iPads, Motivation, Self-Efficacy, Engagement in Upper Elementary School Mathematics

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Abstract

The purpose of this study was to investigate the use of tablet technology in the classroom and its impact on student motivation, self-efficacy, and engagement during mathematics concepts and skills review. Furthermore, the study also examined students' preference between iPads and paper and pencil, justifications of their preference, and the strengths and weaknesses of using iPads and paper and pencil. The study was guided by six research questions. The researcher utilized quantitative analysis to examine how one-to-one tablet technology use impacted teachers' perceptions of student motivation as well as students' perceptions of motivation and self-efficacy. Additionally, the researcher used qualitative analysis to examine students' preference between iPads and paper and pencil when completing mathematics skills review, students' justification of their preference, and students' perceptions of the strengths and weaknesses of iPads and paper and pencil. The sample for this study consisted of two classroom teachers and 21 students. The researcher conducted interviews for the qualitative analysis. One sample *t* tests, chi-square tests of independence, and a Likert-type survey were utilized to test the research hypotheses. The results indicated that a statistically significant relationship exists between iPad use and student motivation and iPad use and students' perceptions of self-efficacy during mathematics skills review. The research supports the idea that one-to-one tablet technology does impact students' perceived motivation and self-efficacy, while time on-task may not be impacted. Furthermore, the research revealed no statistically significant difference regarding students' preference between iPads and paper and pencil. Students' justification of their preference varied for using iPads over paper and pencil or paper and pencil over iPads.

Dedication

This work is dedicated to my loving family. Your endless support and encouragement have fueled me to fulfill my educational dreams. For my dearest husband, Josh, thank you for being a shoulder for me to cry on when frustration got the best of me. Thank you for becoming the chef and always being my champion through words written, words spoken, or through no words at all. For my mom, I can only hope to be half the woman you are. Thank you for always being positive and strong. You are the most amazing woman I have ever known. For my dad, your hard work and determination have set an amazing example in order for me to become who I am today. For Speedy, walking with you and gathering my thoughts made for pleasant breaks during the writing process. Thank you for always supporting me. Lastly, for my beautiful baby boy, Asher, you are the light of my life. You joined us for the dissertation journey, and I spent many days holding you with one arm and typing with the other. Your smile, giggle, and kissable cheeks have provided me with the energy to continue moving forward. I love you all more than words can ever express.

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Table of Contents

List of Tables

Chapter One

Introduction

It is vital that the United States, as a globally competing nation, strives to educate students to contend academically worldwide. According to the results of the 2009 Program for International Assessment (PISA), as published by USA Today (2010), students in the United States ranked as "average" in reading (14th) and science (17th) and "below average" in math (25th) out of 34 tested countries. In order to fully educate students for the 21st century and prepare them for scientific and technological global competitiveness, it is essential for teachers to enhance or change the way they are teaching. Incorporating technology into teaching and learning is one such way.

Due to changing academic expectations, teaching and instructional methods continue to evolve. Again, a school goal that remains constant is the teacher's desire to teach each student effectively and guide students to academic success. With the adoption of the Common Core State Standards, as reported by ASCD, the Association for Supervision and Curriculum Development (2012), teachers are carefully examining the resources and individual state standards used to teach students. Phillips and Wong (2012) argued that with the implementation of the Common Core State Standards, teachers are instructed to spend more time on core concepts to aide students in developing a conceptual understanding, to develop procedural skills and fluency in every subject area, and to utilize their knowledge to solve problems in and out of the classroom. Phillips and Wong (2012) wrote, "The Common Core State Standards encourage teachers' creativity in the classroom, honoring the creative tension in teaching, and provide ample guidance to ensure quality" (par 7). Research has shown that traditional instructor-centered

lectures are an ineffective means through which to reach students; whereas, a learning environment that fosters active participation, interactive learning, and collaborative teaching and learning is more effective (Enriquez, 2010).

Learning anytime, anywhere becomes truly real when students have a technological device in their hands (Foote, 2012). The current generation of students is more digitally aware and is absorbed in a techno-saturated world, which causes them to process information in a different way than previous generations (McHugh, 2005). Through technology, the 21st century student has the opportunity to interact with the world in a variety of ways and multi-task daily in most activities. McHugh (2005) suggested, "This generation of students is more likely to be armed with cell phones, laptops, and iPads than with spiral notebooks and number 2 pencils" (para. 4).

Technology is one tool that is consistently used in the daily lives of students may have an impact on their education. Computing and technology use are ubiquitous in 21st century learning (Murray & Olcese, 2011). Effective use of technology in the classroom allows students to be creative while developing new skills and provides students with a wealth of information, which can be used in the future (Centre for Education in Science & Technology, 2008). Even more, the growing use of technology is altering traditional teaching methods in the classroom. It is believed that by allowing students to use tablet technology in the classroom, student motivation to learn and to achieve will increase (Kunzler, 2011).

Background

Reforms have been implemented in school districts to enhance education and student learning outcomes; however, they are not always successful in producing positive

change. It is time for educators to implement a tool to transport schools and classrooms into the 21st century and incorporate learning that directly applies to the modern student. Prensky (2006) wrote, "Schools are stuck in the 20th century. Students have rushed into the 21st," (p. 10).

From a young age, children interface with various devices such as mobile phones, iPads, and iPods. Children may even learn to read and write by using some kind of technology. Students of the 21st century speak the language of technology and are therefore known as "digital natives" (Prensky, 2006, p. 1). According to the Child Trends Data Bank (2010), "In 2010, almost six out of ten children ages three to seventeen used the Internet at home (57 %), nearly three times as many as in 1997" (par. 5). These students are waiting for their teachers, the digital immigrants, to change the landscape of the 21st century classroom and enable them to express themselves creatively through digital technologies (Gasser, 2008). Blair (2012) shared that 21st century students have instant access to information, and it is imperative that teachers and administrators rethink the role of technology in the classroom. To further classroom instruction and homework completion and accuracy, it is beneficial for teachers and school administrators to embrace technological advancements and students' knowledge of technology use. When implementing effective learning tools and strategies, teachers provide students an education that meets their learning needs and inspires further growth in the classroom (Saravia-Shore, 2012).

A core task for teachers is being prepared for classroom instruction and facilitating learning using a variety of educational tools that enhance the education of each student. Knight (2011) stated, "Teachers are living, breathing, complicated

professionals, and they work with living, breathing, complicated young human beings" (p.20). Through continuous conversation and reflection, schools can begin to build a collaborative environment that supports teachers and offers them the tools and resources to reach out to the entire student population.

Classrooms are complete with students of different backgrounds, different needs, and different achievement levels, with one teacher to educate them. Classrooms should not be designed as one-size-fits-all. Differentiation is important in order to foster the growth of each student as an individual. Technology use in the classroom is one way to facilitate academic differentiation. The use of tablet technology and one-to-one computing within schools can help to differentiate instruction and engage today's students, as well as enhance learning and meet educational outcomes (Gulek & Demirtas, 2005). It is imperative that teachers, as digital immigrants, collaborate with one another, receive professional development, and stay current on technological trends in order to continue engaging the 21st century student (Salpeter, 2003).

The more confident and prepared a teacher is for the classroom, the more effective the instruction. This can lead to students feeling successful in their learning. Therefore, the students' sense of self-efficacy is enhanced. Teachers only experience success in educating their students when they help students view themselves as competent in the subject areas (Tomlinson, 2005). Efficacy is important because it affects personal aspirations as well as shapes career goals (Bandura, 1986) and may be a predictor of student achievement in the classroom. Caprara, Vecchione, Alessandri, Gerbino, and Barbaranelli (2011) suggested two facets of self-efficacy are related to academic achievement: the perceived ability to master a specific subject area and the

perceived ability to self regulate studying and learning activities. Britner & Pajares (2006) concluded that both facets of perceived self-efficacy for academic achievement influence learning in the classroom. The learning environment and teaching methods employed can have a direct impact on students' sense of self-efficacy (Bandura, 1994). Couse and Chen (2010) found technology could positively impact students' sense of efficacy and academic achievement. Students' educational experiences, academic opportunities, and development of critical employment skills are positively affected through technology integration (Wilson, 2002).

A continued challenge for educators is to engage students in classroom learning and encourage students to maintain that engagement and interest throughout the school day and in various subjects (Pemberton, Berrego, & Cohen, 2006). Today's students are wired and ready (Schrum, 2013), and it is the school's responsibility to take advantage of new technology when teaching in order to engage students and enrich their school experience. Over the course of time, educators have experimented with different ways to engage and motivate students in the classroom; the latest technique is to engage students through the use of technology. Donaldson (2012) observed, "The Internet has shifted the power focus from the instructor to the 'consumers,' our students" (para. 3). Students have become enabled by immediate access to the world through technological resources, and therefore, students are becoming accountable for their own learning (Donaldson, 2012). With the effective implementation of technology resources in the classroom, students may feel more in control of their learning, feel more engaged with the topic, and demonstrate more responsibility when completing their coursework.

The use of tablets and one-to-one computing devices has been popular in contemporary classrooms (Cox & Hanson, 2009). For example, tablets, laptops, and even iPhones have been used by teachers to facilitate interactions with learning materials. Technology can be used to enhance the students' experience in the classroom (Enriquez, 2010). Tablet technology, such as iPads, and one-to-one computing, "are tools of communication, they're tools of creativity, and they can be shaped by their user" (Gates, 2010, p. 9). Individuals use technology in different ways, and seek different benefits from different tools. For instance, the Nook tablet may be used for reading, whereas the newest iPad may be used for reading, for internet access, for video streaming, for music, and for gaming. These tools allow users to engage creatively with their learning and surroundings. Technology, because of its versatility, can be effective in creating a classroom that offers students a more interactive and collaborative environment.

Statement of the Problem

The Associated Press (2010) revealed, "The United States' students are continuing to trail behind their peers in a pack of higher performing nations" (para. 1). Considering the demands placed on schools to compete globally in educational achievement, it is increasingly important to provide students with the tools necessary to achieve success. The use of technology in the classroom enhances student performance by creating different learning opportunities. Technological tools support quality instruction and provide a personalized learning environment to sustain differentiation and classroom instruction in the digital age (Smith & Throne, 2007). Tomlinson, (2000) wrote, "Differentiation means tailoring instruction to meet individual needs" (para. 1). While studies have shown that differentiation and accommodations made within the

school environment can positively influence student performance in the classroom, there is little research on whether technology, when used to differentiate learning, can influence student performance. Hidi and Harackiewicz (2000) noted that challenging instructional materials in a differentiated classroom provide choices to students in their academics, promote determination, and positively affect motivation. The importance of investigating the use of tablet technology in the classroom is to discover if tablets can positively influence student performance, students' motivation, students' perception of self-efficacy in the learning environment, and students' time spent on task.

Purpose of the Study

The purpose of this investigation was to examine the use of tablet technology in the classroom and determine whether tablets can positively influence students' perceptions of self-efficacy and motivation within the learning environment and students' time spent on-task. Additionally, the purpose of the study was to discover students' preferences between iPads and paper and pencil, students' justification for their preference, and students' perceptions of strengths and weakness of iPads and paper and pencil.

Significance of the Study

"Tablets are launching a full scale assault on education" (Hill, 2012, par. 1). Exploring the use of tablets in the classroom may provide valuable information for educational leaders, funding organizations, and technology companies. Because today's students are growing up during an era of continuous technological development, it is the responsibility of schools and of educators to incorporate the same technology used outside of school in the classroom to further engage students and enhance learning. The

present study is significant because it provides valuable insight into the use and impact of tablet technology as a classroom tool.

The results of this study can inform teachers and school administrators about the effects of technology use on student motivation as perceived by the classroom teacher, students' perception of self-efficacy and motivation, and time spent on-task when practicing mathematics concepts review. This study can assist administrators in determining if utilizing tablet technology during independent skills practice in mathematics positively affects student motivation and time spent on-task. Furthermore, this study could establish to what extent tablet technology engages students in mathematics skills practice in comparison to pencil and paper practice exercises, thus contributing to the research base on this topic.

Delimitations

The researcher purposely sought to work with 5th and 6th grade students and their teachers who used tablet technology regularly during independent mathematics skills practice. In addition, the study included only students in 5th and 6th grades who attend public schools. Students in this age range, preadolescence or preteens, are beginning to develop independent thinking and share opinions. "It's natural for children this age to begin to think independently and develop their own opinions about various things in their world" (Lee, n.d.). At this stage of development, children are beginning to distinguish their own individual differences from that of their peers, and the risk factors involved in choosing different pathways (Compas, Hinden, & Gerhardt, 1995). The use of public schools did not allow the researcher to state the views of teachers and students in private, charter, or parochial schools. Furthermore, the use of tablet technology was explored in

one rural school district only during independent mathematics skill practice; therefore, it did not allow the researcher to gain the views of those in other districts or of teachers and students in other subjects.

Assumptions

Assumptions can influence a study (Lunenberg & Irby, 2008). This study was conducted based on the following assumptions: (a) the researcher assumed the selected students responded to the survey honestly; (b) the researcher assumed the teachers answered questions honestly and to the best of their ability during the interview; (c) the researcher assumed the data collected accurately portrayed students' time spent on-task; and (d) the researcher assumed the interpretation of the qualitative data reflected the perceptions of the teachers accurately.

Research Questions

The following research questions were developed to guide the researcher in investigating the extent of the relationship between tablet technology and student motivation, self-efficacy, and time on-task:

Research question 1. To what extent does implementing tablet technology in the classroom impact student motivation in mathematics skill practice as perceived by the teacher?

Research question 2. To what extent does learning with tablet technology in the classroom influence students' perceptions of their own motivation and self-efficacy in mathematics?

Research question 3. To what extent does implementing tablet technology in the classroom influence students' time spent on-task during mathematics skills practice?

Research question 4. What do students report to be the strengths and weaknesses of using paper and pencil and iPads in mathematics concepts and skills practice?

Research question 5. If given the choice, what do students report they would rather work with: paper and pencil or iPad during mathematics concepts and skills review?

Research question 6. What are students' justifications for choosing paper and pencil or iPad to work with during mathematics concepts and skills review?

Definition of Terms

To ensure understanding, the following terms are defined as follows for the purpose of this study.

