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A case study of the implementation of iPads with high school students at two charter high schools in southern California

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A CASE STUDY OF THE IMPLEMENTATION OF IPADS WITH HIGH SCHOOL STUDENTS AT TWO CHARTER HIGH SCHOOLS IN SOUTHERN CALIFORNIA

A dissertation proposal submitted in partial satisfaction

of the requirements for the degree of

Doctor or Education in Organizational Leadership

by

Margaret Alice Matthews Pettit

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John F. McManus, Ph.D. – Dissertation Chairperson

This dissertation, written by

Margaret Alice Matthews Pettit

under the guidance of a Faculty Committee and approved by its members, has been submitted to and accepted by the Graduate Faculty in partial fulfillment of the requirements for the degree of

DOCTOR OF EDUCATION

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TABLE OF CONTENTS

Page

LIST OF TABLES

Page

VITA

ABBREVIATED CURRICULUM VITAE
Margaret Alice Matthews Pettit

Education

PEPPERDINE UNIVERSITY Ed.D. in Organizational Leadership, 2014
Dissertation*: A Case Study of the Implementation of iPads with High School Students at Two Charter High Schools in Southern California*

SEATTLE UNIVERSITY Masters of Arts in Teaching, 2001

UNIVERSITY OF WASHINGTON B.S. in Biochemistry, 1999
B.A. in Psychology, 1999 **Minor** in Chemistry.

Relevant Professional Positions

IT'S ABOUT TIME PUBLISHING- Contributing Author, National Instructor, Curriculum Development, 2003 – Present
Working with a team to develop a new curriculum has been an amazing opportunity for me to grow as a teacher. From my second year of teaching, I have been involved in this professional journey to grow as a teacher and to help others reflect on and grow their teaching experience.

I have had the opportunity to be a part of the field test and pilot testing of this curriculum. In each stage of development, there were improvements and additions and through this project I have been given more responsibility. I began doing workshops at NSTA conventions in 2004 and have enjoyed the challenge of teaching teachers. From this, I was asked to work with school districts and provide professional development on inquiry based teaching methods. Additionally, I have filmed many instructional videos to create a resource for "just-in-time" learning. Most recently, we have created an online learning community for teachers and I am moderating professional discussions.

LOYOLA HIGH SCHOOL OF LOS ANGELES- Science Teacher, 2008 – 2010
Integration of an inquiry based curriculum with science teachers, teacher professional development.

While working as a consultant I was recruited to join the faculty and help implement the Active Chemistry and Active Physics curriculum. Over these three years Loyola science enrollment has increased and students are scoring higher on the California State Science exam. As a result of these improvements surrounding institutions have been contacting Loyola to learn more about the changes that have led to these improvements.

As part of faculty development I have worked with a group of four other teachers in a unique self-evaluation exercise. By extending the education practice from the classroom to our peers, we presented our findings at a regional NSTA convention. This new experience provides better understanding of effectiveness within the classroom and professionalism in sharing best practices among colleagues.

SHOREWOOD HIGH SCHOOL- Science Teacher, LINK Crew Advisor, AVID Elective Teacher, Technology Coach, Varsity Golf Coach, Reading and Literacy Cadre 2001 – 2008
Research and development on inquiry learning in science education, Technology Integration, Literacy in Content Area Subjects.

Through a Microsoft grant, I was trained as a T2CI coach to work with teachers and help them implement technology into their classrooms. Working 1-1 with teachers to specifically address their needs provided them the support they needed to effectively integrate technology. This coaching of adults also transferred into my work as the liaison for student teachers and master teachers to help them navigate growth oriented communication.

COSTCO- Accounting Department Rebate Program, 1994 – 1995
Designed and developed computer management program for the tracking of coupons and their potential use in Costco.

Professional Growth

RECENT PRESENTATIONS BEFORE PROFESSIONAL CONFERENCES

Matthews, M. A. (2010). Inquiry-based learning for the high school chemistry class. Los Angeles, CA: LA County Science Fair.
Matthews, M. A. (2009). Sharing what we're doing with the world and with the teacher next door. Phoenix, AZ: Regional National Science Teacher Convention.
Matthews, M. A. (2009). Using inquiry to activate your chemistry students. Phoenix, AZ: Regional National Science Teacher Convention.
Matthews, M. A. (2006). Using inquiry-based activities to teach the principles of chemistry. Baltimore, MD: National Science Teacher Convention.
Matthews, M. A. (2005). Active chemistry. Los Angeles, CA: Regional National Science Teacher Convention.
Matthews, M. A. (2004). Active chemistry. Seattle, WA: Regional National Science Teacher Convention.

RECENT WORKSHOPS AND PROFESSIONAL DEVELOPMENT SESSIONS

Cairo, Egypt (2013-2014) Led the professional development for two new STEM schools adopting an inquiry-based curriculum. Three virtual sessions for startup and then monthly follow- up sessions with asynchronous messages and lesson plan coaching.

Virtual Presence (2013-2014) Moderate a professional development learning community by providing prompts and responding to queries to encourage growth in teaching.
Ankeny, IA (2011) Led one-day district wide workshop on inquiry-based learning.
Aurora, CO (2011) Led one-day district wide workshop on inquiry-based learning.
Cherry Creek, CO (2011) Led a two-day workshop on inquiry-based learning.
Columbus, OH (2011) Led a project based learning workshop for a teacher inservice day for all of the charter and private schools in the region.
Klein, TX (2009-2011) Led multiple three-day sessions for the Klein district to facilitate teacher reflection and coach them on project-based learning, inquiry-based learning and meeting the Texas standards over the course of three years.
Mapleton, CO (2011) Led a half-day teacher inservice on inquiry-based learning.
Hershey, PA (2010) Led a one-day workshop for the teachers at a private boarding school on how to maintain rigor within inquiry-based learning.
Mariner High School, WA (2010) Provided a pro-bono coaching session for the new teachers working to implement a project-based curriculum.
Denver, CO (2008-2009) Led four two-day district wide sessions on the implementation and management of an inquiry-based project-based learning curriculum over the course of their implementation year.
Louisville, KY (2009) Led a three-day district wide workshop on inquiry-based learning.
Akola, India (2008) Led a teaching/sharing session to model hands-on learning and work with the teachers to incorporate inquiry learning.
Los Angeles, CA (2008) Provided two days of modeling and two days of coaching the science department on how to integrate inquiry-based learning.
Puyallup, WA (2008-2009) Led a three-day district wide orientation workshop on inquiry-based learning followed by four full-day follow-up sessions throughout the year.
Boston, MA (2005, 2007, 2009, 2011) Worked with a team of professional development providers to develop, refine and differentiate Professional Development sessions using current research for implementing Active Chemistry.

Participation in Professional Associations

NATIONAL SCIENCE TEACHERS ASSOCIATION (NSTA)
ASSOCIATION FOR SUPERVISION AND CURRICULUM DEVELOPMENT (ASCD)

ABSTRACT

The purpose of this case study, was to conduct research that provided an in-depth understanding of the 1-1 implementation of iPads into the senior class of two four-year charter high schools in Southern California. The problem addressed was the following: to date, there has been little definitive research to examine what works and what did not seem to work in the implementation of iPads into high school classrooms. This study describes the experiences and reflections of the participants during their first year of implementing the iPads. The participants included: administrators, staff and faculty at both schools who were interviewed, and students over the age of 18 during the last weeks of their senior year who completed an online electronic survey. All of these participants had experience with the iPad in a 1-1 setting for the 2012-2013 school year.

This study found that the culture of the school created a rich learning environment, due to the trust between participants formed from their communities of practice, which allowed for resilience in the participants while they experimented with the iPad implementation. There were more meaningful interactions between students and faculty, and the participants did not desire, or require, formal professional development. There were potential "green" benefits from working digitally and a "cool" factor that helped to engage participants. In conclusion, the culture of the school as pioneers and the shared vision of the participants, along with the nature of their training, were the factors that contributed to the success of this iPad implementation.

Chapter 1: Introduction

Background and History

In his book *The World is Flat,* Friedman (2005) stated that in the areas of math, science and technology, U.S. students underperform compared to their global counterparts. Friedman uses an example to show the difference in science engagement using the Intel science competition, which is an international challenge among high school students. In 2004, there were 65,000 American students involved in the Intel science competition. In China there were as many as six million students involved. At the college level, science and engineering degrees represent roughly 31% in the United States as compared to 60% in China. Friedman argues that because of the flattening of the world, the competition for jobs will no longer focus on the best-qualified candidate in a specific city, but rather the best-qualified candidate in the world. Thus, American students must now compete with candidates from all over the world and their success will depend partly on their education.

The leaders in the American education system have recognized the challenge of global competition. Repeatedly throughout his administration, President Obama announced a goal of improving Science, Technology, Engineering and Math (STEM) education. The goals in STEM education are to enable all students to learn deeply and think critically in order to ensure a quality education. These goals of improving STEM education have been set because of the dismal performance of American students on international exams such as the Programme for International Student Assessment (PISA). According to the White House (n.d.), "in the 2006 PISA comparison, American students ranked 21st out of 30 countries in science literacy among students from developed countries, and 25th out of 30 in math literacy" (para. 2). According to the PISA report from 2006, the economic health of countries is dependent on having a workforce

that is skilled in science. “While basic science competencies are generally considered important for the absorption of new technology, high-level science competencies are critical for the creation of new technology and innovation” (OECD, 2007, p. 20). As a result of these and other factors, the President has called for improvements in STEM education to move America’s students to the “top of the pack”.

The Obama administration has also created an initiative, Race to the Top, to encourage states to raise standards while increasing career readiness. Race to the Top prioritizes STEM subjects over other subject areas when considering efforts to raise standards. Many states have developed plans to enter the Race to the Top, incorporating all four of the goals:

- to develop better standards and assessments,
- to adopt better data systems to track student progress,
- to support teachers and leaders to become more effective, and
- to increase the resources to implement interventions in the lowest performing schools.

The government has dedicated four billion dollars to enact these plans to improve K-12 education in 19 states to date.

Meanwhile, in a related effort to improve education, the United States Secretary of Education, Arne Duncan, has called for all textbooks to become obsolete and for schools to transition to digital texts. “The world is changing,” Duncan said in a press release; “This has to be where we go as a country.” Countries like South Korea consistently outperform the United States on educational outcomes, such as the PISA, and South Korea has moved much more quickly in embracing and integrating technology into the learning environment. South Korea is one of the most wired countries in the world and they are working toward a goal of using entirely digital textbooks by 2015.

In addition to the benefits of being technologically advanced by using digital textbooks, the use of digital media also has the capability of facilitating a green movement within the school (Lindsey, 2011). According to her research on the "going green initiative" within the department of Leadership Studies at Wright State University, the use of iPads by approximately 20 department members saved roughly 27 reams of paper in the first six months of the study. Based on a conservative estimate of these numbers, if each person could save one ream of paper every six months, that would equate to two reams of paper per year per person. Possible side benefits to schools embarking on the implementation of iPads could be a decrease in the expense of paper as well as saving millions of trees.

With global competition and American students lagging behind, it is necessary to make the kinds of changes that President Obama has made with the Race to the Top initiative and the increase in STEM education. These goals are being addressed to meet the needs of students today. Prensky (2001) reminds readers that the students today are digital natives to technology. Students are digital natives, which means they have grown up with technology being an integral part of their lives. It is a natural fit for these students to embrace technology and use it not as a prosthesis, but as an integral part of their education. In 2007, Larson posited that the rapidly expanding use of the Internet and other forms of communication are "changing and redefining what it means to be literate" (p. 240). Hence, educators at all levels need to recognize these global pressures and the changing needs of their students and adjust their teaching to include meaningful technology use.

Students benefit from technology. Several studies indicate that the use of technology in education will have a positive effect on student achievement. In 1996 Dwyer reported research that shows that the use of technology improves "mastery of basic skills, test scores, writing, and

engagement in school" (p. 24). Hopson, Simms, and Knezek (2002) compared students with and without access to computers and found that students in the technology enriched classroom developed higher order thinking skills. Additionally it was shown by Clements and Sarama (2003) that when computers and software are used well, they act as catalysts for positive social interaction, inspire creativity, generate increased use of language and facilitate cognitive interactions.

Evolution of Technology

Educators have worked to incorporate technology into the classroom. "From the birth of motion pictures in the 1920s, to the advent of the personal computer in the 1970s, educators had been intrigued with the potential of technology to help transform education and improve learning" (Hew & Brush, 2007, p. 224). Many technological inventions have found their way into the classroom through the hard work of passionate educators who are working to make the learning in schools relevant for the students when they enter the workforce. In 1983 the Apple II e made a big jump forward for the ease of using technology in education and educators worked to get computers into schools in computer labs. The presence of these computer labs became the marker for a school that was working to add technology to the list of skills that the school taught. The presence of computer labs was the primary indicator of success in a school until the development of laptops. By 1986, 25% of high schools were using desktop Personal Computers (PC's) for college- and career-readiness classes. High schools were buying mostly DOS-based clones while elementary schools (grades 1-8) were buying mostly Apple II and Macintosh computers (CSULB).

Technology advances quickly as seen in Moore's Law, proposed in 1965, states that computing power doubles every 18-24 months and as a result, the cost of computing is

fundamentally halved. This fast paced change in technological products will result in dramatic changes to the marketplace, and as a result, to the computers used in education. Based on this research, Bull and his colleagues (as cited in Peng, Su, Chou, & Tsai, 2009) projected that most of the students in public schools in the United States will have a portable wireless device by the end of the decade or sooner.

In the United States, the education of students has included technology as a way to prepare these students for the world. The technological devices have changed through the years and the research will be presented in depth in Chapter 2. Even with the swift change of computers, many educators and researchers have maintained the hope that technology integrated in the educational system will provide students with the necessary preparation to be successful (Fenster-Sparber, Kennedy, Leon, & Schwartz, 2012; McClanahan et al., 2012; Theormer & Williams, 2012).

Introduction of laptops. With the introduction of laptops the potential for technology to travel with the student became more of a possibility. The laptops were portable in a way that a bulky desktop computer was not. This portability opened up new possibilities for using laptops in the classroom rather than in a computer lab. The lack of a computer lab meant that the laptop computers could be more seamlessly integrated into the curriculum. Rather than simply using the technology as an added step (i.e., typing an already hand written essay), technology could become a crucial part of the research, writing and presentation of student ideas.

Because of the portability of laptops, one-to-one (1-1) computing programs became more feasible in schools. 1-1 programs are designed to provide each student with a device, which the students will borrow from the school for an entire school year and they will be allowed to take these devices home. The research on 1-1 computing with laptops is presented in Chapter 2. The

research on 1-1 laptop programs is significant because it is the closest technological implementation in schools and the research on laptops may provide avenues and suggestions for future research with tablets.

The iPad. In 2010 Steve Jobs introduced the iPad with much acclaim (Leoni, 2010). The iPad is a tablet computer developed by Apple, approximately the size of printed magazine. It has a color touch-screen with high-resolution display. The device has Internet access capability through WiFi and some options are available with 3G as well. The iPad runs on Apple's iOS operating system and utilizes applications (apps) for reading and consuming content as well as some apps, which are designed to help the user create content. As of 2012, the Apple App Store has more than 700,000 apps that have been created by Apple and third parties. The iPad can take pictures, film video, browse the Internet, access email and perform many of the tasks that have been done on laptops.

Sales of the iPad have been increasing since its introduction. In the first quarter the iPad was released (Q3, 2010), Apple sold 3.27 million devices. Fortune Reports that as of the fourth quarter of 2012, the iPad made by Apple had over 40% of the tablets shipped and the next closest competitor was Samsung at 15.1%. In the first quarter of 2013, Apple had 22.9 million sales worldwide.

The Hope of the iPad. With the invention of the iPad and other tablets, the portability of technology has increased again. With a tablet it is possible to collect scientific data outside of the classroom, film a movie one handed, and carry an entire year's worth of reading materials in a single device. The portability of the iPad means that the technology will be with the student when the student is ready to learn, so learning will not be as confined to the four walls of the classroom.

> Tablets like the iPad will make it second nature to not just facilitate but actually make effective pedagogical use of ubiquitous learning, that is, teaching and learning that can take place any time, in small burst, convenient to all, asynchronously or in real-time, as students and teachers alike immerse themselves in a more engaging and practical learning dialog, seamlessly forming part of the aforementioned digital continuum. (Murphy, 2011, p. 30)

Looi et al. (2010) showed that students can create a seamlessly connected learning experience by bridging the gap between learning at home and at school with the use of mobile technology.

