What factors might increase your use of iPads in the classroom?
11. What factors motivate your students to use the iPad?
12. How do you benefit from using the iPad in your classroom?
13. How do students benefit from using the iPad?
14. What kind of students benefit from using iPads?
15. What kind of students do not benefit from using iPads?

Would you like to add anything else to this interview?

Appendix C: Email Invitation to Participate in the Study

I am a doctoral candidate in the Teaching Learning and Culture Ph.D. program at UTEP. I am conducting research on the factors that teachers find important when selecting mobile applications used in instruction. You may be interested in this study if you currently use the iPad in your instruction. While there are no direct benefits for participating in this study, you will have the opportunity to understand how to critically evaluate IPad applications for your content area with the use of a rubric, which could aid you in your practice.

If you agree to participate in this study, you will complete an online survey where you will rate the importance of 15 criteria when selecting applications. You will answer some demographic questions such as your gender, how many years you have been teaching and what subjects and grade levels you teach. Additional questions about how long and often you use the iPad in instruction will be asked. This survey will take approximately 10 to 15 minutes. In the second phase, I will conduct brief interviews with you about the use of the iPad in your instruction. The second phase will take approximately 30 minutes.

Participation in this study is voluntary and you can stop your participation at any time. This study has been approved by the Institutional Review Boards at UTEP, [Yellow Rose ISD] and [Sunshine ISD]. If you have any questions about the study, you may contact the researcher below. If you have questions or concerns about your participation as a research subject, please contact the UTEP Institutional Review Board (IRB) at (915-747-8841).

Your participation in this study would be greatly appreciated, as it will add to the research about mobile technologies and will inform teacher's critical selection of applications for instruction. Please read the consent form attached to this email. If you are in agreement, indicate your consent by clicking on the survey below.

----- Survey monkey link here -------

Sincerely,
Danielle N. Navariz
UTEP Doctoral Candidate

Curriculum Vita

Danielle Nicole Navariz earned her Bachelor of Arts in Liberal Arts and Sciences at San Diego State University in 2000. She received her Master of Arts with a major in teaching and a specialization in Educational Technology from National University in 2005. She joined the first cohort of the Teaching, Learning and Culture doctoral program at the University of Texas at El Paso in 2009.

Dr. Navariz has worked as a professional educator and mentor at various school districts in California and Texas for over 14 years. She certified K-12 educators in various subjects in her role as Training and Instruction Manager for Texas Teaching Fellows, a subset of The New Teacher Project. She developed curriculum for the Generalist title and delivered several workshops while working for this non-profit certification program. While pursuing her degree, she supported teachers and students as an Instructional Coach in Socorro ISD.

Danielle has presented her research at several workshops and conferences including the Master Teacher Academies Program at UTEP and the Society for Information Technology and Teacher Education (SITE) Conference, which was published in the conference proceedings. Additionally she presented workshops at the Ysleta ISD Teachers Networking Technology and Content (TNTc) Conference as well as several webinars on Pinterest and Prezi for the district.

Danielle plans to continue supporting students and teachers with effective teaching methods in the public schools. She intends to continue her research in the area of mobile technology and plans to publish additional articles on the subject.

Dr. Navariz's dissertation, *Examining Teachers' Acceptance and Use of Mobile Applications and iPads in Instruction through the Technology Acceptance Model: A Mixed Methods Study* was supervised by Dr. Meilan Zhang.

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This thesis/dissertation was typed by Danielle Nicole Navariz