21st century learner. These students tend to be multi-taskers who use sound and images to convey content whenever possible. Learners of the 21st century tolerate written text when technology is not available and view the internet as a universal source of information (Rogers, Runyon, Starret, & Von Holzen, 2006).

Digital immigrants. Those who were not born into the digital world are digital immigrants (Prensky, 2006). Digital immigrants have adapted and are learning the language of technology.

Digital natives. Digital natives are students of the 21st century who are native speakers of technology and are fluent in the digital language of computers, video games, and the internet (Prensky, 2006).

Tablet technology. A tablet is a wireless, portable personal computer with a touch screen interface. A tablet is typically smaller than a notebook computer but bigger than a smartphone (Rouse, 2010).

Self-efficacy. Self-efficacy is concerned with the conviction that one can successfully execute the behavior required to produce the desired outcomes (Gibson & Dembo, 1984).

Overview of the Methodology

This mixed method, quasi-experimental study took place in a rural Kansas school and utilized observations to measure time on-task. The researcher and an assistant completed time on-task observations in a 5th grade classroom and in a 6th grade classroom in which the students used one-to-one technology as well as a paper and pencil math review packet for independent skills practice during mathematics. Additionally, the researcher interviewed the two classroom teachers and distributed a survey to the students to measure perceptions of student self-efficacy and motivation. To conduct the research, the students in 5th and 6th grades were divided into two groups. One group of students completed math multiplication and division review on iPads while the other group completed a similar activity with paper and pencil. The researcher and an assistant completed time on-task observations for 20-minute periods in both the 5th and 6th grade classrooms for each group (iPad and paper and pencil group) in the morning and again in the afternoon. An interview was conducted with the teachers during their lunch break. The visit concluded with the researcher and researcher's assistant distributing and reading a self-efficacy survey to the 5th and the 6th grade classes. Following the visit and the data collection, the researcher completed data analysis by conducting one-sample *t* tests, chi-square tests of independence, and qualitative data coding. These analyses allowed the researcher to interpret the data and draw conclusions.

Organization of the Study

The present study is organized into five chapters. Chapter one included the conceptual framework, background, significance of the study, statement of the problem, purpose of the study, delimitations, assumptions of the study, research questions, definitions of terms, overview of methods, and a summary. Chapter two presents a review of the literature including information on educational reform, 21st century skills and learning, tablet technology and its use in the classroom, students' perceptions of self-efficacy when using tablet technology in the classroom, and student engagement in the classroom as related to the use of tablet technology in learning, and time on-task as it relates to using tablets. Chapter three describes the methodology used for this study. It includes the selection of participants, instrumentation, data collection, and data analysis procedures. Chapter four presents this study's findings including testing research questions, descriptive statistics, hypothesis testing, and additional qualitative analyses. Finally, chapter five provides a summary of the entire study, discussion of the findings, implications of the findings for theory and practice, recommendations for further research, and conclusions.

Chapter Two

Review of the Literature

Technology integration in classroom learning and instruction has the potential to encourage students to become problem-solvers, to become critical thinkers, and to assist students in their readiness to contribute to a growing technological world. Finn and Fairchild (2012) wrote, "Today, American education has the potential to become completely rerouted and accelerated by digital learning" (p.1). It has become increasingly important for school leaders and teachers to utilize technology in the classroom to educate and motivate today's students (McHugh, 2005).

This chapter presents literature relevant to the field of technology and its integration into the classroom. First, an overview of teaching the 21st century student is presented. Second, information regarding technology use in the classroom is addressed. Third, studies of students' perceptions of self-efficacy in relation to the use of technology in the classroom are investigated. Next, literature addressing technology and how it affects student motivation is discussed. Finally, studies that focus on student engagement and technology use in the classroom are presented.

Teaching the 21st Century Student

Educators understand that students need a variety of tools and resources in order to learn about, to experience, and to understand the world around them (Lamb & Johnson, 2012). Technology is one such tool embraced by schools and districts around the country. Digital technology has infused itself into the leisure time and work day of many adults. In addition, for many young people, the integration of technology is part of their everyday life (Henderson, 2011). Researchers Green, Facer, Rudd, Dillon, &

Humphreys (2005) found, "By the age of 21 the average person will have spent 15,000 hours in formal education, 20,000 hours in front of the TV, and 50,000 hours in front of a computer screen" (p. 4). By integrating technology that students are using every day into schools and making it a part of everyday learning, students can perform authentic tasks, define their learning goals and objectives, make decisions about their learning, and evaluate and reflect on their progress (US Department of Education, n.d.). Students will grow up and spend their adult life multi-tasking through technology and live in a multifaceted, technology-driven, diverse world, and it is the responsibility of the schools and educators to prepare them for such an experience (Partnership for 21st Century Skills, 2003).

Traditional teacher-centered pedagogy involves an active teacher as the focus of the classroom with students sitting passively as the audience (Mascolo, 2009). In such classrooms, the teacher has established rules, mandated tasks, provided answers, asked questions focused on recall and recognition, and transitioned to other topics and subjects (Hancock, Bray, & Nason, 2003). Consequently, this traditional method provides students with a basic foundation in the core subjects, assesses few inferential skills, and groups students by ability (Hancock, Bray, & Nason, 2003). With the growth of technology and the need to educate 21st century learners, students need to know more than just basic content knowledge. Teaching in the 21st century means encouraging students to make decisions regarding their learning and give input for designing their own instruction (Prensky, 2006). Henderson (2011) wrote,

> Whilst many of today's youth are able to participate 24/7 in local events half a world away through…connections to online, cabled, wired or wireless media it

> would seem that schooling does not always draw on the multiliterate strengths that students bring to classrooms. (p. 153)

In order to compete in a global economy, it is vital that teachers abandon rote memorization and traditional teacher-centered lessons. As stated by Lamb and Johnson (2012), "One of the big benefits of technology is the ability to reach young people through varied channels of communication" (p. 63). Teachers must guide students to develop critical thinking skills, to become active problem solvers, to be strong communicators and collaborators, to become technologically and financially literate, to be creative, to be innovative, and to be globally competent (Partnership for 21st Century Skills, 2003). Teachers in 21st century classrooms must inspire students to ask strong questions, channel students' interests in productive ways, constantly assess student learning, and provide critical feedback through the use of technology (Lamb & Johnson, 2012). As a result of encouraging them to become technologically literate from a young age through using familiar technology, students will develop into adults who will have the ability to learn, to unlearn, to relearn new technological concepts, and to be motivated to solve problems as well as create solutions using technology.

Through the Internet, learners and "knowledge creators" (Starkey, 2011) are able to communicate with others in the world with similar interests who are able to collaborate, connect, and give feedback. Knowledge, in the digital age, is rarely developed in isolation. Starkey (2011) created and used a digital learning matrix to evaluate six digitally literate New Zealand secondary teachers and their use of digital technologies during their first year of teaching. The teachers volunteered to be studied through observations, reflections, and interviews. Prior to the study, Starkey (2011)

stated, “It appears that it is the teacher rather than the technology that influences the effectiveness of digital technology use in schools” (p. 24). A multiple case study design was used to explore the ways digital technologies are used in learning for a range of purposes. Starkey also used student think-alouds to determine whether or not learning was taking place in the classroom. From the interviews and observations, Starkey (2011) concluded that teachers’ personal beliefs influenced their approaches to education and the learning process; however, technology use did not influence teachers’ beliefs about student learning. Furthermore, Starkey (2011) found that it would not be smart to have students creating and sharing knowledge in every lesson; students need time to think and make connections to concepts and ideas and to learn skills necessary for classroom learning. The results of the study demonstrated that the technology aided in students’ engagement during an activity and students’ connection and development of conceptual knowledge, while there was less evidence of critiquing, evaluating, or creating. Starkey (2011) concluded, “School leaders in the digital age should be confident in their ability to make connections, understand concepts, critique, create, and share knowledge” (p. 37).

Proficient technology use is a necessary skill for participation in today’s society and workplace; students are entering schools with a preconceived notion about the tools they want to use to support their learning and the way they want to learn within the classroom (Geer & Sweeney, 2012). Researchers, Geer and Sweeney (2012), conducted a study with South Australian students, 5-7 years of age, about their learning. All students, 100 students total, were read a survey that required them to answer questions about the way technology impacts their learning and asked to share advice they would give to teachers to help them learn.

The researchers used focus groups, surveys, interviews, and visual representation (student drawings) to collect student data. In the 347 student drawings, 77% of students identified computers/laptops as helpful tools, 44% enjoyed using the interactive whiteboard when learning, and 70% recognized that books and dictionaries were helpful when learning. In focus groups, students also identified teachers, friends, parents or family members, libraries, calculators, and pencils as helpful learning resources. In addition, the six focus groups of students provided positive feedback on the way technology helps them learn, including that technologies help them understand concepts easier and make learning more enjoyable.

The technology tools supported clear learning expectations set by the teacher. The seven-year-old students noted that with technology there is more opportunity for communication and the sharing of ideas through Internet use. In addition, these students echoed the thoughts of the younger students, stating that technology makes learning exciting and interesting. As acknowledged by Geer and Sweeney (2012), "This data leaves educators with the challenge of seeking the holy grail of what an innovative contemporary learning environment might look like for today's students" (p. 302). The researchers found that students are drawn to technologies as a motivational tool, and the study supports that technologies are one way to motivate, engage, and enhance student learning. However, challenges to successful technology implementation still remain. Geer and Sweeney (2012) stated, "The challenge remains to explore and implement learning that identifies a 21st century learning environment without forgetting that a lot of learning does occur outside the classroom as well" (p. 302).

Students today grow up surrounded by technology; they are digitally literate, experiential, and social (Rogers et al., 2006). Schools and teachers must work to bridge the technology gap between home and school by incorporating students' digital understanding in the classroom. According to the United States Department of Commerce (2010), over 70% of students age15 and older in the country have access to the computer and internet in their home, and over 85% of children 3 years of age and older in the state of Kansas have access to a digital device and internet in their home. In a New York Times article, Ritchel (2012) argued, "Access to devices has spread, children in poorer families are spending considerably more time than children from more well-off families using their television and gadgets to watch shows and videos, play games and connect on social networking sites" (par. 3).

Technology in the Classroom

Our lives are constantly changing and interfacing with different technologies, and education is greatly affected by these advances. Furthermore, technology can be seen as a catalyst for change in schools and can be aligned to specific content areas and learning goals (Culp, Honey, Mandinach, & Bailey, 2003). Technology is changing the way young children learn, think, and act. As children interact with technology, they are active participants involved in meaning-making, exploring content and information, and expressing their own sense of self-identity; they move from being passive learners to creators, to designers of their learning, and to experts (Mara & Laidlaw, 2011). Outside of school, children process multiple sources of digital information on a consistent basis. Consequently, schools need to capitalize on this digital age of learning and implement the

technologies and technological skills into content learning and discovery within the classroom.

Implementing technology in the classroom is one way to alter the learning environment to inspire and develop higher order thinking, analyzing, and problem solving skills (Graham, 2012). It is vital that schools and educators extend the students' technological literacy from outside the school building to within the classroom during daily learning (Prensky, 2006). Studies conducted by Rockman and Walker (1997, 1998, 2000), showed that one-to-one computing in the classroom strengthens the students' ability to learn and easily transfer knowledge across the disciplines. Rockman &Walker (1997) found through interviewing teachers who participated in a one-to-one laptop program that student motivation increased and student behavior and attitude became more positive with the use of technology. Teachers in the study stated that the one-to-one laptop program promoted and increased collaboration, enhanced independent classroom learning, supported enthusiasm for school, and supported engagement in problem solving. Rockman and Walker (1997) conducted a three year study across 29 school sites in the United States in which all students in participating grades and schools received a laptop to use during the school day and at home. The researchers examined and studied the Anytime, Anywhere Learning Laptop Program. The program was designed to explore barriers to and facilitators of the process of implementing a one-to-one technology program, to identify effective implementation strategies, to evaluate plans and expectations for instructional use, and to document changes in teaching and learning. The study involved collecting test scores, distributing and collecting surveys and questionnaires, and interviewing and examining teacher and student logs for laptop use.

After the first year, teachers, parents, students, and administrators reported high levels of enthusiasm (6 on a rating scale of 1-7, with 7 representing the highest level of enthusiasm) for using laptops for all schoolwork. Enthusiasm for the laptop program remained high (5.5) for years 2 and 3 of the study. Teachers reported that laptops exceeded their expectations and were easy to use. Also, teachers observed students expressing excitement about working on them. Additionally, teachers stated that one-to-one technology allows students to work at their own pace, allows for advanced students to express themselves more creatively, and "adds a new dimension to their self-esteem" (Rockman & Walker, 1997, p. 29). Students reported enjoying *Word* and *PowerPoint* because of the graphics and usability of the programs.

In addition, Gulek and Demirtas (2005) conducted a study in a California middle school, which investigated the effect of laptop computers on student achievement. As part of an experimental laptop immersion program, all 259 students were asked to purchase a laptop, and if their families could not afford a laptop, one was loaned to them by the school. Teachers were trained in teaching students to use laptops in the classroom and students in the study were directed to utilize their laptops daily in the classroom to complete various activities. To measure if the laptops, in the laptop immersion, were impacting student learning, the researchers used grade point averages, end-of-course grades, and district and state assessments. The results revealed students using one-to-one computing technologies "are highly engaged and focused in activities, frequently apply active learning strategies, interact with each other about their work, problem solve through project-based activities, and regularly find information, make sense of it, and communicate it" (p. 6). Students participating in the program had higher grade point

averages than those who did not. A substantial difference was found in end-of-quarter assessment grades with students who participated in the program versus students who did not, and district and state assessments showed notable differences in scores between students using laptops daily and students who did not.

Technology is at the heart of 21st century learning and today's learners believe that computers are not just technology, but also a part of their life experience (Rogers et al., 2006). Murray and Olcese (2011) conducted a study to "investigate whether or not the iPad and its software environment allow users to do things in educational settings that they could not otherwise do" (p. 43). The study was designed to examine if using iPads enabled 21st century learning and skill development. The researchers explored approximately 30,000 applications (apps) from Apple's 20 different established education categories, for iPhones, iPods, and iPads to determine if any fit into any of Mean's (as referenced in Murray & Olcese, 2011)) established four categories of educational technologies: tutoring, exploring, communicating, or fostering collaboration in a given subject area. The researchers were able to narrow the 30,000 applications to 315, and were further able to catalogue 112. The results of the study demonstrated that many functions of the technological devices allow users more advanced paths to interaction, collaboration, and social networking. Applications also allowed users to synchronize data, share, and access resources across multiple users and from different locations. The researchers noted that current applications on iPads, iPhones, and iPods had the potential to "not only extend what can be done in classrooms, but also strive for better connection to learning theories" (Murray & Olcese, 2011, p. 47).