Need for Research

Penuel (2006) asserts that the research community has not kept up with advances in technology in education. Bebell and O'Dwyer (2010) add that there is little empirical evidence on the educational outcomes of technology initiatives in schools. Yet, according to blog posts on Edutopia and anecdotal evidence, iPads can and are transforming education. But the research on iPads at the secondary level is scarce.

In addition to a scarcity of research on the iPads at the secondary level, it has also been shown that there is a gap in STEM education while the presence of technology is advancing. The research has also shown that there are differences in the way students learn today, necessitating an integration of technology for effective learning. The use of technology has been shown to be beneficial both for the ease with which information can be accessed as well as the potential to

save paper. Researchers have looked to results from studies on laptops in order to guide future research with new technology such as the iPad. However, due to the rapid rate at which technology is changing, there will always be a lag in the development of new devices and the research showing the effectiveness of those devices.

This chapter began with a discussion of the background and history pertaining to this study including a summary of technology being implemented into education since the 1980s. It also provided a framework for the study. The key sections in Chapter 1 are Problem Statement, Purpose and Research Questions. Upon completion of this chapter the reader will be aware of the history leading up to this iPad adoption and the plan for conducting research. Chapter 2 follows with a review of the Background and Related Literature. Chapter 3 discusses the research methodology to be used in the study. Chapter 4 discusses the findings from the study and Chapter 5 provides the conclusions and suggestions for further research.

Statement of Problem

The iPad and other tablet computers offer the potential portability of technology that may allow for transforming education. The problem is that, to date, there has been little definitive research or case study research to examine what worked and what did not seem to work in the implementation of technology into classrooms. The devices have been touted by the industry and through education blogs as a way to revolutionize and transform education. However, with many of the past technological advancements, too often the technology was not used, or was used peripherally. Sometimes technology was used in the classroom in a way that would replicate an already existing analog method, like typing a handwritten paper. But by duplicating this method, there was a lost opportunity for creating something better with the technology, for example in this instance: learning to compose written work on a computer.

The potential of the iPad is that it is portable, wireless, and more affordable than laptops. Bloggers and the technology industry have posited that the iPad could be used as an e-reader to replace printed textbooks. It has also been suggested that the iPad could take the place of laptops and computers but concerns have been noted on the lack of productivity tools such as Microsoft Office programs such as Word, PowerPoint and Excel.

The problem is that while the iPad has been piloted in schools and there has been anecdotal evidence on blogs, the researcher has been unable to find substantial formal academic research on the use of iPads or other tablets at the secondary level.

Statement of Purpose

As technology advances, new devices are developed and are implemented into schools. It is necessary to understand how to best implement these devices to achieve the goals of the school. The purpose of this case study was to conduct research that provided an in-depth understanding of the 1-1 implementation of iPads into the senior class of two four-year charter high schools in Southern California.

Research Question

One central research question is put forth for the study. Creswell (2009) suggests that qualitative researchers "state the broadest question they could possibly pose about the research problem" (p. 108) as a central question and then include several subquestions to follow the central question. The central research question that was used to guide this study was: How are iPads influencing the academic learning environment? The subquestions that support this central question are:

a) How does the experience of teaching and/or learning change with the use of an iPad?

b) What is the influence of an iPad on the interactions among friends and colleagues?

c) What is the influence of an iPad on the relationship between students and faculty?

d) How do the participants assess their training for using iPads?

e) What changes/improvements should be made to the iPad and its accessories?

Significance of the Study

The results of this study have both practical and theoretical significance. On a practical side, a number of schools are attempting to adopt iPads either with a 1-1 implementation or on carts within the schools and the results of this case study may help to inform those schools. One of the goals of 21st century skills is that students are proficient with technology (NETS, n.d.) and it is crucial for schools to find a way to integrate the technology in a manner that is pedagogically appropriate. The expenditure of funds necessary to implement a technology makeover in a school is significant and there is not substantial research to show that this is a good expenditure of funds. In addition, this study also addressed the teachers' and students' impression of the effectiveness of the iPad as a learning tool in an academic environment. This study gathered input from the teachers and the students in the learning environment regarding their experience with the iPad, their training to implement the iPad and their impressions of what worked and what did not. Ultimately the future research must determine if the use of an iPad is a good tool for education based on the expenditure of funds, effectiveness for learning, convenience for the users and ability to save money on paper and texts when compared to the learning outcomes for the students.

Venkatesh, Davis, and Morris (2007) found that technology adoption research has made progress, but more work is needed to provide additional theoretical perspectives. The theoretical significance of this study was to add a perspective of the students and teachers in this iPad

implementation to the literature that identifies and reframes the variables to be considered in future research.

Operational Definitions

Academic Environment- The academic environment was defined as the place and space where learning happens. The academic environment was defined through this study as the students report how and when they used their iPads for learning. When students and teachers are utilizing mobile learning devices, such as the iPad, it is the hope of the technology industry as well as educators that the devices will provide learning environments that are ubiquitous.

iPad- A tablet produced by Apple. The iPads in this study are WiFi only, have 16 GB of memory and were issued to all of the teachers in the school and senior level students for the school year. The participants were issued iPads at the beginning of the school year and they returned their iPad at the end of the school year. An Acceptable Use Policy (AUP; Appendix A) from the school district in which both of these charter high schools are located governed the use of the iPads.

Tablet- Any other type of tablet computer produced by a manufacturer other than Apple. Tablets have touch screens, some have keyboards that will attach to the device, and they all have either the WiFi or 3G access.

Tablet PC- A small laptop computer developed with a touch screen and a swivel screen. The device can be operated as a laptop, or closed with the touch screen accessible so that it resembles a bulky tablet.

1-1- One-to-One computing represents the distribution of technology to each student for the course of the year. Students borrow the device for the entire school year and typically sign an

Acceptable Use Policy (AUP) from their school (Appendix A as an example) to guide their use and the expectations of the school while using the device.

E-reading - Reading content in a digital format. The digital device on which E-reading occurs may or may not be connected to the Internet. E-reading may occur on a device that is portable or on a hardwired desktop computer. E-reading encompasses all formats of presentations, including word documents, web pages, eBooks, PowerPoint presentations and all other types of electronic text.

Students- The senior class at the two charter high schools involved in the study were issued iPads following a 1-1 format at the beginning of the school year (2012-2013). These students were involved in the iPad implementation for the duration of the school year. The students who were asked to participate in the electronic survey portion of this study were only those students over the age of 18 at the time of data gathering, which occurred during the last few weeks of the school year.

Teachers- All teachers at both schools were issued iPads at the beginning of the school year regardless of the grade level of student whom they taught. The teachers of senior level students worked to involve the students using iPads into their lessons. The teachers of freshmen, sophomores and juniors have been using the iPad primarily as a teacher tool however there were some class sets of iPads made available to these teachers at both schools. All of the teachers who used iPads for the school year being studied were invited to participate in the study.

Administrators- There are two high schools in this study and one principal and one assistant principal represent each school. Both principals and both assistant principals were issued iPads for the school year and were invited to participate in this study.

Staff- All of the staff working at the two schools were invited to participate in this study even though not all staff were issued iPads for the school year.

Assumptions

The researcher made several assumptions while conducting this study. First, the researcher assumed that study participants understood the survey and interview questions and second that they would provide honest answers to the questions. These assumptions seem tenable because the participants volunteered for the study. Third, the researcher assumed that the sample studied was representative of the total population of students, teachers, staff and administrators at the two charter high schools. Fourth, the researcher assumed that the observations were representative of typical experiences on a typical day.

Delimitations and Limitations

Delimitations, which intentionally confine the boundaries of this study, were:

1. This study focused on the iPad and not all tablets, or all technology. The iPad, while similar to many other tablets, is made by Apple, which has a footing in education. That grounding in education provides a resource both through the number of apps available in the app store as well as a history of working in education with other devices.

2. The questioning of students, teachers, administrators and staff involved in the iPad implementation while not addressing the parents, community members and other interested parties intentionally limited this study. Because the researcher does not have unlimited time and resources, the focus of this study was designed to capture the survey and interview responses from those closest to the learning.

3. The survey of students intentionally focused on those over the age of 18 at the time of the study. Because the iPads were tested at these two schools only in the senior class and

this study was designed to collect data near the end of the school year, it was reasonable to assume that the majority of seniors were 18 years old by the end of the school year and therefore they could be classified as adults for the purpose of Human Subjects Review.

The limitations, or weaknesses of the study that limit the validity of the results, deal with the small size of the population and the emerging nature of the phenomenon. First this study only examined the students, teachers, administrators and staff at two charter schools. What was true for them may not be true for all teachers, administrators, staff and students in charter, public and private schools. However, the purpose of case study research was not designed for generalization to a broader population. Case study research is intended to create a detailed case description.

Second, the use of iPads in education was and is emerging. Therefore, generalizations may be difficult to form, as the answers to questions will vary with increased exposure to the device. This study was designed to capture the responses of participants after one school year of experience with the iPads. The students and teachers were on the learning edge for how to apply iPads into the learning environment. Future studies would benefit from addressing a wider audience to increase the generalizability of the findings. This study should be replicated in the future once the use of iPads has become more ingrained into daily life.

Summary

This chapter has provided a foundation to set the research in history at a time and place where it is necessary to conduct this study. The chapter then introduced the problem, and defined the purpose of this research, which will be expanded on in Chapter 3. The purpose of the research led into the development of the research questions to guide the study along with a

statement of the significance of the study. Finally, to clarify the research, the operational definitions of key terms were defined and the assumptions, delimitations and limitations of the study were addressed. As this dissertation is meant to contribute to generalizable knowledge, the next chapter, Chapter 2, will expand upon the research to date through a thorough literature review. Chapter 3 expands on the research design and methodology of the study. The instrumentation for both the survey and interview will be presented along with selection of participants and the procedures to follow to conduct research. Chapter 4 will present the results from the interviews, surveys and observation. Finally Chapter 5 will present the conclusions based on these results.

Chapter 2: Background and Related Literature

Overview

This chapter reviews the literature related to the adoption of technology within educational settings. The purpose of this literature review is to (a) provide a background for the introduction of technology into classrooms, (b) introduce the issues related to technology implementations, and (c) introduce relevant research pertaining to the iPad.

In order to address the purpose of this literature review, this chapter is organized into the following major sections: (a) the background frameworks of educational technology, (b) an introduction to the evolution of devices and their supporting technology from 1980 through the present, (c) Federal involvement in technology in education, (d) technology implementations in education and the factors which are shown to work and those which do not, (e) global pressures: factors moving the world toward increased technology use, (f) the students' experience of interactions with technology, (g) the teachers' experience of interactions with technology, and finally, (h) research specifically on iPads and tablets in education. In terms of broad categorization, the first four sections (a-d) present a chronological discussion of technology use and the in the classroom. The next section (e) discusses factors moving the world toward an increased use of technology and the reasons behind the drive to integrate technology in the classroom. Sections (f-g) present research on the students' and teachers' interactions with technology in the classroom and as a learning/efficiency tool. The final section (h) presents research specifically on iPads and tablets in education.

Background Frameworks in Educational Technology

In tracing the historical development of technology in education, Hew and Brush (2007) assert that, "from the birth of motion pictures in the 1920s, to the advent of the personal

computer in the 1970s, educators have been intrigued with the potential of technology to help transform education and improve learning" (p. 224). Jonassen, Howland, Moore and Marra (2003) provide examples of the early history of technology used in education from "illustrations in 17th –century books and slate chalkboards in the 18th-century" (p. 10). In the 20th century, projectors, radio, and film emerged as fixtures within the classroom (Jonassen et al., 2003). The significance of these technologies and even computers is that they were not developed specifically for education, but the educational community recognized the potential use of the new technology in meeting their instructional goals and applied it to the teaching of their curriculum.

The introduction of programmed instruction in the 1950s and 1960s was the first instance of technology designed to meet an educational need and therefore the first example of educational technology.

Changes in educational technology have evolved and replaced each prior invention, a phenomenon known as creative destruction. Creative Destruction is based on the work of Marx and was popularized by Joseph Schumpeter through his book, *Capitalism, Socialism and Democracy* first published in 1942. The idea as it applies to technology suggests that each new invention that revolutionizes an industry will eventually be replaced by newer technologies. For example, a company like Xerox that was known for its copiers and replaced the mimeograph companies has been in decline since the advancement of digital scanners. The same can be seen in companies like Kodak, Polaroid, and in the progression of music recording devices (i.e. 8-track, cassette tapes, compact discs, MP3s). The Internet has catalyzed creative destruction by increasing sales areas for companies, and by providing the structure for the distribution of online newspapers. The progression of creative destruction will be explained further as the technological devices are introduced in a following section.

Educational technology has not only changed rapidly but the classification as to whether technology is a pure science or an applied science was addressed by Bunge in 1966. He showed that the motivation and outlook were different with one being the desire to understand things better and the other seeking to have mastery over the thing in question. Technology, he posits, is the latter and he proposes the classification of technology as "applied science." Two decades later, philosophers started to pay attention to the epistemology of technology (Durbin, 1984).

Continuing the philosophical discussion of technology in education, Kerr (1996) argues that the culture of education has become accustomed to readily embracing technology without questioning the costs or time involved in the implementation of this technology.

> In all these cases, we started with enormous expectations about what a particular set of technological devices, used in a particular way, might be able to accomplish. While there were a few successes (the overhead projector that rapidly spread into most of the classrooms in America, the somewhat slower but still wide-ranging dissemination of VCRs, the power of distance education and "open university" approaches to extend higher education to new audiences), there were certainly more failures and criticisms—the machines that were used once and consigned to the closet, the devices that teachers used once a year because they were too complex, the stigma that attached to teachers who used "too many films." (p. 2)

In this previous quote, Kerr shows the difference between the expectations of what technology in the classroom could do to the actual use of technological devices to foster meaningful advances in education. He further states four goals that could be used to guide education and the inclusion of technology: the acquisition of knowledge as a tool for self-discovery, a feeling of self-worth, a mutual respect for others with different beliefs, and finally, a willingness to participate in a democratic society. These goals, notes Kerr, would allow schools to adopt technology based on human values and not the economic utility of preparing workers for their future jobs. The concern of preparing students for their future jobs is frequently noted in research as one of the goals of technology implementations (Nolan & Meister, 2000; Penuel, 2006). Yet Sutherland-

Smith (2002) reminds us that the technology is changing so rapidly, that to attempt to teach students how to use each device will result in always playing a game of catch-up.

These changes in technology are occurring so rapidly and Tugui (2011) predicted in a report for the *World Future Review* that there will be a rise of *calm technologies*, a term used to describe the reduction of excitement and information overload while focusing on the information selected by the user. In the future, technology will become "constantly invisible and increasingly omnipresent" (p. 71). These calm technologies will:

> Remove barriers of language, time, and space between teachers and learners, and help to reduce today's huge costs for technical education, as well as facilitate the handling of large amounts of knowledge with efficient storage devices and the rapid access to visual and audio resources that offer well-documented, practical experience to students. (p. 72)

Calm technologies add to an experience, while maintaining a presence that is not obvious. He stated that education will be the key advantage in learning how to utilizing calm technologies effectively and he predicted that education would propel the world toward six great trends (Cornish, 2004) where four are positive for society and two are distinct negatives. The four positive trends for society are technological progress, economic growth, improvement of people's health and the increase of mobility. The two negative trends are the decline of the environment and the increasing deculturization, which is the abandoning of one's culture. Education then will have the power to influence the direction of the six trends mentioned above and with technology becoming increasingly omnipresent and invisible, these calm technologies can shape our future. There is evidence to support the notion of a powerful alliance forming between education and technology, but it is necessary to examine best practices for integrating technology within educational settings to ensure that the two interact in a way that services society.

Educational technology is understood to play a role in the advancement of learning; however, in 2008 Swan and Hofer found that the research was scarce on how the use of technology would impact achievement and learning goals. The following sections will discuss the implication of computers in schools and how educators are working to pair technology to meet the learning goals of their students.

Evolution of Devices and Supporting Technology 1980-Present

> The term "educational technology" includes both analog technologies, such as clay tablets, blackboard, chalk boards, books, photos, audio, writing and drawing tools, movies, classic tools of computation, etc., and digital ones, such as e-tablets, tablet-PC, e-books, e-recordings, video projectors, educational software, educational games, multimedia presentations, e-learning platforms, digital libraries etc. (Tugui, 2011, p. 67)

The history of educational technology has been introduced on a broad scale, and in relation to this study, the technological advancements from the introduction of the personal computer relate most directly to the study of tablet computers and iPads. This section of the literature review will focus primarily on the educational technology advancements from the early 1980s, starting with the introduction of the personal computer into the classroom, and following the technological advances with laptops and the corresponding research on one-to-one (1-1) computing. Along with the advancements in devices, there have been connectivity advances such as Ethernet and wireless connections. Next, the possibilities for interconnectedness and research through the development of the Internet and the advancements in technology, which allow for wirelessly connected devices leading to portability will be discussed. This section will close with a general discussion of the iPad and other portable devices.