Oliver and Corn (2008) found in a two-year mixed methods study that utilizing one-to-one computing with middle school students positively influenced student behavior and attitude within the classroom and school. The study was requested by a private middle school in the southern United States, and included 300 students in grades 6-8. The study participants completed two 50-item surveys, one at the end of the 2006-2007 and 2007-2008 school years, using a Likert-type scale. Questions asked students about their satisfaction with technology, their experiences with technology, their technological skills, and their technology experience across subject areas. The students reported that the use of technology in the classroom provided them with more opportunities to learn. Students who used one-to-one computing in the classroom rated themselves higher on technology skills than those who did not use one-to-one technology.

Results of the survey, observations, and interviews revealed that only the 6th grade students reported a significantly higher satisfaction with the way their teachers were utilizing technology in the classroom; 6th and 7th grade students reported significantly higher satisfaction with opportunities to learn new technology tools. Several statistically significant differences emerged in regard to the study of subject-area technology use. There was a statistically significant difference in technology use across all grade levels in math and science, a statistically significant difference in technology use in social studies for 6th and 7th grades, and a statistically significant difference in technology use in foreign language in 8th grade. Finally, results showed a statistically significant difference in 6th grade students acquiring new skills in regard to technology use. Oliver and Corn (2008) stated, "Observations did not indicate any increase in cooperative or collaborative learning in year one" (p. 225). The researchers concluded that to integrate technology

successfully in the classroom across subject areas, teachers need professional development and support. The researchers reiterated that changes in classroom teaching take time as does the students' experience with those changes.

Today's generation of students is different from the previous generations. They are digital natives. The children are growing up with technology and excited to use it in all facets of their life. Students are entering classrooms with ideas about how they want to learn and the tools they want to learn with (Geer & Sweeney, 2012). Studies are showing that it is important for schools to begin incorporating these familiar technologies into the educational lives of students.

Student Perceptions of Self-Efficacy and Technology

To succeed at a task or demand, people need not only the required skills and skill level but also a strong belief in their ability to exercise personal control and motivation (Bandura, 1990). Conversely, when students lack this perceived sense of self-efficacy, they do not manage situations effectively, even when they possess the required skills and know what to do (Bandura, 1990). Tomlinson (2005) wrote, "Self-efficacy is born only when any student encounters something that student believes to be out of reach, only to find out that he or she had what it took to overcome what seemed impossible" (p. 13). Self-efficacy permeates all ways of life: goal setting, achievements, competition, behavior, and academics to name a few. Students who are confident in their academic capabilities work harder, evaluate their progress frequently, and engage in more self-regulatory strategies that influence academic success (Usher and Pajares, 2006).

Self-efficacy beliefs are determinants in human behavior and experience. Within academics, to reach success students depend on being able to exert control over their

behavior and motivate themselves properly to succeed. For example, when students believe that their efforts and application of skills have been successful, their confidence is raised; while on the other hand, when they believe their efforts have failed, their confidence is diminished (Usher and Pajares, 2006). Finally, self efficacy refers to people's beliefs about their capabilities to organize and to affect their courses of action to attain set goals (Capara, Vecchione, Allesandri, Gerbino, & Barbaranelli., 2010).

Chen and Zimmerman (2007) compared 120 seventh grade students in Nashville, Tennessee to 188 sixth grade students in Taiwan. The study compared data from a mathematics self-efficacy scale, a mathematics assessment, a mathematics effort judgment scale, and a self-evaluation scale to examine if nationality affected self-efficacy judgments. The researchers utilized multiple translators to ensure the surveys and the test were well understood. The testing was comprised of two one-hour sessions to prevent the students from becoming fatigued. Results revealed evidence of a cultural difference in reactions to students' perceptions of their own learning abilities and self-efficacy. Asian students were more likely than American students to believe that academic failure has great consequences. Also, Asian students had lower self-efficacy beliefs and a higher fear of academic failure. In addition, the findings revealed Asian students believe that exerting more effort when studying will lead to better academic results and gains in achievement; whereas, American students tend to believe that learning and academic ability were innate. The results of the self-efficacy study showed that American students rated their self-efficacy higher than Asian students did on easy mathematics items, but not for moderately difficult and difficult math problems. Similar results surfaced on the self-evaluation survey, in which American students rated themselves higher on easy math

problems, but lower on more difficult items. The Asian students rated themselves higher in self-efficacy and self-evaluation on more difficult math problems. Researchers concluded that self-efficacy beliefs on easy math problems were indistinguishable and significant differences only emerged with the more difficult math problems; American students were more likely to give up, whereas, the Asian students were more likely to work harder to come to the correct answer.

Lei and Zhao (2008) examined the use of one-to-one technology (tablets or laptops) among 231 middle school students and 28 teachers. The study utilized surveys and interviews and was conducted in a middle to upper-class school in which most students (97%) had access to the Internet at home. Researchers found that when students brought their one-to-one computing technology to school, 81% used it for school work such as taking notes or homework, 71% used it for searching information for school work, and over 80% reported having a feeling of being more organized. Students who struggled with organizational skills reported feelings of satisfaction and success when using the technology to help with organizational skills. The students were able to acknowledge the usefulness of the tool to keep them organized with their schoolwork and homework. Also, students reported feeling powerful leading to higher self-efficacy beliefs because they could access the Internet to discover additional information that contributed to their classroom learning. There was collective student satisfaction in their "ability to construct, explore, and learn at their own pace" (p.108).

Incorporating familiar technology into classroom instruction may increase a students' sense of self-efficacy. Authors, Tsai, Tsai, and Hwang (2010) surveyed 414 students in grades 3 through 6 on the use of personal digital assistants (PDAs) in the

classroom during ubiquitous learning or u-learning. The results of the self-efficacy and attitude survey demonstrated that students with high self-confidence when it comes to the use of tablet technology had a reduction in class related anxiety and were more willing to utilize the technology in the learning process. The findings also revealed that students with higher confidence in using hand-held technological devices had a more positive outlook on their education when using one-to-one computing devices as learning tools (Tsai et al., 2010). Furthermore, students with a high sense of self-efficacy believed they could accomplish a task when confronted with obstacles and adverse situations.

Tablet Technology, Student Motivation, and Student Engagement

One study conducted by Amelink, Scales, and Tront (2012) investigated student use of tablet PCs and its impact on student learning behaviors. This study examined 560 university students in an engineering program, and found that there was an increase in student confidence and motivation related to applying concepts learned in class when using programs on the tablet PC. Of the students surveyed, the researchers received results from 12% of the student population who were administered the Motivated Strategies for Learning Questionnaire (MSLQ). A Pearson correlation was used to analyze the survey results and it was determined that there was a statistically significant, positive relationship between student use of the tablet and learning behaviors. The researchers concluded that instructional technology, when used among undergraduate, engineering students, enhanced their motivation to learn and apply course concepts in new ways. Technology has the potential to increase student motivation in the classroom.

Blankenship, Ayres, and Langone (2005) found students diagnosed with emotional disturbance (ED) had increased independence, increased content retention, and

higher instructional engagement when using iPad technology. The researchers completed their study in an alternative public high school math classroom and conducted their research with seven students; however, only three students returned parent permission slips to have their data and information published. The study involved an alternate treatment design to compare two instructional methods: math worksheets and a math program utilizing an iPad. Each treatment group worked for 40 minutes, and the number of correct answers per minute was recorded. The researchers also observed and recorded active engagement and student behavior during the 40-minute intervals. The findings revealed that the technology allowed students more flexibility in goal achievement and choice making, and therefore, the students had increased independence, engagement, and self-determination.

Jaciw, Toby, and Ma (2012) conducted a study to explore if the iPad can facilitate learning, particularly in middle school mathematics, as well as boost students' motivation to learn and succeed in algebra. Their study utilized a specific tablet algebra program that included the content of the printed textbook along with a series of interactive tools that allowed for exploration of various algebraic concepts. The study took place in four different school districts in California, within six schools, and with 11 teachers during the 2011-2012 school year. Within the study, there were 11 treatment sections with a total 334 students and 23 control sections with a total of 664 students. Students in the treatment group used an algebra app that provided interactive lessons, explanations, quizzes, and problem solving as well as videos and a glossary of vocabulary terms. The students in the control group used a print edition of the iPad program as well as various worksheets. Students completed final assessments on the California Standards Test in

Learning Questionnaire. Teachers in the study were surveyed on nine occasions about tablet use during instruction and students' time spent using tablets in the classroom. While the results demonstrated the iPad did not impact performance on the California Standards test or on the end of course assessment, there was positive impact on motivation to learn and students' attitude toward math. The researcher deemed the results of the research as exploratory and suggested future investigations be completed.

Educational technologies allow educators and students to integrate multiple sources and applications to create the best possible learning environment for the students (Hooper & Rieber, 1995). Because the 21st century generation of students is labeled as digital natives, teachers need to foster and enhance the appreciation and understanding of technology as well as integrate it into the curriculum. In doing so, students can begin to take ownership of their learning; they will become intrinsically motivated to solve problems, apply concepts, and succeed in school. Wilson and Corpus (2005) wrote that intrinsic motivation is one contributing factor to academic success and student learning. Technology provides the tools for authentic learning, creates diverse learning environments and opportunities to evaluate learning in multiple ways, and enhances the way teachers teach and students learn (Schrum, 2013). Today's students multitask and use images and sound as often as possible to convey content (Rogers et al., 2006).

In order to study motivation in the classroom, researchers, Autio, Hietanoro, and Ruismaki (2011) conducted a qualitative case study, to discover if technology impacts students' motivation. Individual theme interviews were conducted with four 15-16 year old students. The four individuals were chosen based on their gender and attitude, positive or negative, toward technology in education. All participants came from the

same school in Finland. With each participant, the researchers found that students were more motivated when using technology because the technology offered them a greater freedom of choice and immediate feedback. The students also commented that a technology rich classroom environment further enhanced their motivation because of the different stimuli used to challenge and engage them in their studies.

"Youth in contemporary society have been profoundly impacted by an array of new media applications realized through networked and stand-alone computers, smart phones, and other devices" (Liu, Horton, Olmanson, & Toprac, 2011, p. 2). Researchers, Liu, Horton, Olmanson, and Toprac (2011) conducted a mixed method study with 180 middle school students, specifically 6th grade science students. The study investigated how technology affected student motivation in science learning. To collect data, the researchers administered a science knowledge test, a motivation questionnaire, and open-ended response questions. The researchers conducted a multiple regression analysis on the data of student motivation and students' science knowledge. The results of the analysis of the six open-ended survey questions, centered around a science computer game "Alien Rescue", varied widely from extremely positive to extremely negative. The word "fun" was used 107 times, and many students stated enjoying the challenge of the program and the problem solving it involved. Additionally, 51% of students stated that the program assisted them in learning about the solar system, 12% of students stated that they enjoyed the problem solving, and 15% of students enjoyed the computer program because it taught them about different alien species. Finally, 61% of all 6th grade students surveyed enjoyed the computer program "Alien Rescue" more than other science activities that taught similar concepts. The results showed that students' motivation score

significantly predicted their science knowledge test score. The results revealed that the higher the students' motivation score, the higher the students' scored on their science post-test. Today's students, the digital natives, have access to a variety of technological tools to enhance the world of education and possibly to enhance their motivation as well.

Chen (2010) wrote, "Today's students find this new world of digital learning to be very motivating" (para. 3). "I believe many students are bored and unmotivated because of the way they are taught, with heavy reliance on reading textbooks, memorizing facts and figures, and listening to lectures, over and over" (Chen, 2010, para. 2). Students need to feel ownership of their learning.

Technology integration in the classroom can become a motivational factor for students, motivating students to pursue their learning with vigor. By incorporating technology, teachers can reach students through varied channels of communication (Lamb & Johnson, 2012). Furthermore, students who are presented curriculum with which they can interact will be more likely to be motivated to learn, and therefore, their performance will increase (Amelink, Scales, & Tront, 2012).

Haydon et al. (2012) compared the effects of worksheets and iPads on student engagement and the accuracy of math work of three high school students in an urban Midwestern alternative school. The classroom teacher had requested support to address low rates of engagement during instruction. The observations occurred over the course of 15 forty-minute math sessions. All three students received special education services under the criteria of Emotional Disturbance (ED). The researcher utilized an alternate treatment design to compare student engagement and behavior between worksheets and iPads in math.

Over a 5-week period, Haydon et al. (2012) observed student engagement and behavior as students completed math work on worksheets for a time period ranging from 26-40 minutes and on iPads for a time period of 26-40 minutes. Results showed that all the students received a higher number of correct responses when completing math work on an iPad. "All data points (100%) exceeded the highest worksheet data point across all phases of the study" (p. 239). From the research, it was found that technology use in the classroom has the ability to give students immediate feedback and show learners how to answer questions correctly to prevent practicing the wrong skill. The data demonstrated that students had noticeable increases in correctly completed problems per minute on the iPad versus on the worksheet. For instance, out of ten questions, one female student scored only one problem correct on the worksheet and three correct on the iPad; had an engagement score of 88.7 while working with a worksheet and an engagement score of 98 while working with an iPad. One male student did not get any problems correct while working on the worksheet and scored approximately four out of ten correct while working on the iPad. He had an engagement score of 86 while working on the worksheet and a score of 98.6 while working on the iPad. Another male student did not score any problems correct on the worksheet and received two and a half out of ten correct on the iPad. He had an engagement score of 69 while working on the worksheet and a score of 100 while working on the iPad. Furthermore, the researcher explained that the iPad promoted active student learning by providing immediate feedback to student errors as well as each correct response, thus reinforcing the correct responses.

Technological tools such as iPads, are transforming instruction and the way students are learning in the classroom. Lombardi and Oblinger (2007) reported students

are more motivated and engaged in their learning when they are presented with real-world problems to solve and are provided the opportunity to complete hands-on activities rather than simply listening or taking notes from a lecture. Teachers reported that students are more engaged as they do not view classroom activities with technology as schoolwork, but as exciting and unique experiences (Saine, 2012).

Students can demonstrate engagement in a multitude of ways including: making connections with prior knowledge or other text/media, monitoring and applying their understanding of concepts through critical thinking activities, and having an organized approach to identified learning activities. Franklin (2011) suggested the virtual world does not change the indispensable aspects of how people learn, but it unites learners and challenges them to work in partnerships during problem solving activities and participate in meaningful learning. Furthermore, Autio, Hietanoro, and Ruismaki (2011) wrote, "Motivation is critical not only to current academic functioning, but also to student beliefs in their future success as students" (p. 360). The use of iPads or other tablet devices in the classroom may be one such way to encourage student motivation, student responsibility, and student engagement in the classroom. Amelink, Scales, and Tront (2012) acknowledged that one way student motivation to learn can be examined is by observing student engagement during learning. Additionally, tablets may help bridge the gap between classroom learning and practical workplace skills and also promote more diverse fields of learning and study (Hamdan, 2012).

Summary

This review of literature provided an overview of technology in the classroom as it relates to 21st century student learning and student motivation, as well as student self-efficacy, and student engagement. The literature review provided relevant information about technology use, specifically tablet technology and one-to-one computing. Reviewed studies demonstrated that students were engaged with and exposed to technology often and from an early age. Furthermore, literature revealed that the field of education is changing. Students today are growing up in the digital world and schools need to teach students to utilize technology in order to promote higher order thinking skills, to bridge the way students live with the way students learn, to reduce class anxiety, and to enhance students' outlook on education. Also, studies revealed that students are more motivated to explore concepts when technology is involved.

Observations and survey tools have been relied upon for much of the research, and the outcomes show the strong influence technology has on schools and classrooms. There is a fear among educators that schools and district officials are rushing into tablet and one-to-one technology implementation without sufficient knowledge or research on the effects it has on the classroom (Attard and Northcote, 2011). The findings of the literature review demonstrated that iPads and tablet technology have the potential to revolutionize teaching and learning. Each study addressed the importance of incorporating technology into the education of the 21st century student and the importance of higher order thinking skills that can be tapped through its use. Study results varied; however, the predominate message conveyed in the literature was that a need for additional research regarding the use of tablets in the classroom exists.

Chapter three presents the research design, population and sample, research questions and hypothesis, data collection, and analysis of the study. Also, the chapter restates the purpose of the study and research questions and identifies the hypotheses, as well as shares data collection procedures.

Chapter Three

Methods

The primary goal of this study was to investigate the use of tablet technology in the classroom. Specifically, the study investigated the extent of a relationship between the use of iPad technology and teacher perceptions of student motivation, students' perceived motivation and self-efficacy, and students' time spent on-task in the classroom during mathematics concepts and skills practice. Additionally, the researcher investigated the strengths and weaknesses of iPads and paper and pencil when completing classroom work as reported by the students, students' preference between iPads and paper and pencil, students' justification their preference. The methodology employed to address the research questions is presented in this chapter. Chapter three includes nine sections: (a) research design, (b) population and sample, (c) sampling procedures, (d) instrumentation, (e) measurement, (f) validity and reliability, (g) data collection procedures, (h) data analysis and hypothesis testing, (i) limitations, and (j) summary.

Research Design

The researcher used a mixed methods design. Most of the data that were collected were quantitative, but the researcher asked the students two open-ended questions and interviewed the teachers. Most prevalent in the study was quantitative analysis. The researcher used qualitative analysis to support and add depth to the research study.

The researcher analyzed the effect of the independent variable, the utilization of iPads and worksheets during mathematics skills review. The dependent variable was time on-task as measured by observations conducted during a mathematics activity. The quantitative variables were teachers' perceptions of student motivation, students'

perception of motivation and self-efficacy, and the qualitative variables were students' preference between iPads and paper and pencil, students' justification their preference, and students' perceptions of the strengths and weaknesses of iPads and paper and pencil when completing classroom work.

Population and Sample

The population for the study included students in 5th and 6th grades in District A, a rural Kansas school district comprised of one building educating students in kindergarten through 12th grade. The total population for this study in 5th and 6th grades was 22 students, while the sample size was 21 students. The sample included two teachers as well as students in 5th and 6th grades with a complete set of data, including perceived self-efficacy surveys and time on-task observations. The 5th grade sample included 12 students with experience using iPad technology during mathematics skills practice. The 6th grade sample included 9 students with experience using iPad technology during mathematics skills practice.

Sampling Procedures

Purposive sampling provided the means to investigate a specialized population (Lunenberg & Irby, 2008) of students and teachers who used tablet technology daily within the classroom. The selection of students was based on the teacher and classroom being equipped with one-to-one iPads for students during instruction and learning in mathematics class. Students using their own iPad during mathematics skills review was a second criterion for participation in the study. The third criterion for participation was having parental permission. One sixth grade student opted out of participating in the study and therefore, that student's data were excluded.

Students in 5th and 6th grade were chosen due to their ability to demonstrate self-control in the classroom, to make independent decisions, and to be self-aware of the decisions they make. Eccles (1999) wrote about early adolescent children, "They seek opportunities to master and demonstrate new skills, to make independent decisions and control their own behavior, and to form good social relationships with peers and adults outside the family" (p. 31). Finally, this group of students was chosen because of their familiarity with technology use in the classroom. The superintendent of District A (personal communication, April 2, 2013) said, "Students in 5th and 6th grade have been using some kind of technology since 1st grade. They used iPods, computers, and now iPads."

Instrumentation

The researcher used a variety of instruments to investigate the research questions. In order to measure student motivation as perceived by the teacher, the researcher conducted a semi-structured interview individually with each 5th grade and 6th grade teachers. The interview script included four questions: (a) How do you believe that the use of iPads in the classroom affects the students' motivation to work during mathematics? (b) In what ways do you believe iPads affect classroom dynamic and student behavior? (c) From your observations, how do you believe iPads affect students' sense of self-efficacy and class participation? (d) From your observations, how do you believe iPads affect students' overall learning and grades? Additional follow up questions were asked to clarify further key points and teacher thoughts. See Appendix A for the entire interview script.

To gather data on the effect of tablet technology on students' perceptions of self-efficacy and motivation, the researcher developed a self-efficacy survey (see Appendix B). The 12 item self-efficacy, Likert-type survey, contained one statement that addressed student motivation and 10 that addressed facets of self-efficacy. The Teacher's Sense of Self-Efficacy Scale Short Form (Tschannen-Moran & Hoy, 2001), was modified for use in the current study. First, the Likert-type scale range was altered from a one-to-nine point scale to a one-to-five point scale to measure agreement with a particular statement where l = *Nothing*, 2 = *Very Little*, 3 = *Some*, 4 = *Quite a Bit*, and 5 = *A Great Deal*. Second, the researcher altered the questions from Tschannen-Moran and Hoy's self-efficacy short form (12 questions) to become statements about the use of iPads in the classroom. Questions were written so that when they were read aloud, students would be able to better comprehend their meaning. The modified survey also included statements addressing student behavior and academics as a result of using the technology in mathematics. For example, the question, "How much can you do to motivate students who show a low interest in school?" (Tschannen-Moran & Hoy, 2001) was changed to the statement, "An iPad motivates me in completing school work." Another question, "How much do you help your students value learning?" (Tschannen-Moran & Hoy, 2001) was altered to the statement, "An iPad helps me to value learning with my teacher and classmates." The survey was designed to take the students approximately 10-15 minutes to complete.

The researcher measured students' time on-task by using two grids that organized information about the observations. The worksheet and iPad observation grid was comprised of seven columns and sixteen rows. The columns contained labels for the

student's identification letter, the grade of the student, and the minute observed. During the observation, the researcher and researcher's assistant marked whether the student was on-task (o), actively off-task (a), passively off-task (p), or verbally off-task (v).

Following the completion of the self-efficacy survey, five open-ended statements were read aloud to the students to encourage students to compare using the iPad in math to using worksheets and to justify their reasons. The statements were: (a) The very best thing about using paper and pencil is; (b) The very worst thing about using paper and pencil is; (c) The very best thing about using iPads is; (d) The very worst thing about using iPads is; (e) If given the choice, would you rather complete math work with an iPad or on paper and pencil and why?

Measurement. Several instruments were used to measure the variables included in the six research questions. Time on-task, a variable included in research question three, was measured by completing 3 one-minute observations of each student during which time on-task was recorded. In order to measure the variable of perceptions of student motivation as noted by the teachers in research question one, the researcher utilized interviews and took field notes as well as recorded and transcribed the interviews. For the purposes of this research, the self-efficacy scale was altered to measure the students' self-efficacy when using tablet technology. The efficacy scale was comprised of statements and a Likert-type scale designed to measure the attitudes and opinions of the students in response to the statements. The Likert-type survey was used in order to answer research question two, addressing the extent iPads influence students' motivation and self-efficacy. In addition to the self-efficacy scale, the students also answered five constructed response questions. According to McEwing (2013), constructed response

questions allowed for the students to focus on central aspects of the content, to expand on their thoughts and opinions, and to allow for variation in student responses. The five open-ended questions were designed to measure the variables in research questions four, five, and six: strengths and weakness of iPad use and paper and pencil use, student preference for iPad or paper and pencil, and justification for their preference. The open-ended questions were helpful because the student was not influenced by the researcher to answer in a certain way and allowed "respondents to freely answer the question as they want without limiting their response" (Dillman, Smyth, & Christian, 2009, p. 72).

Validity and reliability. The Woolfolk Hoy teaching self-efficacy survey was created after extensive research on established self-efficacy surveys in an effort to create a more reliable and valid measurement tool. Researchers, Tschannen-Moran & Hoy (2001), wanted to be sure that the survey allowed teachers to respond to statements about their ability to meet the needs of capable students as well as their ability to use a variety of instructional strategies to promote student thinking. The researchers developed their original survey with 8 participants; each had teaching experience ranging from 5-28 years. Each participant was provided with a list of teaching elements that Bandura (1997) used when he measured self-efficacy in teaching. Tschannen-Moran and Hoy asked the participants to independently select the items they believed to be important tasks or elements of teaching. Furthermore, the participants generated 8-10 new items that reflected areas of teaching that were not included in Bandura's scale. From this process, 100 items were produced, combined, and discussed. Ultimately, 52 items were kept to assess the range of important teaching tasks or elements. A nine point scale was generated and used for each item including: 1 = *nothing*, 3 = *very little*, 5 = *some*

influence, 7 = *quite a bit*, and 9 = *a great deal*. The resulting self-efficacy measure was named the Ohio State Teacher Efficacy Scale (OSTES) (Tschannen-Moran & Hoy, 2000). The scale was studied 3 different times. The first study narrowed the 52 item scale to 32 items after being tested on 224 participants, men and women ages 18-47 years of age, including preservice teachers as well as inservice teachers. After sampling 217 participants from three different universities, researchers reduced the 32 item scale to 18 items. After the third study, researchers further refined the OSTES by conducting a field test in a class of 19 at the Ohio State University. Within this class 17 were teachers and 2 were educators of teachers. The field test required the participating class to read the survey statements and add or eliminate statements. After modifying the survey based on feedback from the class, it was again tested on a sample of 410 participants, male and female preservice and inservice teachers from the three universities from the second test. The results of this survey helped Tschannen-Moran and Hoy create both the 24 item long form and 12 item short form of the self-efficacy survey.

From this point, Tschannen-Moran and Hoy (2001) examined construct validity of the long and short forms by assessing the correlation between efficacy of student engagement, efficacy for instructional strategies, and efficacy for classroom management of this tool with existing tools that measure efficacy in the classroom. Tools such as Gibson and Dembo's Self-Efficacy Scale (Gibson & Dembo, 1984) and the Rand Measure of Self-Efficacy (as cited in Rotter, 1966) were utilized. The results of the analyses revealed that the Ohio State Teacher Efficacy Survey (OSTES) was considered reasonably valid and was considered a useful tool for researchers interested in examining personal self-efficacy among teachers (Tschannen-Moran & Hoy, 200). The OSTES is

"superior to previous self-efficacy surveys in that it has a unified and stable structure and assesses a broad range of capabilities that teachers consider important to good teaching" (Tschannen-Moran & Hoy, 2001). This survey has sound psychometric properties that can be used in diverse educational settings to measure teacher self-efficacy (Tsigilis, Grammatikopoulos, & Koustelios, 2007).

In order to ensure content validity and readability of the survey for 5th and 6th grade students to use and understand, the researcher met with two 5th grade students and three 6th grade students who were familiar with and comfortable using iPad technology. The researcher and students discussed motivation, student behavior, classroom learning, learning strategies, and organization as they related to the use of iPads. Because the group was small, the group discussed and came to a consensus on the wording of each survey item. Based on the students' input, the researcher modified the 12 statements on the self-efficacy survey and reduced the Likert-type options to a one to five rating scale, with one representing nothing and five representing a great deal. Reducing the number of answer options made it easier for students to rate their opinions and attitudes. After the researcher and committee of students finished the survey modifications, the researcher asked for three different volunteers in both the 5th and 6th grades to take the survey. Again, the students taking the survey had familiarity with and experience using iPad technology. Following the students' completion of the survey, the researcher and the students who helped modify it sat together to discuss the survey statements, and whether any statements were unclear or needed modification. The students indicated to the researcher that the questions were easy to read and understand. By incorporating the 5th and 6th grade students the researcher was able to ensure that the survey and Likert-type

rating scale were easily understood by the intended audience. Finally, the researcher presented the survey to both a high school math teacher and a middle school math teacher. These two individuals read the survey once more to check for readability and understandability in regard to student iPad use and efficacy in math. Slight grammatical corrections were made to enhance readability.