Computers are introduced into primary and secondary schools. In 1981, IBM became the first mainframe manufacturer to develop a personal computer (PC). Previously, academic institutions, governments, and major corporations used computers, but because of their

size and cost, they were not available to the general public. With the advancements in technology that allowed for the size of the computer to decrease from being the size of a room to occupying a desk, personal computers became a presence in the home. Meanwhile in the schools, Computer Aided Instruction (CAI) gained acceptance as a medium for drill and practice problems as a means of learning. By 1983, the Apple II computer found widespread acceptance in schools. By 1986, schools were buying mostly Apple II and Macintosh computers while businesses were buying mostly PC's ("History, the History of Computers, and the History of Computers in Education," n.d.).

Apple computers were the predominant type of computers in schools in the early 1980's and an investigation into their usefulness was undertaken in the Apple Classroom of Tomorrow (ACOT). As reported by Dwyer (1994) in an article prepared for *Educational Leadership*, the experiences of teachers involved in the project were compiled and the lessons learned from the project were reported. Some of the lessons learned included: (a) teachers were not hopeless illiterates, (b) children did not become social isolates, (c) children's interest in and engagement with the technology did not decline with routine use, (d) children, even at young ages, did not find the keyboard a barrier to fluid use of the computer, (e) software did not prove to be a limiting factor, even in the high school classrooms where Macintosh was the tool of choice.

At the ACOT site in Memphis, Tennessee, computers were intentionally used for the purpose of raising student test scores. For two consecutive years, the students in the ACOT program scored significantly higher on the California Achievement Test (CAT) than control group students who were not in the ACOT program (Dwyer, 1994). Most notably, however, was not the standardized test scores but the skills demonstrated by the ACOT students: "They

routinely employed inquiry, collaborative, technological, and problem-solving skills uncommon to graduates of traditional high school programs" (p. 8).

Computers through the 1980's were primarily positioned in schools via computer labs. But, with the introduction of the laptop in 1988, computers could be transported to the student rather than having to make the students come to the computers, which were wired into the walls of a computer lab. By the mid 1990's, most classrooms had at least one PC available for instructional delivery, but not all instructors had access to a computer to prepare their lessons. By 2002, Market Data Retrieval (2002) noted that computers have achieved a "substantial" presence in schools.

Introduction of the Internet into schools. As with computers, when the Internet was introduced, it started in businesses, followed by schools and gradually moved into homes. This is an example of creative destruction as described in a previous section. By the 1990s the Internet was in homes first as dial-up and then as cable modems. In the early 1990s elementary schools, secondary schools and colleges started adding infrastructure to allow for Internet connections, and people started creating email addresses. The Internet grew in popularity in the mid 1990s, and by 1997 many schools were rewiring for web access and encouraging teachers to create instructional websites. VanFossen and Waterson (2008) found that 70% of teachers in their study reported that they still use the Internet to gather background information for the lessons they teach, and they wished that they used it more, showing that it can be a valuable instructional tool.

Development of laptop computers and their introduction into schools. The introduction of the laptop in 1988 brought about the possibility of transporting a computer to the place where the person was working rather than having to relocate people to where the computers were hardwired into the walls. Early adopting schools began piloting laptop

academies in the early 1990s. In 2001 there were the beginnings of laptop one-to-one (1-1) adoptions for entire schools and districts. While it was hoped that the laptops would transform education, it was noted by Penuel (2006) that the research community lacked research on the impact of initiatives such as 1-1 implementations on student learning. Additionally, Penuel (2006) added that the research community has not kept up with advances in technology in education.

Research on 1-1 computing within schools. Since Penuel's (2006) assertion that there was a lack of research on 1-1 computing, a number of studies have emerged. A 1-1 roll-out of laptops from the 2007-2008 school year to all students in grades three through 12 of the Mooresville Graded School District was documented by McCrea (2011). The district included "improved student engagement, state and national assessment scores, and student attendance" (p. 1) as top priorities to this digital conversion. Over the four years of the study, there was a positive trend across all data and specifically the suspension rate and dropout rate decreased while attendance and graduation rates have increased. Additionally, Maninger and Holden (2009) reported on the successful 1-1 laptop integration in a middle school.

> Yet there was still a dearth of empirical evidence on 1-1 computing. In recent years, we have seen increased interest in implementing 1-1 computing initiatives in schools. However, for educators and policy makers that wish to invest in these initiatives as a means for improving educational outcomes, there is little empirical evidence upon which to base decisions. (Bebell & O'Dwyer, 2010, p. 5)

This small amount of empirical evidence was not due to the lack of computers being used in schools. As seen earlier, by 2002 computers had achieved a substantial presence in schools (Market Data Retrieval, 2002). The lack of evidence was also not due to the lack of standards for teachers to address in their classes because the ISTE had published their first edition of technology standards in 2000. This lack of research on technology in

education continues to be an issue today and may be a result of the inability of the research community to keep up with the advances in technology.

Introduction of wireless technology to change laptop and future device usage. Wireless technology allows for the connection of a device to the Internet without being physically connected through cords to the phone or cable lines. Wireless technology operates by transmitting electrical energy from the device to a receiver and utilizes different types of connections depending on the availability of networks. One type of connection is Wi-Fi, which is a wireless local area network. Wi-Fi is commonly used in homes, offices, schools and in some public spaces. Another type of wireless connection is though a cellular data service. Cellular data operates within a range of 10-15 miles from the nearest cell site. In largely rural areas, a Mobile Satellite Communication is commonly used for transportation, aviation and military use.

iPods, ereaders, cellphones and other small portable devices. Penuel (2006) demonstrated the fact that technology is increasing in portability and decreasing in cost leading to more implementations of 1-1 initiatives including such devices as tablets, ultra-mobile PC's, iPhones and netbooks. These 1-1 implementations are expanding rapidly across the globe. This is also supported by the work of Garland (2006), who deduced that portable computers (laptops, tablet PC's, Alpha Smarts and Palm Pilots) were becoming increasingly common in schools.

An example of the use of these portable devices occurred in the Comal Independent School District (IDS) in Texas in 2009 with the teachers of students learning English (Demski, 2011). The English Language Learning (ELL) teachers and administrators were looking for a solution to bridge the gap between their ELL students and the general education population. The teachers were looking for a device that was small enough to fit in the pocket of the student so that they would take it with them wherever they went and use the device as much as possible. In

2009, the teachers and administrators in this study (Demski, 2011) opted for the iPod Touch because it is a comparatively small device that allowed for portability and offered the students the ability to translate and define words as well as record their own voices. The school district issued students the iPod Touch devices for the entire school year, allowing students to treat the device as their own, rather than only use it at school because of their belief that the learning would happen both at school and at home.

Banister (2010) summarized the research to date on mobile learning for kindergarten through 12th grade students in her dissertation focusing on the iPod Touch. While many potential uses for the iPod Touch were listed and some of the apps were listed for their effectiveness at working in the classroom, it was determined that the devices were still new to the classroom and more time and testing situations were needed to document the impact of mobile learning. Banister also suggested in the conclusion that it would be important for teachers to "take up the challenge of integrating the devices" (p. 129) to find ways to manage the devices, to monitor students' use for learning purposes and for researchers to document the process.

Moore's Law, proposed in 1965, states that computing power doubles every 18-24 months and as a result, the cost of computing is fundamentally halved. Based on this research, Bull and his colleagues (as cited in Peng et al., 2009) project that most of the students in public schools in the United States will have a portable wireless device by the end of the decade or sooner.

These portable computing devices have become increasingly common in schools. In 2007 the National Educational Technology Standards projected, based on preliminary reports, that stylus-interfaced technology held potential as a learning tool and a means to implement technology standards. In 2009, Reed College underwent a study using the Kindle to determine

the potential of that device as an e-reader. In 2010 the iPad was introduced and in 2011 Reed College revisited their study on e-readers and initiated an iPad pilot. Over the years, a number of different technologies have been introduced into the classroom, yet there is only an opaque understanding of how technology integration has impacted learning outcomes and secondary factors, such as student-teacher interaction. Thus, with the inconclusive findings from previous studies, more research is needed to indicate the costs vs. benefits of ever newer technologies, and specifically, iPads (Marmarelli, & Ringle, 2011).

Tablets. Tablets include Tablet PC's, the iPad and most recently the other tablet devices that have been created to compete with the iPad. Since its release in 2010, the iPad has been met with much acclaim, and beginning in 2011, schools began 1-1 initiatives and pilot studies. The research to date on iPads in education will be presented in a later section but because one of the main hopes people project onto the iPad is that it will enable seamless learning to occur anywhere, in this next section, the research pertaining to the potential for ubiquitous learning will be presented.

Tablet PC's. Tablet computers, also known as Tablet PC's were introduced by Microsoft in 2000 and had the functionality of a touch screen as well as a physical keyboard that would fold away similar to a laptop for storage. These devices were the predecessors of the tablets seen on the market today. These Tablet PC's worked with a pen-like stylus and utilized an operating system that functioned with Microsoft office. The research on Tablet PC's was mostly favorable. Schroeder (2004) found increased student engagement of high school students when using tablet computers because of their high level of interactivity. Barton and Collura (2003) found that tablet computers had an advantage for improving the writing and organizational skills of high

school students because the students are able to type or handwrite and then convert handwriting to text.

iPad. In 2010, Steve Jobs announced the iPad and released the initial specs on the device. The original device utilized a multi-touch screen designed for fingertips instead of needing a stylus and a virtual keyboard rather than a physical one. As of this writing, there are four generations of iPads and an iPad mini. These devices are sold as either WiFi only or with WiFi and a cellular connection (2G, 3G and 4G depending on the device). Also, the memory of the device can be selected at the point of purchase (16, 32, or 64 GB). iPads along with other tablet computers have been introduced into corporations and schools and research on their impact and usefulness began anecdotally at first followed by research studies.

Competing Tablets 2011. In response to the success of the iPad (Chen, 2012) competing tablets have been introduced. Samsung, HTC, Motorola, Sony, Amazon, Microsoft, Google, and others have developed tablets of a similar size, functionality, and connectivity. Murphy (2011) referred to iPads and similar tablets as a post-PC Devices or PPDs. For the purpose of this literature review, the focus will be on iPads, but due to the limited number of studies, supporting research from similar tablets will be provided when available.

El-Gayar, Moran, and Hawkes (2011) proposed a research model to predict the acceptance of tablets based on a number of technological, individual and organizational factors within a school. The model suggests that effort, performance expectancy, attitude, social influence, and facilitating conditions will all contribute to the behaviors that result in adoption of this new technology. The student must believe that there will not be an exceptionally high learning curve for the device. The student must also believe that the tablet will aid the student in an increased academic outcome. There must be a positive attitude toward the device, both

individually and socially with peers and faculty. Finally, the facilitating conditions such as an IT help desk, sufficient bandwidth access to necessary software are necessary for the student to want to adopt the technology.

Murray and Olcese (2011) researched the iPad and its applications to determine if the device offered a unique learning advantage in the K-12 educational setting that was not possible with other technologies. Based on their review of the device and the available apps, they have determined that the iPad will not "ignite a revolution in schools" (p. 48). Their research has determined that the applications designed to run on the iPad are primarily designed for the consumption of content and not the creation and collaboration required to address 21st century skills. Within education, the term '21st century skills' refers to the learning objectives designed to prepare students for meaningful work in the 21st century. Some of these skills include critical thinking, collaboration, creativity, communication as well as ICT literacy along with life and career skills. This report is damning to the proponents of placing iPads in schools, but it is also dated in that new apps are being released every hour.

It was concluded by Kinash, Brand, Mathew, and Kordyban (2011) that for determining effective technology integration, the "authentic independent variable is the collection of pedagogical decisions that the educator puts into play in deciding whether, when and how to use the mobile devices" (p. 349). Webb (2005) concurs that the crucial component in the use of Information and Communications Technology (ICT) in learning and teaching is the teacher and their pedagogical approaches. "The results show that students learn best when technologies are seamlessly integrated into the curriculum to enhance their learning experience" (Manuguerra & Petocz, 2011, p. 62). Therefore, the selection of the device is an important factor, but according

to these reports, the primary focus should be on the teachers who are working in the classroom to implement the devices.

I. Berson, Berson, and Manfra (2012) outline strategies for integrating multi-touch technology (iPads) to foster student centric construction of knowledge. They propose that

> …The new literacy skills involved with iPads go beyond traditional conceptions of literacy to include remixing media and content, collaborating with peers at a distance, sharing and communicating findings clearly and efficiently and understanding which apps best fit their learning goals. (p. 90)

The strategies include first determining if the activity can be done without technology. If the activity (like note-taking) can be done without the device then teachers may not be making use of the technology to its fullest potential. Rather than replicating an activity and retrofitting the technology to fit a traditional teaching activity, they propose utilizing a combination of apps to gather content and media, taking advantage of social media and web 2.0 resources to engage in social knowledge construction and attempting to solve complex and authentic problems in the world.

The student-centered approach of integrating technology in the classroom in a constructivist manner is aligned with 21st century standards but additionally the component of mobile learning changes the traditional learning environment (NETS, n.d.). Constructivist learning environments rely on the student to construct meaning and to learn from experimental learning through real life experiences. Peng et al. (2009) propose a vision for the future of education that includes ubiquitous knowledge construction, which merges both mobile learning and constructivist pedagogy.

Learning extends outside of the classroom. Due to the availability of small, portable devices with wireless connectivity, learning is no longer limited to the classroom. The possibility

of learning to occur outside of the physical walls of the classroom and outside of the schedule of the school day is known as ubiquitous learning.

> Tablets like the iPad will make it second nature to not just facilitate but actually make effective pedagogical use of ubiquitous learning, that is, teaching and learning that can take place any time, in small burst, convenient to all, asynchronously or in real-time, as students and teachers alike immerse themselves in a more engaging and practical learning dialog, seamlessly forming part of the aforementioned digital continuum. (Murphy, 2011, p. 30)

One of the benefits of small, portable, wireless devices is that they provide the technology necessary to enable ubiquitous learning to occur. However, the following research discusses the other issues at play in order to facilitate ubiquitous learning from ubiquitous access to devices.

S. Li, Pow, Wong, and Fung (2010) showed that the implementation of 1-1 mobile technology would have a pervasive effect on the student's ability to create a learning space that spans both home and school regardless of the curriculum and pedagogy. M. Berson and Balyta (2004) noted that tablets and other portable technology "offer the means to maintain the physical structure of the classroom while enhancing content delivery and student productivity" (p. 145). Looi et al. (2010) showed that students can create a seamlessly connected learning experience by bridging the gap between learning at home and learning at school with the use of mobile technology.

Mobile learning enables our students to go out into the field to collect data and find answers and then share their findings with the world. Seamless learning with mobile devices intertwines the formal and informal learning of the student and therefore understanding both types of learning is necessary to facilitate seamless learning with mobile technology (Looi et al., 2010).

The challenge for ubiquitous learning as stated by Looi et al. (2010) at this point is "to enable learners to learn wherever they are curious and seamlessly switch between different

contexts, such as between formal and informal contexts and between individual and social learning" (p. 154). Grace-Martin and Gay (2001) found that there were certain times when it was beneficial to have ubiquitous network access and other times when it was better for the student to be limited in their network access. Student achievement and productivity were increased when students were limited by their network connection and they were forced to focus on the application designated by their instructor.

A 2011 iPad study by Kinash et al. (2011) reveals that the "presence or absence of mobile learning devices does not guarantee or preclude student learning" (p. 343) and "that mobility does not equate to learning" (p. 349). Kinash et al. discuss the separation of the term "mobile learning" to focus on the mobility and learning implied by the joint term. Mobility is made possible through portable devices and wireless networks and while many devices offer this potential, they suggest that simply having a device capable of mobile learning does not predicate that learning will occur. However, they suggest that a constructivist educator who, as part of their pedagogical structure engages the students in hands-on-learning, will utilize these devices for learning and accomplish mobile learning.

According to Grace-Martin and Gay (2001) the theory that ubiquitous access to technology and networks will benefit students must be carefully considered. The research shows that "such benefits may exist for some populations in some contexts, but the characteristics of the user and his/her educational environment may limit or even reverse these benefits when measured in terms of academic performance" (p. 104).