Data Collection Procedures

Prior to conducting the study, the researcher submitted a letter explaining the dissertation topic to the superintendent of the district, who is also the principal of School A, in order to obtain approval to conduct the study in the district. Initial permission was requested to conduct the research study in District A on September 17, 2012 (see Appendix C) and granted on September 25, 2012 (see Appendix D). Second, a request to visit and conduct the research in the 5th and 6th grade classrooms on April 2, 2013 was made on February 7, 2013 (see Appendix F). Finally, permission to send home an opt out participation form to the parents, to observe the 5th and 6th grade students (see Appendix G), and interview the 5th and 6th grade teachers was obtained from the teachers on February 12, 2013 (see Appendix H). An Institutional Review Board (IRB) request was submitted to Baker University and approved on March 26, 2013 (see Appendix I).

The researcher and an assistant traveled to District A to conduct the student observations, interview the teachers, and survey the students regarding the use of iPads during mathematics practice on April 2, 2013. The researcher and assistant began the morning in the 6th grade room. First, the class was divided in half. Then, each student was handed a sticker with a letter on it to provide the students with anonymity. The students were instructed to keep their sticker on their shirt to help the researcher and

assistant complete their observations. Then, the students were told that half of them would work on their iPad for 20 minutes while the other half would work on a math packet. The application the students used on the iPad was MathBoard. This application is customizable, and so the teacher and students were able to set the app at the appropriate level. For this study, the application was set to provide students with a mix of 2-digit and 3-digit multiplication review problems and a variety of long division problems. MathBoard also provided students space at the bottom of the screen to do the necessary work to answer the problems correctly. The math packet the students worked from was provided by the researcher and was comprised of 5-7 pages of mixed multiplication and division review problems. The mixed review included basic multiplication and division facts, multiplication and division word problems, 2-digit multiplication review, and mixed long division. Both groups worked on similar content but through different mediums.

The researcher and researcher's assistant conducted two 20 minute observations in both 5th and 6th grade classrooms. Over the course of 20 minutes, students were observed in 1-minute intervals and their on-task or off-task behaviors were recorded. Observation behaviors were recorded on sheets of notebook paper. Following each 20 minute period, the researcher and assistant conferred about the observed behaviors of the students.

During morning classroom hours, the researcher observed the time on-task of the 6th grade students in the math packet group while the researcher's assistant observed time on-task of the 6th grade students in the iPad group. Both the researcher and the assistant watched their group of students for a 20-minute period. During this 20-minute period,

the researcher and assistant observed students, one-at-a-time, for 1-minute intervals. Notes were made when the student was passively off-task (P), actively off-task (A), on-task (O), or verbally off-task (V). Passively off-task behaviors were those such as sitting and looking around the room without working or fidgeting with clothing. Actively off-task behaviors were those such as walking around the room, drawing, or doodling instead of working. On-task behaviors were those that demonstrated work completion. Verbally off-task behaviors were behaviors such as talking or whispering to another student. Then, the researcher and assistant completed the same process and activity in the 5th grade classroom.

The teachers received the interview questions via email prior to the visit. Each teacher was interviewed separately during her lunch period. The researcher interviewed each teacher in her classroom for approximately 20 minutes, took notes, and tape recorded each interview to ensure accuracy of note taking. During the interview, the researcher read aloud each question to the teacher, and the researcher allowed the teacher ample time to provide answers to each question. The researcher also repeated parts of the teacher's answers to make certain thoughts and responses were clearly understood. The teachers were invited to provide additional information if desired

After lunch, the researcher and assistant returned to the 6th grade classroom. The researcher and assistant shared with the students that the group that first worked with iPads would now work with the math packet and the group that began the morning with the math packet would now work with iPad using the app MathBoard. Students worked on the worksheet on the same math problems as the first group, but the problems were presented in a different order. It was shared with the students again, that the researcher

and assistant would give the students a 20-minute work period. The researcher monitored time on-task for the math packet group while the researcher's assistant monitored time on-task for the iPad group. Again, students were watched for 1-minute intervals while the researcher and assistant tracked time on-task using the observation protocol. Following this observation period, the researcher and assistant completed the same activity in the 5th grade classroom.

The visit concluded in the afternoon with the researcher in 5th grade and the researcher's assistant in 6th grade administering the self-efficacy surveys to the students by reading the survey statements as well as the constructed response statements aloud to the students to ensure comprehension. To express gratitude for their generosity, the researcher gave a thank you note and an Amazon gift card to each teacher, gave candy to the students, and donated ten books to the school library. Following the school visit, the teacher interviews were transcribed and returned to the teachers via email. The teachers were asked to read the transcripts to check for accuracy and provide any additional information desired. The teachers returned the transcripts to the researcher via email.

Data Analysis and Hypothesis Testing

The following section includes the methods for qualitative and quantitative data analysis and hypothesis testing. Qualitative analyses were conducted to address research question one, research question four and research question six. Quantitative analyses were conducted to address research question two, research question three, and research question five. Data analyzed through statistical measures are presented below.

RQ1. To what extent does implementing tablet technology in the classroom impact student motivation in mathematics skill practice as perceived by the teacher?

Teacher interviews were transcribed. The researcher also conducted a member check to ensure the accuracy of the interviews and transcriptions. The transcriptions were emailed to the two teachers and the teachers were asked to read the document and edit to ensure correctness of their responses. The 5th grade teacher made corrections and the researcher revised the transcription and returned it again to be checked. After the second check, the 5th grade teacher confirmed the interview transcription. The 6th grade teacher confirmed the interview transcript. The interviews were then coded for themes, similarities, and differences. The qualitative data analysis was utilized to determine the extent that tablet technology impacts student motivation as perceived by the teacher.

RQ2. To what extent does learning with tablet technology in the classroom influence students' perceptions of their own motivation and self-efficacy in mathematics?

H1. Tablet technology has a positive influence on students' perceptions of their own motivation.

H2. Tablet technology has a positive influence on students' perceptions of their self-efficacy in mathematics.

Data addressing H1 and H2 were input and analyzed in an Excel spreadsheet. A one-sample *t* test using the responses to survey item 2 was utilized to determine the extent tablet technology influences students' perception of self-motivation in mathematics. Ten one-sample *t* tests using survey items 1, 3, 4, 5, 6, 7, 9, 10, 11, and 12 were utilized to determine students' perceptions of self-efficacy in mathematics. For each hypothesis test the null value was set at 3 ($\alpha = .05$).

RQ3. To what extent does implementing tablet technology in the classroom influence students' time spent on-task during mathematics skills practice?

H3. Tablet technology does influence students' time spent on task during mathematics learning.

Chi-square tests of independence were conducted to address the extent tablet technology influences students' time spent on-task in mathematics. One chi-square test of independence was conducted for each minute of observation ($\alpha = .05$).

RQ4: What do students report to be the strengths and weaknesses of using paper and pencil and iPads in mathematics concepts and skills practice?

Qualitative data analysis was utilized to determine what students reported as being the strengths and weaknesses of using paper and pencil and the iPad. Student responses were coded and content analyzed to reveal similarities and differences in student responses.

RQ5: If given the choice, what do students report they would rather work with: paper and pencil or iPad during mathematics concepts and skills review?

H5: Students report a preference in working with iPads during mathematics concepts and skills review.

A chi-square test of equal percentages was conducted to discover the extent students would rather work with paper and pencil or the iPad. The observed frequencies were compared with the expected frequencies. The level of significance was set at .05.

RQ6: What are students' justifications for choosing paper and pencil or iPad to work with during mathematics concepts and skills review?

A qualitative analysis was conducted on information provided by the students to evaluate students' justification for choosing paper and pencil or iPad to work with during mathematics skills review. Student responses were coded by the researcher to categorize

students' responses for the justification of choosing paper and pencil or iPad to complete class work.

Limitations

As stated by Lunenberg and Irby (2008), a study's limitations are not under the control of the researcher. When interpreting the findings or results of a study, limitations may arise and have an effect on that interpretation. Many variables outside the control of the researcher could impact student motivation, perceptions of self-efficacy, and students' time spent on-task during skills review activities. These variables may include: interest in topic or concept taught, classroom atmosphere, and the expectations placed on students in the classroom. One limitation was that the 6th grade teacher spoke to her class about proper behavior when a guest is visiting and shared with them about the researcher and researcher's assistant's trip to observe her class. The 5th grade teacher did not provide her students with similar instruction. This could have influenced the behavior of the students because the 6th grade teacher set high expectations for student behavior and instructed them on proper classroom conduct when guests are present in the classroom. This could have influenced the students' time on-task.

Summary

This chapter restated the purpose of the study. The population and sample were defined, and the procedures for data collection were shared. The processes utilized for quantitative and qualitative data analysis and hypothesis testing were described. Procedures for data collection were shared and quantitative and qualitative data analysis and hypothesis testing were described. Last, research questions were reiterated and the

null hypotheses were identified. Chapter four presents the results of the hypothesis testing and an interpretation of the qualitative data.

Chapter Four

Results

This chapter presents the results of quantitative and qualitative data analysis that addressed the research questions about the use of iPads in mathematics concepts review in 5th and 6th grades at one rural school district in Kansas. The research questions addressed teachers' perceptions of student motivation, students' perceptions of motivation and self-efficacy, time on-task with the use of iPads and paper and pencil skills worksheets, students' preference between iPads and worksheets, and justification of that preference. One sample *t* tests, chi-square tests of equal percentages, and chi-square tests of independence were used to address the four quantitative research questions. Content analysis and qualitative coding were used to address the two qualitative questions.

Descriptive Statistics

The sample was 21 students who used iPads in daily mathematics concepts and skills practice, one 5th grade mathematics teacher, and one 6th grade mathematics teacher. The 5th grade classroom was comprised of 5 girls and 7 boys, and the 6th grade classroom was comprised of 3 girls and 6 boys. At the time of the study, both female teachers held a bachelor's degree in education and had a minimum of 10 years teaching experience. The study took place during the spring of the 2012-2013 school year.

Results of the Qualitative and Quantitative Analyses

The results of the one sample *t* tests, chi-square tests of independence, chi-square test of equal percentages, qualitative data analysis, and qualitative coding are presented in the order of the numbered research questions. The results of the qualitative research

analysis for questions one, four, and six are included. The responses for each qualitative research question were coded, and the results are presented below. The quantitative research analyses results for questions two, three, and five are presented with the relevant hypothesis, the analysis, and the results of hypothesis testing.

RQ1. To what extent does implementing tablet technology in the classroom impact student motivation in mathematics skill practice as perceived by the teacher?

The researcher interviewed both teachers individually and then conducted a qualitative analysis of the transcribed interviews as well as a member check with each interviewed teacher. After the member check was completed, the transcription was coded to reveal common themes. Both the 5th and 6th grade teachers reported the use of iPads in the classroom as a *motivating factor* for their students; however, they had different reasons for this. The 5th grade teacher believed that the immediate feedback provided by the iPad application was a motivating factor pushing kids further in their work; while the 6th grade teacher believed it was the *familiarity* with the technology that motivated students to work harder in the classroom. In regard to iPads affecting student behavior, the common theme was *availability*. The teachers felt that iPads were too available, and therefore led to more classroom management challenges. The 6th grade teacher said, "What I would do next year, is have them (the students) put them all in their mail boxes when we are not using them, instead of leaving them on their desk; so the management piece is a little bit easier." The 5th grade teacher reflected, "The mistake I made was having it (iPad) available too much and it became a distraction." The teachers both stated that they would try different strategies for the next school year in order to improve instruction in areas where they were weak this past year.

Both teachers believed that using iPads in the classroom increased students' sense of self-efficacy and class participation; however, they had different reasons for believing this. The 5th grade teacher stated that the immediate feedback provided by the iPad helped students who were anxious about sharing answers and allowed them to have the confidence to participate in class and share answers. The 6th grade teacher believed that the games available on applications encouraged students to pursue higher levels of learning on their own.

Both teachers believed that overall learning had increased with the use of the iPads in math, but for different reasons. The 6th grade teacher felt that the iPad helped to eliminate careless errors because of the online help available to the students and the applications available to assist them when solving problems. In this case, the 6th grade teacher believed that students could seek individualized help from the application if she (the teacher) was busy with another student. The applications allowed the students to become problem solvers through the use of various online manipulatives and tools. The 5th grade teacher believed the iPad created a safer environment for taking risks; the iPad allowed students to know the answer was correct before they share with the class.

RQ2. To what extent does learning with tablet technology in the classroom influence students' perceptions of their own motivation and self-efficacy in mathematics?

H1. Tablet technology has a positive influence on students' perceptions of their own motivation.

The results of the one sample *t* test for survey item 2, assessing if students believe an iPad motivates them to complete their class work, indicated that there was a statistically significant difference between the two values, $t = 2.28$, $df = 20$, $p = .03$. The

sample mean was tested against a null value of 3. The level of significance was set at .05. The sample mean (M = 3.62 , SD = 1.24) was higher than the null value (3). This provides evidence to support the hypothesis that tablet technology has a positive influence on students' perceptions of their own motivation.

H2. Tablet technology has a positive influence on students' perceptions of their own self-efficacy in mathematics.

Ten one sample *t* tests were used to test hypothesis two in order to determine students' perceptions of self-efficacy. For each of the ten one sample *t* tests, the sample mean was tested against a null value of 3. The level of significance was set at.05.

The results of the one sample *t* test for survey item 1, assessing if students feel they can control their behavior better while using an iPad, indicated that there was a statistically significant difference between the two values, t = 5.55, df = 20, p = .00. The sample mean (M = 4.05, SD = 0.86) was higher than the null value (3). This provided evidence to support the hypothesis that tablet technology has a positive influence on students' ability to control their behavior in the classroom.

The results of the one sample *t* test for survey item 3, assessing if iPads help students believe they can achieve higher in their studies, concluded that there was a statistically significant difference between the two values, t = 2.67, df = 20, p = .01. The sample mean (M = 3.57, SD = 0.97) was higher than the null value (3). This provided evidence to support the hypothesis that tablet technology has a positive influence on students' perceived self-efficacy.

The results of the one sample *t* test for survey item 4, examining if iPads encourage students to value learning, indicated that there was a statistically significant

difference between the two values, $t = 3.44$, $df = 20$, $p = .00$. The sample mean ($M = 3.81$, $SD = 1.07$) was higher than the null value (3). This provided evidence to support the hypothesis that tablet technology has a positive influence students' value of learning.

The results of the one sample *t* test for survey item 5, exploring if the iPad helps students craft strong questions, determined that there was a statistically significant difference between the two values, $t = 3.07$, $df = 20$, $p = .00$. The sample mean ($M = 3.95$, $SD = 1.14$) was higher than the null value (3). This provided evidence to support the hypothesis that tablet technology has a positive influence on students' ability to develop high level questions.