Forston (2012) described the experience of a New York state teacher, Feraco, who has invested his spare time into developing apps to help students study for the Regents exam. Feraco, the teacher and developer of the app, noticed that his students were constantly on their cell

phones, laptops, tablets and other mobile devices and he is quoted as saying, "it's fantastic, but it's everywhere" (p. 1). This pervasiveness of the technology inspired him to create the apps that would allow students to prepare for exams wherever they were whenever they had time to invest. Each app has six basic features, "lessons organized by topic, interactive 'fun quizzes' with questions from past tests, YouTube videos with relevant content, newsfeeds sourced from subject-specific media, vocabulary flashcards, and the option to share the app on social media" (p. 1).

Ultimately, according to Murphy (2011), there is a lack of research on the uses of PPDs (iPads and other tablets). The limited numbers of studies that have been published on PPDs fall into a few categories; helping students with special needs, primary school studies, tertiary school studies and how these devices impact teachers. The results of these studies will be reported later in this chapter but the largest hole in the literature is studies with secondary students.

There are many devices that have been introduced in the last 35 years since the ACOT. Each of these brought new technology into education, which has helped to create the evolving framework on how educators integrate and best utilize these new tools to support the learning of their students. As the understanding of technology integration has improved and as the need to provide students with 21st century skills has included ICT literacy, the Federal Government of the United States has entered the scene.

Federal Involvement in Technology in Education

The United States federal government has promoted the message that technology is important to America's ongoing status as a world power (White House, n.d.). Additionally, at the third annual White House Science Fair, President Obama encouraged a focus on STEM education and added, *"*we need to make this a priority to train an army of new teachers in these

subject areas, and to make sure that all of us as a country are lifting up these subjects for the respect that they deserve" (White House, n.d., para. 1). In addition to calling for additional STEM integration in schools, the government has also developed standards for technology integration.

The Communications Act of 1934 was designed to regulate interstate and foreign commerce in communication by wire and radio in order to provide all people with access to these communication tools at a reasonable cost (Paglin, 1989). The Federal Commerce Commission (FCC) was created to oversee and enforce this act. In the Telecommunications Act of 1996, the Communications Act of 1934 was amended along with the guidelines for the FCC to add broadband and internet access to the previously mentioned wire and radio communications. The implications of this law are such that the government deemed necessary for all people to have access to the Internet at a reasonable cost.

Also in 1996, along with the Telecommunications Act, Clinton proposed in his 1996 State of the Union Address his plan to create 21st century schools. Part of this plan included a goal to have every school wired for the Internet by the year 2000.

> Our second challenge is to provide Americans with the educational opportunities we'll all need for this new century. In our schools, every classroom in America must be connected to the information superhighway, with computers and good software and well-trained teachers. We are working with the telecommunications industry, educators, and parents to connect 20 percent of California's classrooms by this spring, and every classroom and every library in the entire United States by the year 2000. I ask Congress to support this education technology initiative so that we can make sure this national partnership succeeds. (Clinton, 1996, para. 30)

Clinton recognized the importance of educational technology, and specifically in this case, access to the Internet with quality hardware and software, for providing American students with the skills they will need to be successful.

Development of technology standards in schools. The International Society for Technology in Education (ISTE) was formed in 1979 and has published technology standards to create a framework of expectations for students in elementary and secondary education. These standards were first presented in 2000 and the most recent edition is available from 2008 (NETS, n.d.).

Grades 9-12 (Ages 14-18)

The following experiences with technology and digital resources are examples of learning activities students might engage in during grades 9-12 (ages 14-18):

1. Design, develop, and test a digital learning game to demonstrate knowledge and skills related to curriculum content.
2. Create and publish an online art gallery with examples and commentary that demonstrate an understanding of different historical periods, cultures, and countries.
3. Select digital tools or resources to use for a real-world task and justify the selection based on their efficiency and effectiveness.
4. Employ curriculum-specific simulations to practice critical-thinking processes.
5. Identify a complex global issue, develop a systematic plan of investigation, and present innovative sustainable solutions. Analyze the capabilities and limitations of current and emerging technology
6. Resources and assess their potential to address personal, social, lifelong learning, and career needs.
7. Design a website that meets accessibility requirements.
8. Model legal and ethical behaviors when using information and technology by properly selecting, acquiring, and citing resources.

9. Create media-rich presentations for other students on the appropriate and ethical digital tools and resources.

10. Configure and troubleshoot hardware, software, and network systems to optimize their use for learning and productivity.

Technology Implementations in Education: What Works and Concerns

The research on integrating technology into education comes from many sources but is primarily based on research with 1-1 laptop adoptions. The concerns that have appeared in the literature discuss not only the technological difficulties encountered by classroom teachers, but also the broader concerns in determining the philosophical approach of technology implementations. The literature showing what works in technology implementations discusses the preparations that have been shown to increase technology use, the constructivist pedagogy, and the necessary professional development for teachers.

Concerns in technology implementations. A number of challenges have been identified that teachers face when integrating technology (Ertmer, 1999; Ertmer, Addison, Lane, Ross, & Woods, 1999; Ertmer & Hruskocy, 1999; Hruskocy, Cennamo, Ertmer, & Johnson, 2000). Ertmer et al.'s (1999) notion of first- and second-order barriers can be used to get a better understanding of the classification of the barriers. There are technical and logistical questions (e.g. How does this device work? What are the school rules for usage?) that teachers have when integrating technology and these are known as first order barriers. Additionally, there are second order barriers that are also known to impede meaningful classroom use. These second order barriers are more subtle issues, related to teachers' pedagogical visions and beliefs, as well as their perceived confidence for using technology. First-order barriers are obstacles that are external to teachers; while second-order barriers are intrinsic to teachers (Ertmer et al., 1999).

In addition to first and second order barriers to implementation, and while there has been a push to implement technology in schools, Cuban and colleagues (Cuban et al., 2001; Cuban & Kirkpatrick, 1998) have found that the reality of use of technology in schools falls dramatically short of the expectations publicized by proponents of technology. Skeptics (Becker, Ravitz & Wong, 2009; Cuban et al., 2006) argue that the use of technology in classrooms is more banal and less transformative than proponents' expectations. For example Grace-Martin and Gay (2001) have found that the availability of laptop computers allowed for the increased usage of non-instructional activities, which could limit or reverse academic performance of students.

It has been suggested by Cuban and Kirkpatrick (1998) that the following questions should be used to determine whether or not technology is appropriate to facilitate the learning goals:

1. What do we want to use computers for in our classrooms?
2. Can we reach our goals at a lesser cost without additional investments in technology?
3. Will computers help create the type of students and citizens we seek?
4. Through what means can we achieve our desired ends? (p. 27)

These authors suggest that by addressing these questions as an administration as the faculty and staff prepares for technology implementations, the technology will be better aligned to meet the needs in the school.

While there are certain concerns over first and second order barriers in technology implementations (Ertmer et al., 1999) as well as a lack of results that meet the expectations of the prognosis (Cuban et al., 2001; Cuban & Kirkpatrick, 1998). There are also studies showing the benefits for students and that will be discussed in the next section.

What works in technology implementations. Successful one-to-one computing environments in education have been found to include critical factors necessary both before and during the technology implementation. Before the technology implementation, it is necessary for there to be committed leaders who clearly communicate expectations to all stakeholders and provides administrative support from planning through implementation and follow-through. Also it is important to have financial resources for equipment, software, training, and technical support. The academic climate of the school should be one that provides all students with access to technology resources and sufficient opportunities for use (Maninger & Holden, 2009). It is important that the teachers have buy-in (Nolan & Meister, 2000; Shapley, Sheehan, Maloney, & Caranikas-Walker, 2010) as well as positive teacher attitudes toward student technology use (Penuel, 2006). In order for the teachers to become comfortable with the new equipment, they must have time to experiment with the new devices before they are expected to teach students (Maninger & Holden, 2009; Schmid, Miodrag, & Francesco, 2008; Trotter & Zehr, 1999). Along with the time for experimentation, the teachers also need formal professional development (Penuel, 2006; Trotter & Zehr, 1999).

During the technology implementation, it is necessary for the administration and teachers to share with students an "explicit set of simple rules" that shapes their understanding of teaching and learning (Weston & Bain, 2010, p. 11). It is also necessary that there be access to technical support (Littlejohn, 2002; Penuel, 2006) once the devices have been integrated into the class to address technical issues that will arise. In an ongoing effort to determine if the technology is (or is not) enhancing the learning environment, it is important to have frequent monitoring and evaluation of the program (Fletcher, 2002; Maninger & Holden 2009; Nolan & Meister, 2000). Finally, it is important to consider buttressing the technology implementation with teaching

models that the technology supports (Maninger & Holden, 2009; Pun, Li, Kong, & Yuen, 2007; Webb, 2005) and not rely on technology to carry the curriculum. In a future section of this chapter, the curriculum selection and pedagogical approach will be examined alongside technology implementations.

When understanding change within a school, such as technology implementations, Sikes (1992) examined the effect of imposed change on experienced teachers. The experienced teachers (ages 30- 49-years-old) were deemed to have influence on the younger teachers at their schools. As a cohort, these experienced teachers are not digital natives. The older cohort of teachers did experience noteworthy resistance to technological changes. The resistance that they displayed in regard to technological changes may be due to the fact that they are afraid that they might not be able to learn how to use it. It is important to consider the resistance to technology that may appear during a technology implementation.

Technology integrations can be difficult and the following three models have been proposed to make the integration of technology easier: for young children (Haugland, 1999), for science classes (Barab & Luehmann, 2003) and a general, philosophical approach to technology integration (Frank, Zhao, & Borman, 2004). Haugland (1999) proposed a model for computer integration with young children where the young children should be working alongside adults in a process of exploration and discovery. Barab and Luehmann (2003) focused on building a sustainable science curriculum that utilized technology in a way that made the learning more relevant to students and more efficient for teachers. Through their research they have determined that the best way to implement curricula on a large scale is not to use a cookie cutter approach with all districts, but to train the teachers in a way that allows them to adapt the curriculum to meet the needs of their students. The allowance of local control provided the best chance for the

curriculum to thrive and the teachers to willingly participate in the change of instruction. This goal of aiming for local adaptation can be applied to the use of technology as well. Frank et al. (2004) proposed a philosophical model of technology implementations based on social capital. They have found that the spread of technology in schools follows social pressures and those with social capital will share their information and resources first with friends. These models have been proposed, but the research is slim showing their results.

In the *Journal of Researching and Computing in Education*, in an article by Becker (1994), the differential factors were identified to distinguish between exemplary computer-using teachers and other teachers. The findings indicate that exemplary users are more likely to be present when the following four factors were present: "collegiality among users, school support for using computers for consequential activities, resources allocated to staff development and computer coordination, and smaller class sizes" (p. 291).

Dexter, Anderson, and Becker (1999) stated, "For teachers to implement any new instructional strategy, they must acquire new knowledge about it and then weave this together with the demands of the curriculum, classroom management, and existing instructional skills" (p. 223). Additionally, Sutherland-Smith (2002) reminds us that because technology is changing so rapidly, the strategies used by educators will always be a form of "catch-up" (p. 667). The essential learning for teachers when dealing with implementing new technology is to understand this learning curve and be willing to learn from technological changes. Another consideration is that the students will likely be more tech-savvy than the teacher and findings suggest that teachers would benefit from finding ways to recruit students to help in the classroom.

In the past when teachers have attempted to implement technology into school projects, they have adapted technological productivity tools from adult job requirements to

implement into school projects (Penuel, 2006). According to Sherman and Hicks (2000), teachers need to learn how to use the technology, and more importantly, they need to learn how to use various technologies to transform their teaching. The transformation of teaching in conjunction with the use of technology is a common topic of research and will be discussed in the next section.

Changing classroom pedagogy toward more constructivist learning. Prensky (2001) reminds us that the students today are digital natives to technology when he notes, "today's students are no longer the people our educational system was designed to teach" (Prensky, 2001, p. 2). Larson (2007) posited that the rapidly expanding use of the Internet and other forms of communication are "changing and redefining what it means to be literate" (p. 240). Hence, educators at all levels need to recognize these changes and adjust their teaching accordingly.

Many educators and policy makers believe that technology inclusion can be a catalyst for educational transformation (Collins, 1996; Hadley & Sheingold, 1991; Means, Olson, & Singh, 1995; Newman, 1992; Willis & Mehlinger, 1996). They suggest that the use of technology will allow the teacher to take on the role of facilitator to guide students in a constructivist manner. Bruner (n.d.) describes constructivism as an environment where the learner is responsible for constructing their own knowledge by creating their own mental framework and mental models. Constructivism calls for a problem-solving, hands-on, active learning curriculum that leaves no room for the standardization of classrooms. Active learning environments require higher-order thinking than lecture-based courses. The higher-order thinking skills used in an active learning environment include engaging students in problem-solving, discussing ideas, providing feedback and teaching other students (Hamby Towns & Grant, 1997; Johnson, Johnson, & Smith, 1998).

One of the key questions for teachers to consider is the role of technology in the curriculum (Swaminathan & Wright, 2003). Examples of technology use span the continuum from typing reports and watching PowerPoint presentations, to more student-centered uses such as students utilizing research tools to investigate, create and present their findings. Further, Swaminathan and Wright (2003) provide a question to use as a guideline for evaluating technology; "Who does the thinking?" If the student is doing the thinking when using technology, it will allow them to have active control and problem solving, while providing the teachers a window into their development.

However, research from this literature shows that teachers who use technology fall all along the continuum of direct instruction to construction (Collins, 1996; Hadley & Sheingold, 1991; Means et al., 1995; Newman, 1992; Willis & Mehlinger, 1996). Teachers who are using technology in their teacher-centered classrooms use the technology to drill and practice the teacher-delivered content. Teachers who are using technology in student-centered classrooms are using the technology as a tool to allow students to construct knowledge. This is supported by Cuban, Kirkpatrick, and Peck (2001) who posit that when technology is adopted and assimilated into the existing methods of teaching, there is little change in the methodology of teaching and learning. Similarly, Burns and Polman (2006) note that methodological change is volatile in a society where the pace of technological change is occurring rapidly. While a move toward constructivist learning could be beneficial, "Professors still seem drawn to lecturing, crashing their teaching on the rocks due to the seductive and tempting attractions of explicating knowledge to an adoring audience and teaching as they were taught" (Johnson et al., 1998, p. 31). Keyser (2000) also encourages educators to move away from lecture-based instruction,

because, while it may seem "easier" (p. 15), active and cooperative learning are "more worthwhile" (p. 15).

Becker (1994) determined that meaningful technology use tends to be more aligned with constructivist teaching philosophy and as a result, professional development for technology is moving away from an emphasis on building isolated technical skills. The focus is instead on developing the technical skills within the context of designing and facilitating learner-centered activities in the classroom. Many studies (Barak & Dori, 2005; Dori & Belcher, 2005; Hopson et al., 2002) have described the integration of innovative learning environments in an effort to change the prevalent passive mode of teaching and to involve students in technology enhanced active learning. Some of these studies will be examined and presented here.

Examples of changed pedagogy in conjunction with technology implementations. In a study conducted at Massachusetts Institute of Technology (MIT), Barak, Lipson, and Lerman (2006) investigated the use of laptop computers as a tool to change a primarily lecture driven course into a more constructivist learning environment. The students were required to use their wireless laptops to actively participate in the course, which was changed from a lecture delivery to mini lectures with demonstrations and student practice sessions. An online survey revealed that the students felt positively about the use of wireless laptops, but less positively about being actively involved in class. The findings also show that the use of wireless laptops in class can become a distraction if they are used for non-educational purposes. The results further indicated that the use of the wireless laptops allowed for more student-centered, hands-on learning as well as more meaningful interactions between students and instructors. This is reiterated through the following sentiment from Johnson et al. (1998), "Learning is a social enterprise in which students need to interact with the

instructor and classmates" (p. 19). The old paradigm of teaching and learning is that students arrive as blank slates and it is the work of the faculty to transfer knowledge to the student, whereas in the new paradigm, information is constructed jointly by the students and faculty (Johnson et al., 1998).

Students can also work with one another to construct knowledge through cooperative learning. Hamby Towns and Grant (1997) utilized cooperative learning to help students understand complex material in a meaningful way. By interacting in cooperative groups, the students are making sense out of the content by actively processing the information with one another (Pintrich & Schunk, 1996). High performing cooperative groups require interpersonal and small group skills and group processing. In this type of group work there is a positive interdependence and individual accountability (Johnson et al., 1998). In order to increase positive peer interaction within cooperative groups, Lau, Higgins, Gelfer, Hong, and Miller (2005) found that teachers should provide scaffolding to support group interactions.

Another example of a pedagogical change toward student-centered instruction is through the use of wikis. According to Wikipedia, a wiki "is usually a web application which allows people to add, modify, or delete content in a collaboration with others" ("Wiki," n.d., para. 1). Friedman (2008) found that having students use and create wikis improved motivation and self-efficacy. Additionally, for students who were creating their own wikis, they retained more content than students who were using more teacher-centered learning activities.

Another example of pedagogical change with the introduction of technology occurred at the Massachusetts Institute of Technology (MIT) when technology was utilized to facilitate change from a lecture-based course to one that involved active engagement. The goals of the study were to decrease the failure rate in an undergraduate course and to strengthen the students'

understanding of the concepts of electromagnetism. The freshman physics classes were introduced to software and simulations that would help the students visualize and understand the concepts in physics. The technology was additionally used to support group interaction. Through the change in pedagogy and the thoughtful inclusion of technology, both goals were achieved (Dori & Belcher, 2005).

As teachers work to make changes to their teaching style and incorporate technology, the findings from Wong and Li (2008) suggest, "that ICT is able to act as a lever to bring about perceived changes in student learning in the context of establishing collegiality to foster pedagogical innovations in schools" (p. 115). Based on this research, educators should be clear about their goals for themselves and not limit themselves to the simple use of ICT, but they should aim to use ICT in the context of pedagogical and organizational interventions. Pintrich and Schunk (1996) note that teachers should be mindful when setting goals for themselves because they will measure their own success based on how closely their results align with the goals they set for themselves. When teachers reflect on the implementation of technology in their classrooms, they should be encouraged to focus their reflection on what the students did or did not do in response to the lesson. For example, teachers may reflect on whether or not students took pride in the work they created, or teachers may reflect on the learning outcomes as assessed on an exam. It is important for the teacher to select specific goals for themselves (because there are many opportunities for improvement in most teaching activities) and then consider what changes they need to make to the lesson in order to bring about the desired student performance and thinking outcomes (Ertmer, 2000).

Assessment within a constructivist classroom. Backward design is an element of the Understanding by Design (UbD) tool developed by Wiggins and McTighe (2005) to help

educators begin with desired outcomes as they plan classroom instruction. The essential stages include stage one which states the goals of student learning. Stage two includes designing the assessments and determining how the students will show what they know. The third stage involves designing the learning activities to prepare students to reach the essential learning. Haugland (2000) shows that utilizing backward design not only for curricular goals but also technology implementations will best prepare the students for successful learning. Haugland suggests that teachers apply this curricular design to the integration of technology. He proposes that teachers work backward from the learning objectives of the course to determine how technology can best meet those needs.

Stage one of UbD involves identifying the desired results for the students and using technology standards are a good place to start. Additionally, it is important to recognize that within the technology standards, there are many goals for incorporating technology into education. At the outset, it is important to consider goals such as: increasing academic achievement, increasing access to reduce the digital divide, and transforming the instruction to make it more student centered, differentiated, project based or involve higher-order thinking (Penuel, 2006) and to identify the specific goals for each implementation. When considering setting these goals it is important for teachers to consider their philosophical approach to teaching when considering the inclusion of technological materials to support their instructional goals (Shamir & Korat, 2006).

The second stage of UbD is the design the assessments which will show if the students have met the goals. Incorporating formative and summative assessments into a technology implementation will provide frequent data in order to determine how the implementation is progressing. Finally, in stage three the learning activities are designed to help students reach the

predetermined goals. In designing learning activities, it is helpful to look at the best practices culled from research.

The importance of professional development for teachers when adopting new technology. According to M. Berson and Balyta (2004) the shift in pedagogical style toward a more student centered and constructivist approach will only be accomplished by changing the training of teachers, and therefore also changing the teacher preparation programs. However, teacher preparation is unlikely to change unless there is accompanying research to show the effectiveness of technology in classrooms. One set of research by Sherman and Hicks (2000) found that when teachers were given the right preparation, they could create web-based instruction for students that was student-centered and creative. Wong, Li, Choi, and Lee (2008) found in their study of schools adopting ICT for different purposes, that the schools, which were utilizing a pedagogical ICT innovation, were the most successful at implementing change in the classroom. The key characteristics that were found to support this change were the style of leadership, a culture of collaboration, and experimentation. These factors all contributed to the success of moving from a teacher-centered classroom to a classroom that was more student centered, yet more research is needed to support the changing of teacher preparation programs.

When there is a lack of time and training for professional development, students are consigned to using computers for word-processing and factual Internet searches (M. Berson & Balyta, 2004). Likewise, when students cut and paste pictures to add to a report, the use of technology may be lacking in higher order thinking. In order to ensure critical thinking and effective educational outcomes, direct instruction on the use of technology is necessary (M. Berson & Berson 1999) and teachers must be appropriately prepared to provide this instruction.

Trotter and Zehr (1999) note the importance of professional development for teachers when adopting new technology. According to a 1997 presidential advisory panel on education technology, "as schools continue to acquire more and better hardware and software, the benefit to students increasingly will depend on the skill with which some three million teachers are able to use these new tools" (Trotter & Zehr, 1999, p. 38). Drayton, Falk, Stroud, Hobbs, and Hammerman (2010) show in their data that teachers reported "lack of time for professional development, especially in the form of teacher collaboration to develop best practices within the school" as a challenge to implementing 1:1 successfully (p. 41). The Apple Classroom of Tomorrow (ACOT) project concluded that teachers need staff development focused on changing their pedagogical beliefs and practices in order to get the most out of technology. Trotter and Zehr (1999) resolve that school districts have a role in providing "time for teachers to make the new skills their own and to adapt or create digital products" (p. 44) to fit their instruction. According to Schmid et al. (2008), teachers reported that the best training for preparing to teach students with technology was to have personal "play time" with the technology themselves. It is essential that the teachers have adequate time to prepare and feel comfortable using the tool before attempting to teach it to students.

On the topic of professional development for teachers anticipating integrating technology it is important to consider not only the technical training but also the pedagogical knowledge of how and why the technology can add to the learning for their students (Pun et al., 2007). Most training focuses on the technical aspects of the new technology (McCarney, 2004) and while that should be a part of the training, technical skills should be available on a need to know basis (Littlejohn, 2002). Teachers need to consider pedagogical content knowledge and their

knowledge of their students to develop an ICT-rich learning environment that will be appropriate for their students (Webb, 2005).

Wells (2007) examined the professional development of teachers and identified format and design factors to facilitate instruction for technology implementations. First, it was determined that the traditional approach of lecture to the teachers was not conducive to the teachers learning new skills. It was found that the following 10 factors were necessary for effective professional development: (a) evaluation driven, (b) contextual, (c) learner centered, (d) duration of process, (e) engaging, (f) inquiry based, (g) theory/research based, (h) collaborative, (i) supportive, and (j) sustainable. This format of professional development will have the most influence on supporting and preparing teachers to implement technology.

While the format of the professional development plays a role in the success of a technology implementation, the type of pedagogical approach is also important. Niemi (2002) shows that while active learning is desired in the schools in conjunction with technology, the teachers are not adequately prepared in their teacher preparation courses to engage the students in active learning. Because schools and teacher preparation institutions are in the middle of a cultural change toward active learning, there are obstacles, which make it difficult for new teachers to engage in active learning. The obstacles listed by the student teachers were "1) curriculum and lack of time, 2) size of student groups, 3) conditions and materials, 4) other teachers, 5) students and 6) parents" (p. 773). Both teachers and students in the study mentioned all six of these obstacles. A future section will further address the pedagogical concerns in technology implementations, but at this point it is understood that a pedagogical approach, such as active learning, will add a layer of complexity to the professional development supporting the introduction of technology.

Another vehicle for professional development could involve teachers utilizing social networking. Friel (2010) has written about how government executives are using social networking to help train employees and to learn new skills. Many traditional jobs were built upon traditional professional development, which is a functional vehicle for instruction when the skills and procedures needed are set in stone. But, because many federal workers are working in jobs where there is a constant state of change to both the policies and skills needed for their jobs, traditional professional development is not adequate. Employees are therefore responsible for their own professional development and they must constantly work to acquire new skills to meet the flexible and adaptable needs of their jobs. As these employees are faced with the changes to their workplaces, they must reach out, often through social networks, to find others who have successfully navigated the change. This use of social networking is changing the way employees train themselves to be more productive on the job and this method could be used in education.

This section began with the recent history of educational technology utilizing desktop computers and advancing through laptops, e-readers and tablets. The development of technology standards and federal involvement was presented to set the stage for the expected outcomes of teachers and students using technology. This section concluded with a summary of the research on technology implementations including both the concerns by the research community as well as the best practices that have been culled from the research.

Global Pressures: Factors Moving the World Toward Increased Technology Use

Globally, there are tensions between competing for a leading edge in technological advancement and minimizing the real and hidden costs of proceeding toward a more tech-oriented educational framework.

Global competition. According to the US Secretary of Education, Arne Duncan, the students in South Korea consistently outperform American Students on educational exams and educators and policymakers from South Korea are making strides to increase their use of technology. One example of the focus on technology in South Korea is a national goal to utilize solely digital textbooks by 2015 (Lederman, 2012). Another attempt at bridging the technology gap globally comes from Ferrer, Belvís, and Pàmies (2011). They attempted to determine if tablets contribute to reducing existing inequalities in Spanish students. Their findings suggest that there was not an observable difference in the outcomes of students from schools in either rural or urban areas.

One Laptop Per Child (OLPC) program. In January 2005, at the economic forum in Davos, Switzerland, Nicholas Negroponte, the founder of MIT's Media Lab, announced the idea of One Laptop Per Child (OLPC) utilizing new technology that would allow for the production of $100 laptops. With the support of international leaders, the program hoped to disperse 150 million laptops by the end of 2007. Kraemer, Dedrick, and Sharma (2009) examined the successes and failures of the OLPC effort and reported that only a few hundred thousand had been deployed. They reviewed the flexibility with which program administrators adapted to each country and culture and reported on the surprising response by the PC industry (specifically Microsoft and Intel) to create their own versions of $100 laptops as competition for the OLPC initiative. The XO laptop is the $100 laptop as labeled by the media, yet by 2007, nearly two and a half years after the announcement by Nicholas Negroponte in 2005, the cost to manufacture the laptop was $188. The XO laptop was developed to be lightweight, affordable and adaptable to the developing world.

Cotten, Hale, Moroney, O'Neal, and Borch (2011) examined the 1-1 XO laptop rollout in Birmingham, Alabama to the students in grades one through five. Through their research they determined that "few researchers have examined the factors that affect students' usage and attitudes towards computers… yet this is critical for understanding the impacts of interventions such as these" (p. 427). From their findings Cotten and colleagues determined that there were two factors that were consistent predictors of increased XO laptop use. First, the measures of student computer usage for homework at the pretest indicated eager adopters of the XO laptops were more experienced with computer use with school related activities and as a result had a more positive attitude toward the XO laptop as a tool to impact their education. Second, the students' assessment of their teachers' XO laptop usage had a positive and almost unanimous effect on the student attitude and usage of the XO laptop. Ultimately, this research shows that the pre-existing computer fluency of the students, the teachers' usage, and student perceived teacher attitude toward the XO laptop, were the greatest factors in determining student usage of the XO laptops.

In a study by Warschauer and Ames (2010) it was shown that the OLPC program could better use the funds to invest in proven interventions. While highly developed nations could benefit from the educational use of laptops, the economic cost of using laptops in education in less developed countries is not worthwhile. This is further supported by the research in which James (2010) wrote a critique on the idea that one laptop per child is a benefit to children in their education. He proposed that sharing technology devices may actually be a good thing because it would foster community through sharing the device. James used economic reasoning to show that creating a 1-1 laptop implementation in poor countries would cause a severe resource

imbalance and negative welfare effects. He proposed a sharing model where one computer can be shared among as many as 30 students.

Most recently, the OLPC program has been experimenting with providing tablets to remote Ethiopian villages and letting the students teach themselves. In one instance, an OLPC worker delivered the tablets in sealed boxes. Within 4 minutes, one child had opened the box, found the power switch and turned on the tablet. Within 2 weeks, the students in the village were reciting the alphabet, and within 5 months, the students had learned how to bypass the locked desktop settings in order to personalize their desktop preferences and use the camera, which had been disabled. Negroponte has stated that the result of this learning without a teacher is promising, but that more research will need to be conducted in order to determine if students can learn to read this way (Talbot, 2012).

Textbooks and books going digital. While there is a global trend toward the increase in technology, one driving factor is the hope of replacing printed textbooks with electronic texts. The trend toward digital content has been progressing along with the advancements in technology. In his dissertation, Doman (2001) specifies the potential benefits and limitations of e-books. He noted the concerns of durability of the devices, ease of use and clarity as being the major objections to replacing p-books with e-books. The electronic textbook was still not widely used at the time Dominick (2005) concluded that the reason it was not successful was because the "electronic textbook was trapped in a web of logistics that were designed for the paper book" (p. 361).

In another dissertation, Allison (2003) examined the state of electronic textbook design to evaluate their added value over printed textbooks. The subjects in this study rated the added value of electronic textbooks and over 70% of the subjects preferred the following features. The

highest rated function of electronic textbooks was the ability to instantly search and integrate information from anywhere on the Internet (75%). The next highest function was related to portability, 72% of subjects were glad they did not have to carry around heavy textbooks. The next three items all tied at 71%: "the ability to do customized searches in one book or collections of books and papers" (p. 2), the ability to highlight text, and the ability to personally organize and label their binders. The subjects preferred these electronic designs, which provided added value to the traditional printed material, but ultimately the success of electronic textbooks would be determined by the inclusion of electronic added value components.

McFadden (2012) presented information from the Follett publishing group pertaining to the transition from print to digital texts. In this article, McFadden asserted that there was not a whirlwind changing from print to digital, but that the change will be measured. A distinction was also made between the two types of digital textbooks that will be created, native digital textbooks and enhanced print textbooks. The native digital works are built upon web pages and software packages that allow for learning to take place in relative isolation. These types of products are geared for adaptive learning on the part of the student that will enhance their acquisition of knowledge and aid in student retention. This market is predicted to grow quickly (McFadden, 2012). The devices optimized for this type of product are laptops, desktops, netbooks and large format tablets. The enhanced print textbooks are digital replicas of the paper textbooks and ancillary materials. The growth of this type of text is projected to occur more slowly and deliberately. The benefits of enhanced print are cost (because the content can be digitized easily) and efficiency. The devices optimized for enhanced print are multimedia optimized tablets, netbooks, laptops and desktops. By 2010, a review of the Computer Electronics Show (CES) showed the prominence first of e-readers in 2010 followed by tablets in 2011 (Rapp, 2011).

Eaton (2011) predicts increasing sales of e-book readers and tablet devices to public schools within the next 5-7 years and a corresponding transition from print to digital curricula during that time. Based on internal research by Follett cited by McFadden (2012), tablets will begin to edge out their technological counterparts in the next 2-3 years and will become prominent in schools by the end of the decade.

Tomassini (2012) reported on the costs as schools transition from paper texts to digital texts. In his article, he examined the cost of the device, the applications available, and then cited the possibility of using open source material. Watters (2011) cites research which states that one in four college textbooks will be digital by 2015. Additionally, there are programs like Washington State's Open Course Library, which will make course materials available on the Internet for less than $30 per class. Because some states (California, Indiana, Utah and Washington) have passed legislation to promote digital content and Florida requires school districts to spend half of their budgets on digital content, the trend is moving toward digital content in schools. Some schools have adopted a Bring Your Own Technology (BYOT) program where students are encouraged to bring the device they have, but the districts then face the logistical challenge of supplying textbooks and materials that function on multiple operating systems.

According to Xplana, a company who examines 21st century learning, digital texts are projected to rise. Based on their data of e-readers sold (primarily the Kindle), the popularity of the iPad for personal and educational use, a booming textbook rental market, the rise of the Epub3 (a digital book standard), and advances in open source education resources, their predictions show a 25% volume of digital textbooks in the next 5 years. Within 7 years they predict the dominant format to be digital texts in education (Eaton, 2011). If these predictions

hold true, then the market for tablets, such as the iPad and other competing models, will be in high demand as a device on which to read these electronic texts.

Student engagement with the evolution of electronic texts. Wetschler (2011) shows the trend toward digital reading and discusses the impact on school librarians to carry the printed books of all genres and how there can be a larger library potential with electronic books. Barack (2011) in the *School Library Journal* addresses how e-readers are working their way into schools through the leadership of librarians. The three P's of librarianship are participation, portability and personalization and Barack proposes that e-readers allow for all three. With e-readers, the librarians have found the students clamoring for devices, which increase the student participation in reading. The devices are portable, and they allow for personalization by each student. Librarians have identified one of the successes of these devices as the "wow factor" they provide to students. Students reported having fun reading on these devices and it was predicted that the success of any devices would depend on maintaining the wow factor along with a positive effect on student comprehension (Barack, 2011, p. 60).