The results of the one sample *t* test for survey item 6, addressing if iPads assist the students in following classroom rules, established no statistically significant difference between the two values, $t = 0.80$, $df = 20$, $p = .42$. Though the difference was not significant, the sample mean ($M = 3.19$, $SD = 1.07$) was higher than the null value (3).

The results of the one sample *t* test for survey item 7, examining if iPads assist students in learning in a calm manner, determined that there was a statistically significant difference between the two values, $t = 2.33$, $df = 20$, $p = .03$. The sample mean ($M = 3.57$, $SD = 1.12$) was higher than the null value (3). This provided evidence to support the hypothesis that tablet technology has a positive influence on students' ability to learn.

The results of the one sample *t* test for survey item 9, investigating if iPads allow students to use a variety of strategies, concluded that there was a statistically significant difference between the two values, $t = 7.52$, $df = 20$, $p = .00$. The sample mean ($M = 4.43$, $SD = 0.87$) was higher than the null value (3). This provided evidence to support

the hypothesis that tablet technology has a positive influence on students' using different strategies to solve problems.

The results of the one sample *t* test for survey item 10, exploring if iPads allow students to use alternative explanations or examples when confused, determined that there was a statistically significant difference between the two values, $t = 5.21$, $df = 20$, $p = .00$. The sample mean ($M = 4.04$, $SD = 0.92$) was higher than the null value (3). This provided evidence to support the hypothesis that tablet technology has a positive influence on students' ability to differentiate answers.

The results of the one sample *t* test for survey item 11, addressing students' abilities to assist others in the use of iPads to be successful in school, indicated that there was a statistically significant difference between the two values, $t = 3.07$, $df = 20$, $p = .00$. The sample mean ($M = 3.86$, $SD = 1.27$) was higher than the null value (3). This provided evidence to support the hypothesis that tablet technology has a positive influence on students' ability to be successful in school.

The results of the one sample *t* test for survey item 12, exploring if students can use different tablet strategies in the classroom, determined that there was a statistically significant difference between the two values, $t = 6.77$, $df = 20$, $p = .00$. The sample mean ($M = 4.52$, $SD = 1.03$) was higher than the null value (3). This provided evidence to support the hypothesis that tablet technology has a positive influence on students' ability to use a variety of strategies on the tablet to solve problems.

Of the 10 one sample *t* tests, the results of nine tests provided evidence that tablet technology has a positive influence on students' perceptions of self-efficacy in mathematics. The results of the one sample *t* test for survey item 6, though not

statistically significant, provided evidence to support the statement that iPads assist students in following classroom rules.

RQ3. To what extent does implementing tablet technology in the classroom influence students' time spent on task during mathematics skills practice?

H3. Tablet technology does influence students' time spent on task during mathematics learning.

The researcher and assistant conducted observations in each classroom of students working on mathematics skills and concepts review using worksheets and iPads. The students' on-task and off-task behavior was observed for 1-minute intervals for a 20-minute time period. Because there were missing data due to time constraints, not all students were observed equally; however, each student was observed for three, 1-minute intervals. See Tables 1, 2, and 3 for the observed and expected frequencies. Three chi-square tests of independence were conducted to address H3. The observed frequencies were compared to those expected by chance. The level of significance was set at .05.

The results of the first chi-square test of independence, which used the observation data from the first 1-minute observation of the 5^{th} and 6^{th} grade classroom, indicated no difference between the observed and expected values, $\chi^2 = .104$, $df = 1$, $p = .747$. See Table 1 for the observed and expected frequencies. The observed number of on-task behaviors for students using the worksheet ($n = 13$) was not different from the expected number ($n = 13.5$). The observed number of on-task behaviors for students using the iPad ($n = 14$) was not different from the expected number ($n = 13.5$).

Table 1

Observed and Expected Frequencies for Hypothesis 3 Minute 1

		Practice Type	
Minute 1		WS	IP
On Task	Observed	13	14
	Expected	13.5	13.5
Off Task	Observed	8	7
	Expected	7.5	7.5

*Note.*WS = worksheet; IP = iPad.

The results of the second chi-square test of independence, which used the second 1-minute observation data from the 5th and 6th grade, indicated no difference between the observed and expected values, $\chi^2 = .111$, $df = 1$, $p = .739$. See Table 2 for the observed and expected frequencies. The observed number of on-task behaviors for students using the worksheet ($n = 14$) was not different than the expected number ($n = 14.5$). The observed number of on-task behaviors for students using the iPad ($n = 15$) was not different from the expected number ($n = 14.5$).

Table 2

Observed and Expected Frequencies for Hypothesis 3 Minute 2

Minute 2		Practice Type	
		WS	IP
On Task	Observed	14	15
	Expected	14.5	14.5
Off Task	Observed	7	6
	Expected	6.5	6.5

*Note.*WS = worksheet; IP = iPad.

The results of the third chi-square test of independence, which used the third 1-minute observation data from the 5th and 6th grade, indicated no difference between the observed and expected values, $\chi^2 = .933$, $df = 1$, $p = .334$. See Table 3 for the observed and expected frequencies. The observed number of on-task behaviors for students using the worksheet ($n = 12$) was not different than the expected number ($n = 13.5$). The observed number of on-task behaviors for students using the iPad ($n = 15$) was not different from the expected number ($n = 13.5$).

Table 3

Observed and Expected Frequencies for Hypothesis 3 Minute 3

		Practice Type	
Minute 3		WS	IP
On Task	Observed	12	15
	Expected	13.5	13.5
Off Task	Observed	9	6
	Expected	7.5	7.5

*Note.*WS = worksheet; IP = iPad.

The results of the three chi-square tests of independence provided evidence that tablet technology does not create a statistically significant difference in students' time on-task. The observed number of on-task behaviors for students using the worksheet was not different than the expected number during the observations.

RQ4. What do students report to be the strengths and weaknesses of using paper and pencil and iPads in mathematics concepts and skills practice?

A qualitative analysis of the students' responses was conducted to determine what students reported as being the strengths and weaknesses of using paper and pencil and iPads in mathematics. Fun was an umbrella code for the strengths of using the iPads in the classroom and included the ability to access apps and games. Seven of the 21 students reported the iPads were more fun than working with pencil and paper. Five of the 21 students surveyed enjoyed the apps available to them on the iPad, while two of the 21 students reported the access to games as being the primary strength of the iPad. Technological difficulties were an umbrella code for the weaknesses associated with using the iPad, and included challenges while writing and statements indicating there

were no weaknesses when using iPads. Eight of the 21 students surveyed reported technological difficulties as being the primary downfall of the iPad. Difficulties listed included the battery dying, apps accidentally getting erased, autocorrect changing answers to incorrect answers, and screen freezing. Four of the 21 students surveyed reported the iPad to be more challenging for keeping work organized, for writing clearly, and for showing math work, while four students noted that there was no downside to working with the iPad.

The qualitative analysis revealed that 16 of the 21 students reported preferring pencils to complete math work. Students' justification of their choice showed students enjoyed having adequate space to show their math work while solving problems. The remaining five out of 21 students reported that it was easier to write with a pencil when completing math work as opposed to using various tools on the iPad. Hand pain, including blisters, was the umbrella code for the weaknesses of using pencil and paper. Five of the 21 students reported hand cramps and blisters as being a significant downfall of using pencils when completing math work. Also, four of the 21 students reported the act of writing to be the downfall of using paper and pencil when completing math work.

RQ5. If given the choice, what do students report they would rather work with: paper and pencil or iPad during mathematics concepts and skills review?

H4. Students report a preference in working with iPads during mathematics concepts and skills review.

A chi-square test of equal percentages was conducted to address hypothesis four. The observed frequencies were compared to those expected by chance (see Table 4). The level of significance was set at .05. The results of the χ^2 test of equal percentages

indicated no difference between the observed and expected values, $\chi^2 = 1.19$, $df = 1$, $p = 0.29$. The observed number of students who said they preferred paper and pencil ($n = 13$) was not statistically different from the expected ($n = 10.5$). Likewise the observed number of students who preferred iPads ($n = 8$) was not statistically significant from the expected (10.5). Though the difference was not statistically significant, when given the choice between using paper and pencil or iPads to complete math work, 13 out of 21 students reported wanting to use paper and pencil.

Table 4

Observed and Expected Frequencies for Hypothesis 5

Preference	Observed	Expected
Paper and Pencil	13	10.5
iPad	8	10.5

RQ6. What are students' justifications for choosing paper and pencil or iPad to work with during mathematics concepts and skills review?

A qualitative analysis was conducted to code students' justifications for choosing iPads or pencil and paper to work with during mathematics concepts and skills review. The two umbrella codes for wanting to use paper and pencil were space to complete work and reliability of the tool. Students reported enjoying having more space to write on paper and the ease of using a pencil versus a stylus. Some students claimed their handwriting was clearer when using a pencil on paper as compared to using the stylus and the iPad. Finally, students noted that occasionally the iPads have a tendency not to save work or lose battery life, and therefore, the paper and pencil was more reliable when completing work. The umbrella codes for preferring the iPad over paper and pencil were

fun and understanding. Students reported that working with the iPad made school work more fun than simply using paper and pencil to complete work. Students also reported that when working with iPads there are applications to assist them in reaching the correct answer, and they are able to check their work and email it to the teacher, which helps with organization.

Summary

This chapter presented the results of both quantitative and qualitative data analysis. The results of *t* tests were used to determine students' perception of motivation and self-efficacy, while chi-square tests were used to determine student preference of paper and pencil and iPads as well as observations of time spent on-task during mathematics concepts and skills review. The results of the study were mixed and demonstrated that iPad use in mathematics makes a statistically significant difference on students' perceptions of motivation and self-efficacy. On the other hand, there was no statistically significant difference noted in the choice of students using iPads in mathematics and paper and pencil and time spent on-task when using iPad and paper and pencil.

The results of the qualitative analysis of the teachers' perceptions of student motivation demonstrated that teachers believed the different applications and manipulatives engaged students and increased their motivation to accomplish work in the classroom. The result of the qualitative analysis of the students' perceptions of the strengths and weaknesses of the iPad revealed that the majority of students enjoyed the ability to check and organize their work, the use of different applications in order to learn, and the ability to have fun. The weakness was technological challenges.

Qualitative analysis of the students' perceptions of the strengths and weaknesses of using paper and pencil demonstrated students enjoyed using paper and pencil because of the space available to complete and show math work; whereas the weaknesses included hand pain and blisters. Students' responses clearly revealed a preference for using paper and pencil (67%) over the iPad.

Chapter five reviews the problem explored by the present study. An overview of the purpose statement, research questions, and an overview methodology are provided. It also includes a summary of the major findings in connection to the literature review, implications for action, recommendations for future research, and conclusions.

Chapter Five

Interpretation and Recommendations

Technology is beginning to have an influence on education. Galligan, Loch, McDonald, and Taylor (2010) discovered that tablet technology in the classroom is an effective tool to use during class activities, projects, discussions, and independent work because of the increased number of and wide variety of interactions it provides to students. It is imperative that data are gathered and analyzed to understand how tablet technology affects students' self-efficacy, motivation, and preferences between iPads and paper and pencil in order to better understand the effects of technology in the classroom. The present study explored questions about tablet use in the classroom during mathematics skills practice through the use of a self-efficacy survey, interviews, and time on-task observation grids. This chapter includes a summary of the study and how the findings relate to the literature, the implications for action, and the recommendations for future research related to the use of iPads in the classroom.

Study Summary

The study summary presents an overview of the use of one-to-one technology in the classroom and its effects on student self-efficacy, motivation, and time on-task, as well as qualitative data on students' beliefs and opinions on certain aspects of using an iPad versus paper and pencil. An overview of the problem, the purpose of the study and research questions, review of the methodology, and the study's major findings, are provided.

Overview of the problem. Students of this generation are digital natives; they are digitally aware and process information differently than previous generations (McHugh, 2005). Anytime, anywhere learning becomes real when students have access to technological devices in one-to-one settings (Foote, 2012). Studies have been conducted regarding the effects of one-to-one technology on student learning, but there is limited research specifically on students' time on-task during class work and students' perceived self-efficacy and motivation when using tablet technology in the classroom.

As noted in chapter one, technology is one way to enhance the education of American students and enrich classroom learning. It is believed that tablet technology and one-to-one computing in the classroom can lead to increased student motivation and achievement (Kunzler, 2011). District A, a rural Kansas school district comprised of one building educating students in kindergarten through 12th grade, implemented one-to-one tablet technology in the 5th and 6th grade classrooms in the 2012-2013 school year.

Purpose statement and research questions. The purpose of this study was to investigate the use of tablet technology in the classroom and discover if tablets can positively influence students' motivation as perceived by the teacher, students' perception of motivation and self-efficacy within the learning environment, and students' time spent on-task. First, this study investigated the relationship between the use of iPad technology and teacher perceptions of student motivation. The second purpose was to determine students' perceptions of whether their own self-efficacy and motivation were affected when using iPads in the classroom. The third purpose was to evaluate students' time spent on task in the classroom during mathematics concepts and skills practice. Additionally, the study explored students' preference between iPads and paper and

pencil, and students' perceptions of the strengths and weaknesses of iPads and paper and pencil. Next, the researcher analyzed students' preference of iPads or paper and pencil to complete work, and justification of their preference. By studying these variables the researcher was able to investigate if tablet technology, specifically iPads, had a direct impact on student self-efficacy, motivation, and time on-task.

Review of the methodology. This mixed methods, quasi-experimental study took place in a rural Kansas school and utilized a sample of 5th and 6th grade students and their two teachers. The researcher observed students' time on-task, conducted interviews with the teachers, and distributed surveys to the students to analyze the effect of the utilization of iPads and worksheets during mathematics skills review, on teachers' perceptions of student motivation, students' perceptions of self-efficacy and motivation, and students' time spent on-task. Additional variables were students' preference between iPads and paper and pencil, students' justification of their preference, and students' perceptions of the strengths and weaknesses of iPads and paper and pencil when completing math skills practice.