Digital content leads to evolution of e-reading devices. The devices used for reading digital text have evolved. Digital text was read on computer screens, first on desktop computers and then laptops. As devices got smaller and more portable, there were more options such as Palm pilots, and Kindles. Agee (2003) examined the use of e-books for use in school environments and determined that the desired device would be "paperback size, lightweight, computer-like device with a touch screen and a couple of real buttons along the side" (p. 6). Additionally the device should have a long battery life, be easily rechargeable, and have variable font sizes. These specifications from 2003 are remarkable similar to the e-readers and tablets seen on the market today.

Other aspects of the technological advances of e-readers include the work on readability. Yankee Group's e-reader analyst Molchanov states, "E-readers are easier on the eyes" when comparing e-reading to reading on computers. Molchanov credits the use of Electronic ink (e-ink), which is ink that carries a charge enabling it to be updated through electronics. Also, the use of Electronic Paper Displays (EPDs) provides the high contrast that is similar to paper and print. E-ink, when combined with the EPDs, allow for a situation where no front or backlighting is necessary which makes it "viewable under a wide range of lighting conditions, including direct sunlight, and requires no power to maintain an image" (Dougherty, 2010, p. 255).

The evolution of devices continued and in 2010, Lankes wrote for the School Library Journal to propose a new idea about the formatting and user experience of e-books. Based on his belief that reading is inherently social, he imagined an e-reader that would have connectivity to allow social networking and connections during reading. As Symonds (2010) found, students expect their technology to function in a multidimensional fashion and not simply as an e-reader. In 2010, with the introduction of the iPad, all of these functions were made available in a device for e-reading as well as other functions.

Reading digital text. The reading of digital text includes both many types of digital content such as word documents, PDF's, websites, and e-books and can be read from any number of devices including designated e-readers, tablets, phones or computers. This section will start with a discussion on digital reading strategies and skills for digital reading comprehension as well as the research on multi-modal reading. New devices have allowed for e-reading to proliferate and the trends pertaining to digital content will be analyzed. Finally, the development of devices will be traced to provide a background for the following section.

Research on digital reading versus paper reading. Studies have compared students reading content digitally and on paper. Some of these studies attempt to determine if there is a difference in reading comprehension (Baker, 2010; Church, 2002) while others examine alternate factors such as motivation of the reader (Bell, McCoy, & Peters, 2002; Larson, 2010) or fluency of the reader (Guernsey, 2011). The results of these studies are reported as follows.

In 2002, Church attempted to determine if there is a difference in reading and retention from paper, computer linear text (digital but stationary documents such as PDF's) or hypertext (digital text that has embedded hyperlinks such as webpages). The findings showed that the traditional printed text scored higher than computer-displayed text for short-term memory. However, the results were not statistically significant enough to warrant recommendations for changes in practice.

In 2002, Bell et al. surveyed college students when e-books were introduced into a college class with no other changes. Despite some technological and functional limitations, the students in an overwhelming majority preferred reading on digital devices. The professors in this study concluded that the use of e-books did not hinder their pedagogical goals. The professors also reported some instances of increased student motivation where reluctant readers reported enjoying e-reading more than p-reading.

In a more recent study, Baker (2010) compared the reading comprehension of reading e-documents as compared to paper documents. Her findings indicate that there is no difference in basic reading comprehension when comparing reading in three formats (Kindle, iPod Touch and paper). Further, the reader's confidence with using technology and their competence as readers, if low, would lead to the reader's belief that they would score better in reading comprehension

on paper, regardless of how well they actually did. Therefore, it was concluded that the reader's belief did not matter in their reading comprehension score.

Guernsey in the School Library Journal (2011) related the classroom study conducted by a reading specialist on the use of e-books. A class was divided in half and one group was taught using the traditional methods while the other group was assigned a computer to listen to e-books that were at or just above their reading level. The results showed that the students in the electronic book group had a fluency of 23 percentage points higher than their peers after only three months.

Early studies of the difference of reading digitally as opposed to paper show that there was a difference favoring print, however, not statistically significant enough to warrant a change in practice (Church, 2002). In a more recent study conducted by Baker (2010), it was shown that there is not a difference in reading comprehension between different media and further that the reader's confidence in using a type of media showed no difference in the reality of the scores. Larson (2010) in a study of second grade readers using a Kindle found that the students engaged with the text and were in greater control than reading printed text. When readers are more engaged with the text, it follows that there will be greater reading comprehension. Therefore, based on these research studies of reading digitally, it is possible that the iPad could provide a platform for digitally accessing works to be used in education.

Multimodal reading. While the concern that multi-modal features such as animations and sounds may distract readers as they attempt to make sense of the story (Burrell & Trushell, 1997; Matthew, 1996) Glasgow (1996) showed that readers, especially children with reading difficulties, had more motivation after engaging with multi-modal texts.

Multi-modal enhancements to digital text include text that can be read aloud, pop-up definitions, animations to correspond to the text and music will all support the students' reading comprehension, vocabulary development, reading fluency and can enhance student motivation (de Jong & Bus, 2002; Doty, Popplewell, & Byers, 2001; Lefever-Davis & Pearman, 2005; Matthew, 1996; Shamir & Korat, 2006). Matthew (1996) and Pearman (2008) found that students using CD ROM storybooks liked and benefitted from the instant feedback from the computer when looking up unknown words for their pronunciation or definition. Providing students with a rich learning environment can enhance motivation in young readers where the text is paired with animation, sound and illustration (Glasgow, 1996). Larson (2009) reported on the positive experiences of fifth graders when reading e-books. The students preferred reading on e-books because of the "cool tools" (p. 257).

Islam (2008) found that text combined with illustrations and sounds could help facilitate reading comprehension. Further, it was shown that "technologically integrated literature based reading was…valuable in increasing reading comprehension and contributing to students' ability to recognize words" (p. 12).

Digital text, when paired with other multimodal features, has led Apple to add a new category of books in its iBooks store called, "enhanced books." This category includes items such as audio books and books with embedded videos and animations. Additionally there are mobile application versions of books, known as "apps", which include audio tracks with embedded videos as well as digital animation to enhance the story.

Strategies for e-reading. Dominick (2005), in his dissertation, studied how college students read differently on electronic books (e-books) as compared to print books (p-books). He found that college students expressed a preference for the physical interaction with a paper text

to the interaction with a PC laptop. Additionally, Larson (2007) has found that the physical environment and even the physical posture and position of the reader affect the overall reading experience. Therefore considerations pertaining to the interactions with paper as well as the posture of the reader should be considered when examining strategies for e-reading.

Because it was determined in the previous section that there is not a difference in overall reading comprehension for students reading digitally or on paper, it is important to consider that different media necessitate different skills and strategies for reading. Felvégi and Matthew (2012) have found that readers utilize different skills when reading e-books as compared to reading p-books and therefore the students are required to learn new literary skills to use new technologies. The students must learn a new way to read on these devices and read in a new way to learn content through the devices. Clark (2006) supports this proposition with research into the changes in reading medium, which have changed the nature of the text, the reader's role and the act of reading. Further, Clark noted that these changes require the reader to develop a new kind of relationship with the text and the reading process.

Additionally, researchers have found that reading in the digital format requires a different skill set than those required for traditional p-reading (Castek et al., 2006; Park & Helsel, 2008). However, the act of reading something in a digital format and on paper has some overlapping skills such as metacognitive processes, which will have a strong effect on student achievement regardless of the environment (Duke, Schmar-Dobler, & Zhang, 2006; Zohar & David, 2008).

Schcolnik (2001) conducted a study of dedicated e-readers to address questions pertaining to the strategies and preferences of adult readers when reading on an electronic device. The study found that attitudes toward e-readers were positive for both pleasure reading and reading for content information for academic purposes. She found that readers preferred

using the devices for pleasure and anticipated that the devices would become more ubiquitous as the technology improved. Of the strategies used by the readers on dedicated e-readers, the most common strategy is paging forward and backward while the least common strategy is cross-referencing with other materials on the device and note taking on paper. The annotation tool was used sparingly because some of the devices did not offer this function.

Sutherland-Smith (2002) conducted a study of sixth graders in Australia and their experiences reading online versus on paper. The students reported their impressions and the teachers summarized strategies for reading in an online environment. The following suggestions are provided to scaffold reading on the Internet: snatch and grab technique, skim the site and see if there are pertinent pieces of information, when searching refine the key words and provide clear search guidelines, use chunking to investigate subtopics, provide shortcuts to specific sites and search engines, teach students to evaluate non-textual features.

The features most desired by readers in an electronic text were some of the relics of print material and some uniquely electronic additions. The inclusion of an index, a table of contents, page numbers, and page turning from right to left were the remnants of print books that readers wanted to be included in the electronic text. Additionally the readers would like the table of contents to have hyperlinks to take the reader directly to the desired chapter. The readers also noted a preference for portability, easy navigation, ample storage and ease of use (Schcolnik, 2001, p. 6).

Based on these reports, students are using skills and strategies from paper reading and transferring some of these skills to reading digitally. Some additional strategies are necessary when navigating nonlinear text such as web pages and hyperlinked text. Understanding the structure of the digital content and applying metacognitive processes (Duke et al., 2006) will

help in comprehending the essence of digital text. These metacognitive skills and strategies are necessary when approaching digital text and specifically when approaching multi-modal reading.

Students' Interactions with Technology

Digital natives. Prensky (2001) argues that students today think differently because they have grown up around technology than older generations who have experienced the introduction of technology in their lifetimes. "Today's students are no longer the people our educational system was designed to teach" (p. 2). He uses the term "digital native" to describe the students today and "digital immigrants" to describe the older generation who has not grown up with technology.

Oblinger and Oblinger (2005) note that students of the digital age are familiar with social networking such as Facebook, Twitter and instant communication through their smartphones. These students, when faced with university email systems, handwritten assignments, and projected lecture slides, have requested more updated learning methods. They learn differently and they are asking for their educators to meet their learning needs.

Benefits for students of using technology. Dwyer (1996) stated, "significant and mounting evidence shows that technology improves students' mastery of basic skills, test scores, writing, and engagement in school" (p. 24). Research by Clements, Nastasi, and Swaminathan (1993) showed that young students demonstrate confidence and understanding in using software and learning from their computer activity. Children who use computers have been found to show greater gains in intelligence, structural knowledge, problem solving, and language skills compared with those who do not use technology in their learning (Clements & Sarama, 2003; Haugland, 1999; Swaminathan & Wright, 2003; Vernadakis, Avgerinos, Tsitskari, & Zachopoulou, 2006).

The research establishing the benefits for students using technology includes both academic achievement as measured on test scores (Bebell & O'Dwyer, 2010; S. Li et al., 2010; Phillips & Loch, 2011) as well as additional emotional benefits. The authors showed in a study of Tablet PC's how the devices could empower student learning. The results from their study showed that the students increased not only their technological competence, but also their motivation and efficacy in learning. Hopson et al. (2002) compared students with and without access to computers and found that students in the technology enriched classroom developed higher order thinking skills. Additionally it was shown by Clements and Sarama (2003) that when computers and software are used well, they act as catalysts for positive social interaction, inspire creativity, generate increased use of language and facilitate cognitive interactions. Collaboration and the sharing of resources was also a positive result for students who used the Tablet PC's as noted by S. Li et al. (2010). These students were also better at organizing and self-regulating their learning.

A study by Phillips and Loch (2011) examined the retention rate and academic achievement of university students in two different semesters, with and without technology, in this case a tablet PC. They found the greatest gains in students of low socio-economic status (SES), which is encouraging for those who argue that technology aggravates the digital divide. Additionally they found that for all students there was in increase in retention and academic achievement as measured by exam performance, final grade and course progression statistics.

Based on the meta analysis on one-to-one computing programs by Penuel (2006), the research shows that students in 1-1 laptop programs use computers more often and for more varied functions than students who were not in these programs with access to computers. Bebell and O'Dwyer (2010) also consolidated empirical research on 1-1 computing models

and examined the educational outcomes for teachers and students. They found that participation in a 1-1 program correlated with "increased student and teacher technology use, increased student engagement and interest level, and modest increases in student achievement" (p. 4).

In addition to the personal benefits to the students, it has been shown that there are also benefits to the classroom pedagogy through a shift in the focus of education. Teachers in technology-enriched classrooms reported that the classroom became more student centered and students were more likely to form collaborative groups to apply knowledge rather than to acquire knowledge (Hopson et al., 2002). Barak et al. (2006) found that the application of computer technology in collegiate classroom can improve teaching when used appropriately. Technology integration includes the benefit of engaging students in inquiry based learning that is student centered and multidisciplinary (M. Berson & Balyta, 2004). Barak and Dori (2005) found that incorporating IT rich Problem Based Learning (PBL) experiences into an undergraduate Chemistry course enhanced the students' understanding of chemical concepts, theories and molecular structure. These pedagogical shifts toward a more student centered, collaborative and inquiry based learning environment were all as a result of the inclusion of technology. A more detailed look into these pedagogical changes as influenced by technology will be discussed in a future section.

Teachers' Interactions with Technology

Bebell and O'Dwyer (2010) analyzed the data from 1-1 implementations and formulated a model: that access to technology must predicate use, and use predicates any educational impacts and therefore having 1-1 access should create the strongest impact of technology on teaching and learning. After examining the 1-1 studies it was determined "that

teachers play an essential role in the effective implementation of 1:1 initiatives and that the onus of responsibility for implementation often falls to the teacher" (p. 8). Toto, Wharton, Cimbala and Wise (2006) found that the effort of the teacher to implement technology can have positive outcomes. Tablet PC's when used by teachers had the advantage over an overhead projector in that immediately after class, the entire presentation could be saved and uploaded to the course website to be accessed by both the teacher and students at a later date. Also, Toto et al. (2006) found the advantage of using pen-based mark up on student work in an electronic format as an efficient way of grading for the teachers.

Based on all of the research to date, the conclusion reached by Clements and Sarama (2003) still holds true, that educators no longer ask about whether and to what extent technology should be used with students in the classroom but how it should be used. It is the teacher that will hold the responsibility for implementing technology into the classroom (Bebell & O'Dwyer, 2010) and therefore, the teacher's perceptions of technology must be considered, as they are the primary instruments of implementation.

Teacher perceptions of technology. Historically, researchers (Frank et al., 2004) have suggested that teachers' perceptions about the value of an innovation would drive the implementation. Further, according to research done by Fraser (1998) shows that the students' and teachers' perceptions are important factors of the social and psychological parts of the learning environments.

C. Li (2010) counters the current view that changing teachers' perceptions and beliefs will lead to successful implementation with the results of a case study that show the success of the implementation comes from social forces in the school, parental support of the initiative, and

teacher empowerment. The social forces that were found to be the most influential toward motivating teachers toward change were social trust, access to expertise and social pressure.

While C. Li (2010) has provided a counterpoint to the argument that teacher's perceptions of technology must be changed, it can be seen in many works including Fraser and Walberg (1991) that the beliefs and perceptions held by teachers will have an effect on the classroom learning environments in which they operate.

Ertmer (2000) addressed the role that teacher's beliefs play in the adoption and change process of a technology adoption and how professional development might aid in the adoption. In order for teachers to change their beliefs and practices concerning technology integration in education it is necessary that two conditions are met. The first condition is that teachers must be given time to reflect on their own beliefs about learning and instruction and they must think through the consequences of both their existing views and the new views. Second, the administrators must be wiling to implement changes in the environment to support the evolution of teachers (Dwyer, Ringstaff, & Sandholtz, 1991). Therefore, it is essential to consider the professional development of teachers in preparation for a technology implementation.

Benefits to teachers using iPads/tablets. Because the implementation of tablets is still in its infancy in classroom use, attention should focus not only on the student learning, but also on the teacher's experience. Lim (2011) in a phenomenological study examined the experiences of 28 teachers from the College of Engineering using tablets. From her research with teachers, four themes emerged among the results; teachers were positive about 'going digital,' teachers were positive about utilizing handwriting in their presentations, teachers were concerned about the technological barriers to learning new hardware and software, and enjoyment after integrating the tablet.

Additionally, teachers using tablets in their classes have noted the ease with which they can now grade assignments when the student submit assignments electronically and the teachers can comment without printing (Manuguerra & Petocz, 2011; Steinweg, Williams & Stapleton, 2010). Steinweg et al. (2010) found that the tablet offered a unique blend of computer attributes from the laptop and input from a stylus, digital inking. They cited uses for digital inking to be used as an efficiency tool for instructors to add to their presentations, to mark up student work digitally, and to allow students to revisit and revise their own work as their learning progresses. Digital marking of student work is also beneficial in a culture where sustainability or "going green" is a valuable principle (Manuguerra & Petocz, 2011).