The researcher and researcher's assistant observed and recorded if students were on-task, verbally off-task, passively off-task, or actively off-task. The researcher also completed and recorded individual interviews with each teacher. Finally, students completed a 12-item self-efficacy survey with a Likert-type scale to share beliefs about the ways iPads influence their classroom learning. In addition to the survey, students completed three open-ended statements about the strengths and weaknesses of iPads and paper and pencil work, their preference between the two options, and the justification of their preference.

One sample *t* tests were conducted to analyze students' preference and time on-task. Chi-square tests of equal percentages were used to discover the extent students would rather work with paper and pencil or the iPad. To measure the extent tablet technology influences students' time spent on-task in mathematics, hypothesis three, the researcher conducted chi-square tests of independence. Qualitative data coding was utilized to analyze students' reports of the strengths and weaknesses of using paper and pencil and iPads and the justification of their choice between using paper and pencil and iPads. The teacher interviews were transcribed, coded, and a member check was completed to ensure accuracy. A second qualitative data analysis was conducted to reveal what students reported as being the strengths and weaknesses of using paper and pencil and the iPad. A third qualitative analysis was conducted on information provided by the students to evaluate students' justification for choosing paper and pencil or iPad to work with during mathematics skills review.

Major findings. Both teachers reported iPads to be a motivating factor for students when completing classroom work. Additionally, both teachers believed that iPads increased students' sense of self-efficacy and amount of class participation. Student self-efficay was measured through student completed surveys and revealed a statistically significant difference on the impact of iPads on students' perceptions of self-efficacy. On-task behaviors were not statistically different between the students using the iPad and paper and pencil to complete mathematics concepts review. Similarly, no statistically significant difference was found in regard to analyzing students' preference for working with iPads or paper and pencil. Students reported fun as being the primary strength of iPads and technological difficulties as being the primary weakness. In

reporting the strengths and weaknesses of paper and pencil, students noted having adequate space to write out problems as being the primary strength and hand cramps as being the primary weakness.

Findings Related to the Literature

When connecting the findings of the current study with those in the literature, similarities and differences were identified. The current study was designed to add to the existing research on one-to-one technology use in the classroom and its impact on student self-efficacy, motivation, and time on-task. A discussion of the results, which were guided by the research questions, is presented.

The current study aligns with the research of Starkey (2011) who studied six, first year teachers in New Zealand and explored their perceptions of the way one-to-one technology affected students' motivation to learn. Starkey (2011) found through observations and interviews that the teachers believed that their teaching along with the implementation of the device influenced the learning of the student. The difference was not the device itself. The New Zealand teachers believed their learning beliefs and teaching practices were more influential in student learning and student motivation. However, the six teachers did believe student motivation was enhanced with the use of one-to-one technology. The current study aligns with these findings in that the 5th and 6th grade teachers also believed they implemented strong lessons and their teaching was influential in student learning. The teachers believed that the use of iPads enhanced their lessons, and therefore, enhanced the students' motivation as well.

Graham (2012) stated, as summarized in the literature review, that technology is one way to update the educational environment and enhance classroom instruction.

Graham (2012) stated that by implementing technology the students would engage in higher order thinking skills that they would not otherwise use. The current research study did not address if 5th and 6th grade students were using higher order thinking skills; so no comparison to the literature can be made.

Research from the literature pertaining to one-to-one technology use in the classroom revealed that today's 21st century generation of students are requiring a more current approach to learning (Prensky, 2006). One-to-one technology integration into the classroom is one way to enhance education. This generation, known as digital natives, has been growing up multi-tasking through the use of technology. A three year study conducted by Rockman and Walker (1997) supported this finding. The research revealed a connection between student motivation, student behavior, and student attitude and technology use. Findings demonstrated an increase in motivation and more positive student behavior and student attitude with the use of one-to-one technology. The study of the Anytime, Anywhere, Learning Laptop Program by Rockman and Walker (1997) involved collecting test scores, distributing and collecting surveys and questionnaires, and interviewing and examining teacher and student logs for laptop use. The results demonstrated that the technology in the classroom allowed students to express themselves more creatively and provided students with opportunities to work at their own pace, which increased their motivation to work. Transcriptions of teacher interviews conducted during the present study revealed a similar trend. Both teachers believed the iPads increased student motivation in the classroom. The teachers felt students were more motivated to participate and complete their work when the option of utilizing technology was available. The 6th grade teacher said that her students are more willing to

try difficult math problems and explore challenging activities with the use of technology because of the different options available to them to aide in their problem solving. Both the 5th and 6th grade teachers believed that motivation is enhanced with the implementation of technology in the classroom.

Similarly, the research completed by Geer and Sweeny (2012) demonstrated that technology, when implemented with clear learning expectations, provides students with more opportunities to develop and share ideas, and therefore, student motivation is enhanced. Geer and Sweeny (2012) acknowledged that students in their study were drawn to technology as motivational tools. The researchers found that students in school are drawn to using different technologies because they are fun and exciting; therefore, increasing their motivation to complete school work. Through a 12 item Likert-type survey, data were collected during the present study regarding the impact of technology on students' perceptions of motivation and self-efficacy. Results of the present study supported the findings of Geer and Sweeny (2012) in that students reported that one-to-one technology use increased their motivation to learn while completing tasks.

Oliver and Corn (2008) found in their two-year mixed methods study of 300 middle school students that one-to-one computing positively influenced student behavior and attitude within the classroom. Students concluded that technology provided them with more opportunities to learn, and therefore, increased their belief in their ability to successfully complete their work in mathematics. Results of the present study supported this finding about self-efficacy. Students in the present study reported that when working with iPads, there were several apps that facilitated in their ability to get correct answers. It was easier to organize work, and therefore students' self-efficacy was enhanced.

Interviews and surveys were used in a study conducted by Lei and Zhao (2008) to investigate whether one-to-one technology impacted self-efficacy beliefs of 231 middle school students attending a private school. In Lei and Zhao's (2008) research, students reported that one-to-one technology facilitated their organizational skills and gave them a feeling of success. Additionally, students reported having a feeling of power when completing homework because they were able to reference various resources to assist them in discovering the correct answer. The findings of the present study and the study of Lei and Zhao (2008) demonstrated that students' self-efficacy beliefs were higher with the use of one-to-one technology in the classroom. However, the present study did not reveal a significant difference between the use of iPads and student engagement as measured by observing time on-task during mathematics skills review. These results are in contradiction with the findings of Lei and Zhao (2008).

Haydon et al (2012) researched student engagement, motivation, and time on-task as related to the use of iPads to paper and pencil during mathematics skills review. Haydon et al. (2012) found that the use of iPads enhanced student engagement and motivation among students with emotional disturbance. In their observations of four students with emotional disturbance, they discovered that the students scored higher and were on-task more often when using iPads than they were when using pencil paper. The researchers determined that the immediate feedback of the iPad allowed students to feel better about their abilities and therefore, to be more motivated to complete their work. Similarly, the present study revealed a significant difference in student engagement and motivation while working on iPads.

Conclusions

Schools across America are faced with the challenge of assisting students as they learn to compete educationally with others around the world. District A, from which the sample was selected, provided students with a one-to-one technological experience in order to facilitate their educational growth. The findings from the present study have implications for stakeholders ranging from those implementing educational strategies and resources at the building level to the local and state level. The following section details conclusions made from the present study including implications for action, recommendations for future research, and concluding remarks.

Implications for action. Time on-task observations were conducted with the students reviewing mathematics concepts on one mathematics application. Results indicated that students should be offered the choice of using paper and pencil or the iPad to complete their class work because neither was preferred by the students. There was no significant difference in student engagement in mathematics as measured by the time-on-task observations. Consequently, these perspectives create implications for other schools when determining the value and worth of implementing a one-to-one technology program.

Results of the teacher interviews provided information supporting the use of iPads in the classroom. Furthermore, results of the ten one sample *t* tests, which measured students' perceptions of self-efficacy demonstrated that the implementation of tablet technology in the classroom had a positive impact on student self-efficacy and motivation. Because students' preference and justification supported both iPads and

paper and pencil use, the school should continue to provide access to both as resources in the classrooms.

Recommendations for future research. A first recommendation is to conduct time on-task observations during iPad use for longer periods of time and not only during subject or concept review and compare with time-on-task observations of paper and pencil use. Results might differ during project implementation, group work, or instruction. Time on-task observations could be conducted and compared to determine the effects of one-to-one technology at different times in the classroom.

A second recommendation would be to expand the study into other grade levels and into other subjects. Results may vary based on the grade level, information, or subject. By expanding the study, further research could be conducted examining if a correlation exists between the age of the students and the technology interaction, self-efficacy, and motivation of the students. Further research may reveal varied student perceptions of technology use in different subject areas and lead to district administration and faculty designing more engaging curriculum based on student feedback and study results.

Additionally, research could be conducted to examine the technology implementation and use of students in different schools with different demographics. Qualitative research, including student, teacher, and parent interviews, as well as quantitative research, consisting of time on-task observations, surveys, and tests, could be utilized to determine the effect of one-to-one technology in different classroom settings and different grade levels. Including diverse classrooms and school districts would enhance the ability to generalize the study's results.

Data in the present study were not disaggregated by gender, by age, or by exposure to technology at home. Administrators in District A could further their knowledge by investigating specifically how boys and girls of different ages and grade levels differ in responding to and using one-to-one technology. In addition, the district could examine if student self-efficacy was higher for students who are exposed to technology in their home versus students who do not have access to technology outside of school.

Concluding remarks. Technology is influencing the way we live on a daily basis. Implementing technology in the classroom in an effort to enhance students' self-efficacy and motivation as well as engagement in academics is a worthwhile endeavor. The results from the present study indicated that technology can lead to higher self-efficacy and motivation. Students' perceptions of technology were positively influenced when using one-to-one technology; therefore, increasing their personal motivation and perceived self-efficacy in classroom learning. Teachers and school administrators must monitor and consistently evaluate the implementation of technology in a one-to-one setting. Teachers and district administrators can capitalize on these research findings and create a learning environment that fosters high self-efficacy through the use of one-to-one technology. With the use of technology in the classroom, teachers may decrease students' anxiety toward learning and increase a desire to pursue knowledge. Increased student learning is the main goal of all reforms, and one-to-one technology is one way to reach that goal.

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Appendices

Appendix A: Interview Script

How do you believe that the use of iPads in the classroom affect students' motivation to work during math?

In regard to their (students) motivation, do you believe it (students' motivation) is higher because of having those manipulatives and knowing how to use them?

R: Anything else?

In what ways do you believe iPads affect the classroom dynamic and in what ways do you believe they affect student behavior?

So you think that by keeping them on their desk, they are distracted too easily?

What about the dynamic of the classroom? With you teaching, do you feel the focus has truly shifted from you to this technology?

How has your math class changed?

Anything else behavior wise?

Do you see anything different organizational wise?

From your observations, how do you believe iPads affect students' sense of self-efficacy and class participation?

Do a lot of your students have access to the Internet or a computer at home?

Did the kids persuade you to bring it up to the school board to allow them to bring their iPads home?

Motivation aside, specifically in math, do the kids seem more confident or is there not really a big change?

Why do you think they (the students) feel that way, not afraid to explore?

How do you think iPads affect the overall learning in the classroom and their grades?

Do you see students voluntarily, on their own, during study hall at the end of the day, take out their iPads to complete work?

Anything else about kids in math and overall learning, student engagement, or grades?

Appendix B: Students' Sense of Efficacy Scale

Student Beliefs in Learning with an iPad

Directions: This questionnaire is designed to help the researcher gain a better understanding ofthe iPads can affect your classroom learning experience. Please indicate your opinion about each of the statements below. Your answers are confidential.

Nothing(1) Very Little (2) Some (3) Quite A Bit (4) A Great Deal (5)

1. I can control my behavior in the classroom when working with an iPad.

(1) (2) (3) (4) (5)

2. An iPad motivates me in completing school work.

(1) (2) (3) (4) (5)

3. An iPad helps me to believe I can do well in school and my work.

(1) (2) (3) (4) (5)

4. An iPad helps me to value learning with my teacher and classmates.

(1) (2) (3) (4) (5)

5. I can create good questions when learning with an iPad.

(1) (2) (3) (4) (5)

6. An iPad helps me to follow classroom rules.

(1) (2) (3) (4) (5)

7. Ipads help me and my classmates learn in a calm manner.

(1) (2) (3) (4) (5)

8. iPads help my class stay organized and behaved.

(1) (2) (3) (4) (5)

9. I can use a variety of strategies with the iPad.

(1) (2) (3) (4) (5)

10. I can use an alternative explanation or example on the iPad when I am confused.

(1) (2) (3) (4) (5)

11. I can assist others in using iPads to do well in school.

(1) (2) (3) (4) (5)

12. I can use different tablet strategies in the classroom.

(1) (2) (3) (4) (5)

Appendix C: Initial Request

On Sep 17, 2012, at 8:08 PM, Jessica Kyanka <jmkr21@yahoo.com> wrote:

Good Evening [redacted],
I am continuing to move along on my dissertation: studying the use of tablet technology in the classroom in relation to student self-efficacy, student achievement, student motivation and engagement in grades 4, 5, and 6. I was wondering if you would be interested in allowing me to use your school in my study?
Thank you for taking the time to consider it!
Jessica Kyanka (Candidate for Doctoral Degree in Educational Leadership)
6th Grade Teacher at Hyman Brand Hebrew Academy

Appendix D: Initial Permission

This will be fine!

[redacted]

On Tue, Sep 25, 2012 at 7:31 AM,

Appendix E: Dissertation Correspondence

On Thu, Feb 7, 2013 at 7:55 PM, Jessica Kyanka

I am really excited about it, but it is a little different than before. I will not need any pre and post tests as I am not going to measure achievement. However, I am going to measure time on task, so if it is alright with you, I would need to come to your building and do an activity and observation with your kids. I may need to do it with another classroom, too. Can you refresh my memory as to the amount of students you have? Do you know of another teacher, either above or below your grade level that would be willing to let me barge in on them for about an hour or hour and a half one day? I, again, understand and realize how much of a request this is, but I can promise you bribes! :)
I want to be as accommodating as possible; so please do not feel pressured! Due to my baby wanting to come May 12th and me not having many sick days to use to travel to your school, I am wondering if I can come during our spring break if you are in still in school then. My break is March 25th - April 3. Would any day in there work?
We can discuss the details later but basically, I would do 1 activity on iPads with one group, the same activity on pencil and paper, and then switch groups and activities. About 15 minutes per activity then a survey and interview of the teachers (4 questions tops).
Let me know! I hope all is well!
Jessica

Research Approval

It will be our pleasure to have you in our school as a guest researcher! I, too, am working on chapters 1,2, and 3 of my dissertation. You certainly have my permission to visit the school. We are 1:1 iPads in grades 2-6! I will send you link of a video about our school and our iPads!