In an effort to become more environmentally conscientious, teachers have also turned to online testing software to save the paper used for printing out tests. One of the past problems with online testing was that the students were able to navigate away from the testing site and search for answers on the Internet or contact other classmates. However, at the Apple Worldwide Developers Conference 2012, it was announced that the iOS 6 allows the device to lock on to a single mobile application. This capability, known as "Guided Access" provides the security for testing situations (both state testing and classroom tests) to prevent students from accessing websites or connecting with other students (Schaffhauser, 2012).

Jalali, Trottier, Tremblay, and Hincke (2011) reported on the use of iPads in a multiple-choice testing situation at the college level. While students and teachers liked the idea, and it saved significant paper resources, students reported extra stress from a potentially unreliable Internet connection and concerns about their responses being correctly recorded and submitted.

Another example of iPads being used in testing situations comes from the United Kingdom in the fall of 2012 where pilot testing has begun on the MOCK exams. In a report by

Exley (2012) students are testing portable wireless devices in standardized test conditions. Isabel Nisbet, the former Chief Executive at Ofqual warned that the testing of students using paper and pencil "cannot go on" because the way in which students learn is increasingly different from the manner in which they are tested. Again, Prensky's (2001) idea of digital natives resurfaces to accurately assess student's knowledge by using tools that are reflected in the students' native environment.

To this point, the history of technology in education has been presented, the mindful changing of education practices in conjunction with technology, the research on e-reading and digital devices, and in this final section, the research will culminate with a synthesis of the use of tablets in education to date.

Research Specifically on iPads and Tablets in Education

This final section will present the research on iPads and Tablets as they have been studied in education. There has been some research conducted on Tablet PC's, students with special needs using iPads, the use of iPads in Elementary school settings, the use of iPads in college/university settings, and finally the use of iPads at the high school level.

Tablet PC. In 2000, Microsoft introduced the Tablet PC, also known as Tablet computers. These Tablet PC's were the precursor to the tablets on the market today. Tablet PC's were similar to laptops in that they would unfold to open a keyboard, but the screen was touch sensitive and responsive to a stylus. The research on Tablet PC's was mostly favorable. Schroeder (2004) found increased student engagement of high school students when using tablet computers because of their high level of interactivity. Barton and Collura (2003) found that tablet computers had an advantage for improving the writing and organizational skills of high school students because the students are able to type or handwrite and then convert handwriting

to text. While there were benefits for all students using Tablet PC's, there were also reports on the benefits to students with special needs.

Students with special needs were benefiting from the use of Tablet PC's because of the unique functions of the device along with increased portability. Cavanaugh (2002) found that the text-to-speech function of electronic books read on portable devices improved the reading comprehension for students with reading disabilities. One component of this finding was that students engaged in "synchronized highlighting of the text," while it was being read (Cavanaugh, 2002, p. 60). Digital or electronic text has the added benefit of being able to adjust to the needs of the student. This is particularly helpful when dealing with students who require accommodations to adapt a lesson to meet their special needs. Electronic text can easily be adjusted in size, often has text to speech capabilities, offers the resources of a dictionary and can allow the student to search either within the book or on the internet (Cavanaugh, 2002). Maninger and Holden (2009) reported on the benefits of Tablet PC's in regards to students with dysgraphia. The teachers observed that the students who would require keyboards were no longer out of place because the whole class was utilizing tablets. The teachers were then able to provide accommodations to their students without making obvious changes in their instructional routine. Reports on the benefits for students with special needs show the educational benefit of introducing such technology into the classroom.

Tablet PC's were useful not only in addressing student needs, but also in approaching the broader issues such as pedagogy of the classroom. Schroeder (2004) reported on the implementation of Tablet PC's and noted how the classroom changed and became more student-centered as the teacher would access student work from individual tablets and display it on the main screen to use student solutions as talking points for solving problems. Additionally, the

students were encouraged to lead the class from their own tablets, and the culture of the classroom became more collaborative as the material was easily transferred between tablets. The use of Tablet PC's was bridging the gap to transform education by increasing the collaboration among students. M. Berson and Balyta (2004) noted that the role of tablets and other portable technology "offer the means to maintain the physical structure of the classroom while enhancing content delivery and student productivity" (p. 145). Tablet computers were making gains in education, yet their presence was not long lived because of the continuous advances in technology development such as wireless connectivity.

Students with Special Needs using iPads. Bennett (2012) argues that while most schools attempt to purchase class sets of iPads, an impact can be made with fewer iPads to facilitate individualized and tailored instruction. As an example, at the beginning of her article, she relates the story of one of her preservice teachers attempting to integrate the iPad into her elementary student teaching experience. While the whole class activity of learning about money and denominations was the primary goal, the student teacher used the iPad to entice an unruly student to take up reading. This student then began reading with focus and concentration for 20 minutes each morning, something he had not done before the introduction of the iPad. The article concludes with a reminder to consider using the available resources, even if it is only one iPad because the limited resource will require innovative thinking that may result in excellent ways to differentiate instruction.

Shah (2011) reports on the use of iPads with developmentally delayed and disabled students. She related the story of a young girl lacking communication skills due to a combination of Down Syndrome and Apraxia who was able to use the iPad and an app (Proloquo2Go) to scroll through pictures and phrases to communicate with her teachers and classmates. Her social

isolation decreased and her self-confidence increased when she was using the iPad to support her communication with peers.

McClanahan, Williams, Kennedy, and Tate (2012) conducted an intervention where the iPad was a vehicle for reading intervention strategies for a student with ADHD who was struggling with reading. The iPad was shown to be helpful to aid the student in maintaining focus and the student advanced his reading skills 1 year in a 6 week time period.

Because iPads are a relatively new tool and new to the classroom, iPads are emerging as a strategy to support struggling students in the classroom. McClanahan et al. (2012) documented the use of an iPad to facilitate reading improvement with a fifth grade student struggling with ADHD. The use of the iPad in a learning environment allowed the teacher to modify the content and strategies for this student as needed or requested. For example, the student was struggling with compound words and the teacher had prepared flash cards to help practice. But when the student remarked about his difficulty reading the compound word, the teacher adjusted and remade the flash cards on the iPad through the FlashCards+ application. This flexibility and ease of use allowed the teacher to adjust the lesson to meet the needs of the student. This lesson on compound words was followed up by a game, "The Compound Boogie" which had already been downloaded onto the iPad. The game provided guided practice with feedback and an opportunity to correct a previous response. The use of the iPad was tailored to the needs of this student with ADHD to address his learning needs both in the lesson and in the guided practice. A recent development in iOS6 is the availability of "Guided Access" which allows the device to be "locked" onto a single app. This feature was mentioned in an earlier section on testing situations, but it also beneficial to students with ADHD. Guided Access is a benefit to students with ADHD

and autism as it allows them to focus on a single objective without being distracted by other functionalities of the device (Schaffhauser, 2012).

Tablets and specifically the iPad have also been beneficial to ELL students (Demski, 2011). Demski (2011) shares a story at the beginning of her article of the culture of ELL students both before and after they were introduced to tablets. Before the tablets, the students would group by language at lunch and during breaks and converse in their common language. After the students were presented with tablets, the groups were much more diverse as they used the tablet's ability to translate and define words to communicate more effectively. This change in the resources of the school has provided for a cultural change allowing students to connect with their new, shared language through the use of technology.

Students with special needs are present in the classroom and this research showing how the iPad can be beneficial to their learning is important for teachers of all levels.

iPad and Tablets in the Primary School. S. Li and Pow (2011) studied the impact of a 1-1 adoption of tablets in the classroom. They found that without changing the pedagogy in the school or the curriculum, there was an immense impact on learning. The researchers had students complete a daily log detailing the student's use of the tablet and asked students to assess their own motivation for learning, cognitive skill, use of learning strategies and planning. The researchers found that the students perceived an impact from the use of technology that increased the student's beliefs about their motivation, cognitive skills, learning strategies and planning and organization.

Couse and Chen (2010) conducted a study of the viability of using tablet computers with 3-6 year old students to engage the students in drawing. The students were presented with tablets and a stylus and asked to complete drawings in an introductory session and finally asked to

complete a self-portrait. The students were invited to participate in an exit interview after they completed their self-portrait. The students were asked to provide instructions for drawing on the tablet and then ultimately asked if they would prefer drawing on a tablet or with paper and markers. Sixty-four percent of the students preferred drawing on the tablet computers despite "technical issues they frequently encountered" (p. 91). "As the children gained familiarity with the tablet, they became more independent, asking for less instruction and assistance from the adults" (p. 93) and as the students became more independent, they explored the device and the program more fully and encountered more technology glitches. Even though the students encountered more technological glitches, they were rarely frustrated.

The research on iPads and Tablets with students in the primary grades is important to understand how students reacted to the presence of technology in their lessons. S. Li and Pow (2011) showed that the students increased their perception of their learning while Couse and Chen (2010) showed the resilience of the students to overcome technology glitches. These same findings may apply at the high school level currently, or they could become applicable when these students reach high school.

iPad and tablets at the college level. Colleges and universities have traditionally been known to offer large lecture courses. While these lecture courses still exist at many schools, other schools have attempted to change the delivery of their instruction. Along with these pedagogical changes, some schools have worked to integrate technology as a means of becoming more constructivist and to enhance learning and engagement for their students.

Enriquez (2010) conducted a study of college aged engineering students using tablets to enhance learning in a large lecture hall. The tablets were used to create an Interactive Learning Network (ILN) to actively engage all students during lectures, conduct immediate and

meaningful assessments of student learning and to provide real-time feedback to maximize student learning. Enriquez concluded that the tablets were capable of changing the dynamics of classroom interactions by utilizing wireless communication to assist students in analyzing and solving engineering problems.

Murphy (2011) summarized studies of iPad implementations with college students. The advantages of mobile learning and ubiquitous learning are: portability, affordable and ubiquitous access to content, situated just-in-time learning opportunities, connection and convergence to other devices, networks and technologies, individualized and personalized experiences.

Manuguerra and Petocz (2011) find that the use of the iPad in education allows for the teacher to both take into account the general needs of the class and specific needs of individual students in a flexible way. The students from this study have requested more engaging presentations and the addition of video clips from the iPad have enhanced these lessons. Individual students have noted that they feel "safer" in class because they know that they will have access to the information digitally when they want to access it later. The pedagogical approach has changed in these lecture courses by integrating more student-centered instruction and involvement in their learning.

Manugguerra and Petocz (2011) report on the use of iPads in tertiary classes to enhance learning and engagement for both traditional and distance students. Teachers and students, specifically distance students, noted the benefits of enhancing lessons with video content.

Hall and Smith (2011) described an iPad initiative in a U.S. graduate management program and noted that while learning outcomes were not significantly improved, student convenience and flexibility were enhanced, along with aspects of environmental sustainability.

In 2011, Reed College underwent a study of the iPad as a follow-up to their Kindle study 2 years earlier. The feedback from the Kindle study was used to determine if the iPad would be a better fit in the classroom as a multifunction device. The students reported that they liked; the legibility, touch screen, durability, battery life, portability, paper savings, and the single function of the iPad. The iPad in the fall of 2010 was lacking an update that would allow the device to switch seamlessly from one application to another and the students found this beneficial as they thought it made the iPad less distracting to students because of the effort required to switch modalities (Marmarelli & Ringle, 2011).

In a 2011 study with college students testing the iPad in class, students reported on the advantages and disadvantages of the iPad. The students reported favorably that; the iPad was cool, had a long battery life, was good for games, was good for learning on the go, was a good potential substitute for textbooks and had the potential of helping the school go green as they saved paper. Students were not pleased with; the iPad's lack of USB port, inability to access software and programs such as Microsoft Word and Flash. The students reported that typing was difficult and the iPad in general could function as a "massive distraction" (Kinash et al., 2011). Feedback from students was positive and optimistic, even though most students did not believe that their learning had improved.

The reports from these studies of iPads and Tablets at the college level are important because they show the learning environment where the seniors from this study will be learning in the year following this study. Therefore, these studies at the college level are the most similar to the population to be studied.

iPad and tablets at the high school level. While there have been anecdotal reports on blog posts about the use of iPads at the secondary level, at this point the research is lacking.

Summary

A thorough literature review composed of the examination of technology in education, digital reading, the integration of this technology in 1-1 environments, the pedagogical implications for implementing technology and finally a synthesis of the research to date on the use of iPads and tablets in classrooms from primary school through college has revealed that there is a gap in the literature. The literature is lacking substantial research on the use of iPads at the secondary level. Given Chapter 1 and Chapter 2, it is appropriate at this time that this research should be conducted. As suggested by Venkatesh et al. in 2007, technology adoption research has made progress, but more work is needed to provide additional theoretical perspectives. This is still true today and with the continual release of new devices, it is necessary to research their effect on the school and learning environment. This case study will identify variables to guide further research on the use of iPads at the secondary level.

Chapter 3: Methodology

As technology continues to be introduced into educational environments, the need to understand how it impacts the learning environment is critical. The purpose of this case study was to describe the implementation and use of iPads into the senior class of two charter high schools in the same school district. The goals of the research were to obtain an in-depth understanding of how iPads function to support the learning goals of teachers and students in a public charter high school and to identify the quality of training on iPad use from the perspective of the participants. This study also generated a thorough case description and identified case-based themes from the data.

Research Design

The design of this study was mixed methods because of the need "to obtain different but complementary data on the same topic" (Morse, 1991, p. 122) in order to address the research question.

On one hand, a qualitative design is well-suited for examining changes in the learning environment due to the use of new technology (Stebbins, 2001). Because the introduction of various technological tools changes so quickly, there is often a gap in the supporting research when a new technology is introduced. According to Creswell (1998), a qualitative study should be chosen when a topic is emerging because there are a lack of identifiable variables and theories. Although the iPad was introduced in 2010, no definitive research identifies theories specific to the application of tablets in the learning environment. In the case of tablet usage at the high school level specifically, the literature review has shown that, while there are anecdotal stories, there is a lack of substantial research on iPad usage at the secondary level. There are few if any studies that have been conducted to determine the best practices of this new technology,

potential new capabilities of the technology, or the way that high schools can incorporate and implement this new technology. There was also a gap in the literature concerning effective (and ineffective) training of teachers, administrators, staff and students for the integration of tablets into the educational environment.

Creswell (2007) distinguishes among five types of qualitative inquiry: narrative research, phenomenology, grounded theory, ethnography, and case study. In his description of each of these types of inquiry, he compares the theoretical frameworks suitable for each type of study and provides steps for conducting each type of research. This research design followed a case study approach, using an inductive approach to the relationship between theory and research and the interviews and observations were an example of this inductive approach as it was qualitative in nature. Case study research "involves the study of an issue explored through one or more cases within a bounded system" (p. 73). Further, he describes the case study approach as a "qualitative approach in which the investigator explores a bounded system (a case) over time, through detailed, in-depth data collection" (p. 73). Creswell states that the use of case study methodology is appropriate when the researcher has "clearly identifiable cases with boundaries and seeks to provide an in-depth understanding of the cases" (p. 74). For the purpose of this research investigation, the case study will be bounded by the examination of the use of iPads at two charter high schools within a single school district.

Bryman (2008) provides another definition of case study, which involves the "detailed and intensive analysis of a single case" (p. 52). The case under consideration may be a location, a community or an organization. In this case study, the intensive examination considered a specific event, the implementation of iPads, unfolding within a single organization. Creswell (2007) asserts that this type of study in which the case study is focused on an issue and not a group of

people, is classified as an instrumental case study. “With a case study, the case is an object of interest in its own right, and the researcher aims to provide an in-depth elucidation of it” (Bryman, 2008, p. 54). The specific event, or case, that was studied in this research was the introductory year of iPad usage within a single school district.

Bryman (2008) distinguishes between five types of cases in case study research: the critical case, the extreme or unique case, the representative or typical case, the revelatory case and the longitudinal case. The introduction of iPads in 2010 provided a new technology that had not been previously researched. Therefore, for the purpose of this study, the type of case study was a revelatory case because the researcher “observed and analyzed a phenomenon previously inaccessible to scientific investigation” (Yin, 2003, p. 42).

While a qualitative approach creates a thick rich description, it was apparent that there would be a limitation in the availability of students to participate in this research. As it was deemed important to include the student perspective in this study, it was decided that the student perspective would be included through the use of an online electronic survey. This survey introduced a quantitative component through the use of Likert-style questions. Both qualitative and quantitative data were collected during the same period at the end of the school year and the data initially were analyzed separately and then merged to develop themes. According to Creswell and Plano Clark (2011) this method of mixed method convergent design should be chosen for the purpose of “synthesizing complementary quantitative and qualitative results to develop a more complete understanding of a phenomenon” (p. 77).