[redacted]

Sent from my iPhone

On Feb 12, 2013, at 1:49 PM, Jessica Kyanka <jmkr21@yahoo.com> wrote:

Good Afternoon!

I have been in contact with you but it was several months ago, and wish to refresh my purpose in disturbing your very busy life! :) I am continuing to work on my dissertation by reading many research studies and articles about the use of iPads in the classroom. I

have also been writing and revising chapters 1, 2, and 3 of my actual paper. After meeting with my advisers last week, we have refined and created a vision and direction for my paper and study to go. I have now narrowed my research questions to following 4:

1. To what extent does implementing tablet technology in the classroom impact student motivation as perceived by the teacher in mathematics instruction and learning?

2. To what extent does implementing tablet technology in the classroom influence a student's perception of self motivation in mathematics instruction and learning?

3. To what extent does implementing tablet technology in the classroom influence a student's perception of self-efficacy in mathematics instruction and learning?

4. To what extent does implementing tablet technology in the classroom influence time on task during mathematics instruction?

I have been in contact with [redacted] (she is awesome) about her use of tablets in the classroom and she has been INCREDIBLY helpful and wonderful, and many more positive adjectives! With your formal permission and blessing, I would love to come and visit your school and observe [redacted] classroom as well as [redacted] to conduct 2 fifteen minute observations to address questions 4 (time on task), as well as speak to both [redacted] and [redacted] briefly about using iPads in the classroom to address question 1 (perception of student motivation). I will be traveling with my adviser who is a trained and certified teacher and she offered to watch the class while I completed a short interview with both teachers; this way no one needs to worry about sub coverage. The interviews will not take a long time. After speaking with [redacted] about possible dates, I was wondering if it would be alright for me to visit and complete these activities with minimal distraction on

April 2?

I look forward to hearing from you and visiting your school! The more I read about iPads in the classroom the more fascinated I become (my school does not have this technology) and I am excited to see it in action at your school!

I am forever grateful and in debt to the generosity you, [redacted], and [redacted] have shown me. I have promised gifts when I arrive if I receive your formal permission :) If you would like to speak further about this my number is 816-898-9550.

Thank you,

Jessica

Appendix F: Date Confirmation

On Tue, Feb 12, 2013 at 9:18 AM

You are more than welcome to come visit and I am sure that my partner in crime will be just as welcoming (she teaches 5th grade and has 11 students...I have 10 students). We have our spring break earlier in March, but we do not have school on Friday, March 29 or Monday, April 1.

April 2 should work great for you to come and visit. I talked to the 5th grade teacher and she should be available, too!

Appendix G: Parental Opt Out Slip

My name is Jessica Kyanka-Maggart, and I am a doctoral student at Baker University studying Educational Leadership. I am completing my dissertation in the study of the use of iPads in the classroom and student engagement and self-efficacy.

I would like to request permission for your son/daughter to participate in a study occurring in the Centre School District in grades 5 and 6 on April 2, 2013. I have received permission from the Superintendent/Principal, [redacted], as well as the fifth and sixth grade teachers, [redacted] and [redacted].

My study:

Along with my advisor, Patricia Bandre', I will be dividing each math class into two groups: one group will use an iPad to complete a math review activity while the other group completes a worksheet math review activity. For fifteen minutes my advisor and I will be observing the students in each group as they work to complete the activity. Later in the afternoon, the groups will switch and we will again observe the students as they complete their assigned task on the iPad or with a worksheet.

In addition to these observations, the students will complete a survey consisting of twelve statements, in which they indicate the way they believe iPads affect their learning in the classroom.

If you object to your child participating in the following activities please sign and return the bottom portion of this form to your teacher.

Thank you, Jessica Kyanka-Maggart

I, _____ object to my son/daughter, _____

(parent's name) (student's name)

about iPad use conducted by Jessica Kyanka-Maggart.

_____ _____

(parent's signature) (date)

Appendix H: Consent for Participation in Interview Research

I volunteer to participate in a research project conducted by Jessica Kyanka-Maggart from Baker University. I understand the project is designed to gather information about the use of iPads in the classroom, specifically in mathematics. I will be one of two people being interviewed for this research.

1. My participation in this project is voluntary. I understand that I will not be paid for my participation. I may withdraw and discontinue participation at any time without penalty.

2. I understand that if I feel uncomfortable with the interview process, I have the right to decline to answer any question or to end the interview.

3. Participation involves being interviewed by a researcher from Baker University. The interview will last approximately 20 minutes. Notes will be taken during the interview as well as a voice recording of the interview.

4. I understand that the researcher will not identify me by name in any reports or information obtained from this interview, and that my confidentiality as a participant in this study will remain secure.

5. Faculty and administration from my school will neither be present at the interview nor have access to the raw notes or transcripts.

6. I understand that this research study has been approved by the Institutional Review Board (IRB) of Baker University.

7. I have read and understand the explanation provided to me. I have had all my questions answered to my satisfaction, and I voluntarily agree to participate in this study.

8. I have been given a copy of this consent form.

_____ _____

My Signature Date

_____ _____

My Printed Name Signature of Investigaton

For Further Information Please Contact:
Jessica Kyanka-Maggart
jmkr21@yahoo.com
816-898-9550

Appendix I: IRB Study Approval Request

BAKER UNIVERSITY

Date:

SCHOOL OF EDUCATION IRB PROTOCOL NUMBER _____

GRADUATE DEPARTMENT (IRB USE ONLY)

IRB REQUEST

Proposal for Research

Submitted to the Baker University Institutional Review Board

I. Research Investigator(s) (Students must list faculty sponsor first)

Department(s) **School of Education Graduate Department**

Name	Signature	
1.Patricia Bandre	_____,	Major Advisor
2. Margaret Waterman	_____,	Research Analyst
3. Susan Rogers		University Committee Member
4. Carol Porter		External Committee Member

Principal Investigator: Jessica Kyanka-Maggart _____

Phone: 816-898-9550

Email: jessicamkyanka-maggart@stu.bakeru.edu; jmkr21@yahoo.com

Mailing address: 1105 SW Prairie Star Circle

Lee's Summit, MO 64081

Faculty sponsor:

Phone:

Email:

Expected Category of Review: ___Exempt _X_ Expedited _ __Full

II: Protocol: (Type the title of your study)

iPads in Upper Elementary School Mathematics

Summary

In a sentence or two, please describe the background and purpose of the research.

Today's students are referred to as the digital generation; they are comfortable with technology and use it as an essential part of their life (Donovan , Green, & Hartley, 2010). The research and study is aimed at investigating if the iPad, when used in mathematics, increases time spent on task in mathematics review for students versus traditional worksheets completed with pencil and paper. The study will also be geared toward investigating to what degree the students feel the use of iPads affect their self-efficacy in mathematics and toward investigating how teachers feel the use of iPads affect their classroom and student learning in mathematics.

Briefly describe each condition or manipulation to be included within the study.

After introducing the research assistant and the researcher, the assistant and researcher will divide the fifth grade class in half. Half of the students will complete a math review activity on the iPad while the other half will complete the same math review

activity on a worksheet with a pencil and paper. For 15-20 minutes, the assistant and the researcher will monitor time spent on task in the two groups. Following this observation, the assistant and the researcher will visit the sixth grade class, introduce themselves and explain the purpose of our visit. Again, the class will be divided in half, and half the students will complete a math review activity on the iPad for 15-20 minutes while the other groups completes the same worksheet math review activity. The assistant and the researcher will monitor time on task for the sixth grade students as well. Over lunch, the researcher will interview the fifth and sixth grade teachers separately on the use of iPads in the classroom, specifically in math. In the afternoon, the assistant and researcher will return to the fifth grade class and switch the groups; so, the group that was using the iPads in the morning, will now be given worksheets, and the group that was given worksheets will be using the iPad for their math review. The researcher and the assistant will monitor time on task for these two groups, also. Then, the researcher and the assistant will return to the sixth grade classroom and switch the groups and monitor time on task. After each group has participated in the activity, the students will complete a self-efficacy survey on the use of iPads in mathematics.

What measures or observations will be taken in the study? If any questionnaire or other instruments are used, provide a brief description and attach a copy.

The assistant and the researcher will use a time on task data sheet when observing the students in the iPad group as well as in the worksheet group. The time on task data sheet tracks the activity of the students and categorizes the students on task or off-task behavior. Off-task behaviors are labeled in two groups: disrupting others and visibly

disengaged. The designations of off-task behaviors in those two categories will be labeled as either passively off-task (p), verbally off-task (v), or actively off-task (a).

The students will also be completing a self-efficacy survey on the use of iPads in math. The self-efficacy survey is comprised of 12 statements that students can rank on a 1-5 Likert-type scale. The statements address the use of iPad in the classroom and students' beliefs in using the technology during class. The survey uses a five point Likert-type scale with statements about the use of iPads in math class. The researcher modeled the survey after the Woolfolk-Hoy self-efficacy scale (Tschannen-Moran & Hoy, 2001), and evaluated it for understandability and clarity, and modified it with the assistance of sixth and fifth grade students. The researcher also sought the expertise of two mathematicians, familiar with the use of iPads in math, to check the survey for content validity.

The researcher will conduct a semi-structured interview with each teacher separately about the use of iPads in their math classes. The teachers will receive the questions prior to the interview to allow for preparation. The researcher will ask questions about the teachers' perceptions of student motivation when using iPads in math, perceptions of the ways the iPads affect classroom dynamics, student learning, student efficacy, and overall achievement and grades (see attached Appendix B.

Will the subjects encounter the risk of psychological, social, physical or legal risk? If so, please describe the nature of the risk and any measures designed to mitigate that risk?

Neither the students nor the teachers will encounter psychological, social, physical or legal risk.

Will any stress to subjects be involved? If so, please describe.

There will not be any stress placed upon the subjects during the study.

Will the subjects be deceived or misled in any way? If so, include an outline or script of the debriefing.

No one will be deceived or misled in any way.

Will there be a request for information which subjects might consider to be personal or sensitive? If so, please include a description.

There will not be any requests for information, which subjects might consider to be personal or sensitive.

Will the subjects be presented with materials which might be considered to be offensive, threatening, or degrading? If so, please describe.

The subjects will not be presented with materials that may be considered offensive, threatening, or degrading.

Approximately how much time will be demanded of each subject?

Students will participate in 2 twenty minute observations, and take a 10 minute survey. The teachers will be interviewed for approximately 30 minutes during lunch.

Who will be the subjects in this study? How will they be solicited or contacted? Provide an outline or script of the information which will be provided to subjects prior to their volunteering to participate. Include a copy of any written solicitation as well as an outline of any oral solicitation.

The study is comprised of 11 fifth grade students and 10 sixth grade students. After attending a conference in summer 2012 at the [redacted] where [redacted] Superintendent [redacted] presented on iPads, the researcher emailed [redacted] to explain the dissertation idea and ask for permission to use [redacted] in the research. The superintendent and principal of [redacted], [redacted], responded to the researcher and granted the researcher permission to visit anytime and observe classrooms using iPads as well as speak to the teachers who use them in their classrooms (see Appendix A). The researcher then emailed sixth grade teacher, [redacted], to establish a relationship and explain the dissertation process. [redacted] and the researcher have been in constant contact about the use of iPads in the classroom, specifically in math, since August 2012. [redacted] contacted the fifth grade teacher, [redacted], and both agreed to allow the researcher to conduct the observations in their classrooms.

The researcher will mail opt out slips to the teachers to distribute to their students before arrival. The opt out slip will notify the parents of who the researcher is, the purpose of the study, and the date the researcher is conducting the study. The opt out slip requires a parent signature for only those parents who wish to object to their child participating in the study.

What steps will be taken to insure that each subject's participation is voluntary? What if any inducements will be offered to the subjects for their participation?

The students will receive an opt out slip for their parents to complete and return if they object to their child participating in the study. The students will receive a candy incentive following completion of the two activities and the survey. Teacher interviews are entirely voluntary. The researcher will gift a 15 dollar gift card to Walmart for each teacher participating in the interview process and for allowing the researcher to conduct the study in their classroom.

How will you insure that the subjects give their consent prior to participating? Will a written consent form be used? If so, include the form. If not, explain why not.

Prior to the visit, each student will receive an opt out slip that allows their parents to object to their child participating in the study. Students whose parents do not allow permission will not be observed, but will complete the math activity since it is part of their regular school day curriculum.

Will any aspect of the data be made a part of any permanent record that can be identified with the subject? If so, please explain the necessity.

There will not be any aspect of the data that will be made part of any permanent record.

Will the fact that a subject did or did not participate in a specific experiment or study be made part of any permanent record available to a supervisor, teacher or employer? If so, explain.

Participation in the experiment will not be made part of any permanent record available to a supervisor, teacher, or employer.

What steps will be taken to insure the confidentiality of the data? Where will it be stored? How long will it be stored? What will be done with it after the study is completed?

The survey documents will be stored no more than 3 months to ensure that all data are entered correctly; then the papers will be shredded. The survey documents, before shredding, will be stored in a binder, in the researcher's home library, locked in a filing cabinet. The materials for the research paper in an area accessible only by the researcher.

If there are any risks involved in the study, are there any offsetting benefits that might accrue to either the subjects or society?

There are not any risks involved with the study. The benefits of the study include: additional research to the use of technology, specifically iPads, in the classroom in correlation to time on task, motivation, teaching, and self-efficacy.

Will any data from files or archival data be used? If so, please describe.

There will not be any data from files or archival data used.

Appendix J: IRB Approval Email

Dear Ms. Kyanka-Maggart,
I am attaching a letter of approval for your recent proposal of research submitted to the IRB of Baker University. You will also receive a hard copy of the approval letter in the mail. Please let us know if you have any additional questions.
Best wishes as you continue your doctoral studies with this important research project.
Carolyn R. Doolittle

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