The descriptive, revelatory, multiple methods utilized in this case study, paired with the data collection and analysis procedures was successful in generating the emergent themes from iPad usage at the secondary school level. Richards and Morse (2002) promoted an idea of

methodological congruence in which the entire study design is aligned to the purposes of the type of inquiry. This case study design will be presented in the following sections.

Restatement of the Research Questions

According to Creswell (2007), to study topics in qualitative research, the research should begin with open-ended research questions with the objective of hearing from the participants about their thoughts and experiences. When formulating the research questions in a qualitative study, Creswell (2009) suggests starting with a broad question followed by no more than five sub-questions to narrow the focus of the study. The central research question that will guide this study is: How are iPads influencing the academic learning environment?

The sub-questions utilize the findings from the literature review to relate the central question to the strategy of providing an in-depth understanding of the case. The sub-questions that support this central question are:

a) How does the experience of teaching and/or learning change with the use of an iPad?

b) What is the influence of an iPad on the interactions among friends and colleagues?

c) What is the influence of an iPad on the relationship between students and faculty?

d) How do the participants assess their training for using iPads?

e) What changes/improvements should be made to the iPad and its accessories?

Exploration is a manner of conducting a case study with an open mind. According to Stebbins (2001), an exploratory design should be used when researchers have little to no scientific knowledge about a group, process, activity or situation but "have reason to believe it contains elements worth discovering" (p. 6). This is the case with iPad usage at the secondary level and therefore the research questions are intentionally open-ended and broad. Further, Glaser and Strauss (1967) state the goal of exploration is to generate new ideas and synthesize

the common elements of the data into themes. This research study explored the preparation, implementation and usage of iPads by teachers, students, administration, and staff in order to generate a detailed, rich description of the case.

Through the use of survey, interviews and observation, this researcher explored the experiences of students, teachers, staff and administrators concerning their experiences with the iPad in an academic environment. Semi-structured interviewing was used to generate an intensive and detailed examination of the case (Bryman, 2008). Teachers, staff and administrators were invited to participate in an interview to describe their experiences with using the iPad in an academic environment. Students over the age of 18 were invited to participate in an online survey to relate their experiences about using iPads for learning in the academic environment as well as their training for the implementation of iPads. To supplement the survey and interview results in the case description, the researcher used field notes gathered through observation of the data sources using iPads on campus.

Data Sources

For this study, the data sources are people. The people who served as data sources were administrators, staff, teachers, and students engaged in the usage of iPads. The administrators, staff, teachers and students were selected for participation in this study based on the criteria set forth in the next section.

Process for the selection of data sources. Participants for this study were identified through their affiliation with a public charter high school in Southern California, which was conducting an iPad initiative during the 2012-2013 school year. The iPad initiative was conducted with the senior class of students and the faculty, staff and administrators at the two charter schools, all receiving a device for their use during the school year. Additionally, there

was extra funding to provide for carts carts of iPads in each school to be utilized by the ninth, 10th and 11th grade students in class, but this was not known at the time this study was designed. All of the students over the age of 18 involved with the 1-1 iPad initiative were invited to participate in the electronic survey. All of the teachers, staff and administrators were invited to participate in interviews. A staff member sent a mass email to all administrators, staff, teachers and a separate email to students. The total number of available participants for the study was 56 trained teachers, four administrators, all 149 of the senior level students over the age of 18 and all of the staff persons at both schools.

Selection of teachers, staff and administrators. The selection of data sources entailed recruiting administrators, faculty and staff for the interviews. The administrators, staff and teachers were recruited through an email to invite participation in the study by signing up for an interview. The email to recruit teachers, staff and administrators is attached as Appendix B. The email was sent by a school administrator to all teachers, staff and administrators working at both schools. When the teachers, staff and administrators volunteered for the study, they were provided with an electronic copy of a document informing them of the goals of the study and an informed consent form (Appendix C). If the teachers, staff or administrators replied to the email indicating that they would like to volunteer for an interview, they were contacted by the researcher through email to arrange a mutually convenient time for a 20-minute interview. Participants were then given the option of an in-person, Skype or phone interview and were given the written interview questions prior to the interview. A paper copy of the Informed Consent document was presented to the interviewees at the beginning of each in-person interview and they were given time to read the document and decide if they would allow or not allow recording during the interview. The document was then returned to the researcher before

beginning the interview. An electronic copy of the informed consent document was sent via email to each of the participants in the phone interviews at the start of their interview and they were allowed to state their preference for being recorded and to provide their informed consent for participating in the interview.

Selection of students. The selection of data sources entailed recruiting students for their participation in the online electronic survey. An email (Appendix D) was sent by each principal to all senior level students over the age of 18 involved in the iPad initiative inviting them to participate in the electronic survey. The students were provided with information regarding the purpose and goals of this research as well as information to provide informed consent in the email invitation. The students clicked on the link to the survey to accept that they had read the informed consent and agreed to participate in the study. Following a brief welcome statement, the subjects participated in the electronic survey of their experiences and impressions of using iPads. At the completion of the survey, the students were thanked for their time and participation.

As survey data is likely to have a low response rate, the principal for each school who sent the email also sent a follow-up email three times during the duration of the data collection window (2 weeks at the end of the school year) to remind students of the opportunity to participate in the electronic survey.

Data Collection Strategies

Survey-data collection strategy. Surveys are the most common design associated with quantitative methods Surveys include using questionnaires for data collection with the intent of generalizing from a sample to a population (Creswell, 1994). While the purpose of survey research is to generalize responses from a sample of students at these two schools to a population in order that the population may benefit from the experiences of the sample, and that is not the

case in this case study research; surveys are the preferred type of data collection for this study because surveys involve an economy of design and include a rapid turnaround of the data (Babbie, 1990). From the survey results, it may be possible to generalize to the larger population; however, in this case study research, the goal is not generalizability but rather the creation of a detailed case description. This survey gathered information from a broad pool of users to create a rich description of the use of iPads by the students. The survey was cross-sectional as the data was collected at one point in time during the iPad integration. Fink (2002) identifies four types of survey data collection; for the purpose of this study, a self-administered questionnaire was used. The survey was made available to the participants through the site, SurveyMonkey.

Interview-data collection strategy. The second aspect of data collection for this research was semi-structured, open-ended, 20-minute interviews either in person, by Skype or over the phone with the teachers, administrators and staff. Bryman and Bell (2007) found that the data collection strategy of interviewing had advantages over personal observations. The advantages they found were that interviews allowed the researcher to investigate issues that are not easily observed and allow for data collection across a broader range of situations, rather than the single situation in an observation. Stebbins (2001) also makes a similar recommendation. First, interviews should be used over observation because the researcher will follow an interview protocol to guide the interview, whereas observations are not guided toward the goals of research. This interview protocol was based on prior observations and grounded in the results from the literature review. Second, in an interview the use of open-ended questions allows the researcher to guide the interview in the direction of the research study but also allows the subjects to relate their unique opinions and experiences. Therefore, semi-structured interviews were used to gather the most appropriate information for this study.

This study, and specifically the interviews, attempted to uncover and present the feelings, experiences and impressions of the teachers, administrators and staff using the iPad; and feelings are not easily observed. Because the subjects of the study are not located in the same city as the researcher, some interviews were conducted in person, and all remaining interviews were conducted over the phone. According to McCraken (1988), a long interview is valuable for qualitative studies when considering such factors as gathering depth of information, time scarcity and concern for privacy.

Observation- data collection strategy. While Stebbins (2001) and Bryman and Bell (2007) have found that interviews should be used over observation, in an effort to generate a thorough and detailed case description of the case study, observations by the researcher were used to complement the data from the surveys and interviews. The researcher was present on campus during the school day to observe the students, teachers, staff and administrators using the iPads. The researcher took field notes during the observation and reported these notes in the case description as they were appropriate to provide further understanding.

Data Collection Procedures

Interview-data collection procedure. Participants were welcomed into the interview and after reading and signing the informed consent form (Appendix C) the Interview protocol (Appendix E) was used to guide the duration of the interview. An interview protocol with five open-ended questions was used to conduct the interviews. Creswell (1998) suggests that while conducting interviews, the researcher should be respectful and courteous at all times and when acting as an interviewer should refrain from offering advice.

All interviews were recorded with a digital recording device if the participant agreed to the recording of the interview and the researcher took backup notes whether conducted in person

or over the phone. The privacy of the participants was protected through the use of a numbering system, coded to the participants in a single electronic file which was password protected and stored in hard copy, when necessary, in a locked safe in the researcher's office. All files associated with the interviews were kept by the researcher in a password protected electronic file, and a hard copy when printed, was stored in a locked safe in the researcher's office for 3 years after the completion of the study and then it will be destroyed.

Survey-data collection procedures. Once the student participants received the email inviting them to participate in the online survey, they could read the included text for informed consent (Appendix D) and then they could click a link to open the survey. The survey program queried students about their experiences with iPads and the students entered their responses through the online survey. They were permitted to stop at any time without penalty.

Observation-data collection procedures. The procedure for collecting data during the observational phase involved the researcher being present on the school campus during the school day. The campus had students under the age of 18 present, but because the researcher was observing and not participating in the activity of iPad usage, instruction or learning, the research was considered exempt. The researcher was present on the school grounds (within the gated area of the school, in public spaces such as the cafeteria, the walkways, the courtyards and the classrooms) during the school day (during class and between classes) to observe the use of iPads in the academic environment. The researcher took handwritten field notes with pen and paper and did not record any identifying information of participants.

Data Collection Instruments

Interview protocol. Based on the literature review and research questions for this study, five themes emerged to guide both the survey and the interview protocol. Stebbins (2001)

suggested using these topic areas to guide the creation of the interview protocol for use in exploratory research. The themes that have emerged from the literature review are; first, the first order difficulties of implementing new technology and the application of technology for learning in the classroom, second the potential for altered relationships among peers, third, the altered relationship between students and faculty associated with the potential for pedagogical shifts in the classroom, fourth the training associated with implementing new technology, and fifth, the nature of emerging and evolving technology along with the possibility for ubiquitous learning. The interview protocol was structured based on the guidelines set forth by Creswell (2007, 2009) and written to meet the needs of this study. The interview protocol, which was independently validated by four technology educators, titled, "Interview Protocol for teachers, staff and administrators using iPads" (Appendix E) was used to guide the interviews. An explanation of the validation procedures that were used will be presented in the following section on Validity of Instrumentation.

Survey. The data collection instrument that was used with the students was a cross-sectional, self-administered electronic survey to be completed on SurveyMonkey. Complementing the interview, the survey was also designed based on the five themes that materialized during the literature review. These themes and the sub-questions of the central research question were used to organize the categories of questions on the survey. The structure of the survey was designed and based on the suggestions put forth by Creswell (2009) and modified in content to meet the needs of this study. The survey, which was independently validated by four technology educators, titled, "Survey for students using iPads" (Appendix F) was administered through SurveyMonkey. An explanation of the validation procedures that were used will be presented in the following section on Validity of Instrumentation.

Validity and Reliability of Instrumentation

Validity is defined by Creswell (2009) as an instance when the "items measure the content they were intended to measure" (p. 149). Content validity goes beyond face validity by asking a group of experts if the items on the instrument are valid. Both the Interview Protocol (Appendix E) and the Student Survey (Appendix F) have been validated by a content evaluation panel as suggested by Lawshe (1975) consisting of four technology integration specialists working at the secondary level. The questions on the interview protocol and survey were addressed by each expert independently to determine if the information measured by an item was "essential; useful but not essential; or not necessary" (p. 567). If the questions were rated as essential or useful but were unclear, the content evaluation panel assisted in rewriting the questions for clarity. Additionally, the questions were modified according to the suggestions of the content evaluation panel to ensure content and readability. The resulting questions were deemed appropriate by the content evaluation panel for the goals of this study.

Additionally in a pilot of the instrumentation, the interview questions were piloted with two volunteers to determine the amount of time to block for each interview. The two interviews took roughly 15 minutes each and therefore a 20-minute block of time was prepared for each interview. The survey was piloted with a group of at least five students in order to determine the time anticipated for completion of the survey. The pilot also helped to identify the functionality of email delivery of the survey and the proper links to direct students to the online survey.

External reliability is defined by Bryman (2008) as the "degree to which a study can be replicated" (p. 376). In order to meet the criterion of external reliability it was necessary for the researcher to follow the interview protocol when conducting interviews. Internal reliability means, "when there is more than one observer, members of the research team agree about what

they see and hear" (p. 376). However, there was not a team of researchers and therefore, for internal reliability, it was necessary for the researcher to use coding consistently when analyzing the data. The internal reliability will be discussed in more detail in the following section as it relates to the proposed data analysis.

Description of Data Analysis Processes

Interview data was recorded using a digital recording device as well as handwritten notes. The interviews were transcribed by the researcher using the software program, HyperTranscribe and reviewed for obvious mistakes as the first step toward internal reliability. The student survey participants entered their responses to the survey questions directly into the electronic survey system and the researcher downloaded the data. The quantitative data was analyzed using the program SPSS to find mean ratings. The researcher's field notes from the observations were transferred into an electronic format. All qualitative data from the interviews, surveys and observations were entered into the software program HyperResearch designed to facilitate qualitative analysis. In qualitative research, the collection of data is not a separate process from the analysis of data because the qualitative nature of the study is about discovery.

The qualitative data from interviews, surveys and the field notes of the researcher were coded initially with topic coding. According to Richards and Morse (2002), topic coding is "used to identify all material on a topic for later retrieval and description, categorization, or reflection" (p. 117). This method entailed marking up electronic text utilizing the computer coding system. The material was then organized around topics and categories, which evolved through the coding process. The data coding became more analytic as the identification and linking of codes morphed and the researcher began to question "the data about the new ideas developing in the new codes" (p. 119). Ultimately themes are "something that is more pervasive than a topic or

category" (p. 121) that has emerged from the coded data. Richards and Morse refer to this process of identifying themes as "theme-ing." These themes grew from the data and the researcher created models, diagrams, and tables to manage the abstraction process. By addressing the data as it correlated to the research questions, the data was organized into themes, as was the goal of this case study.

Institutional Review Board and Human Subjects Considerations

This research study involved interactions with human subjects and met the Federal requirements for research considered to be exempt. The subjects for this study were administrators, staff, teachers and students (over the age of 18) at two public charter high schools in Southern California. The researcher was honest with the participants regarding the purpose and the nature of the study when the participants were being solicited for participation. The participants additionally were offered a summary of the research at the conclusion of the study. If the participants, or any member of the school community desired a report of the results of the study, there was a link posted on the school website to provide a review a summary of the research. The nature of contact with the administrators, staff and teachers was through an interview conducted either in person or on the phone lasting roughly 20 minutes. The nature of contact with the students (over the age of 18) was through an electronic online survey with 14 questions. The observations by the researcher were conducted in a manner such that the researcher was not participating in the activity of iPad usage, learning or instruction. The researcher was taking field notes during the observation. The subjects throughout the study were asked to discuss their impressions and relate their experiences with using iPads. The topic of the use of technology in the classroom is not considered to be a sensitive topic, nor would a breach in confidentiality have an impact on their reputations or job as teachers, staff or administrators or

their grade as students. This research was conducted in established educational settings including the classrooms and the school grounds. Interviews and surveys are a part of normal educational practice to gather feedback on the educational practices, strategies and techniques in a school. In order to protect the participant, they could stop at any point in the interview or survey with no penalty. There is very minimal risk to the participants of interviews, surveys and observations, however, there is a potential risk that the identity of the participants may become know. Because interviews cannot be anonymous, the subjects were assigned codes/pseudonyms for all written notes and the final report to mask their identity in an effort to establish confidentiality. The electronic survey system provided a separation of IP addresses and the researcher was delivered the resulting survey data without connection to the identity of the participant. The observational field notes did not contain any identifying data. Should the security of the electronic survey system be compromised, the resulting connections to the participants name and answers were considered to have minimal risk. Any electronic written notes, transcriptions and final report have been protected in a password-protected file on the researcher's computer to which the researcher is the only person with the login and password information. The hard copies of any documents relating to this study have been stored in a locked safe in the researcher's office along with and any handwritten notes. All electronic work has been kept securely on a backup drive in the researcher's office safe for the duration of the study and will be destroyed 3 years after the completion of this research. The researcher also addressed other examples of minimal risk that might concern the participants. For example, the students may have believed that their grade would be affected by the results of their participation, yet the survey system stripped the IP addresses from the survey data to prevent anyone from knowing the identity of any survey participant. The teachers, administrators or staff may have believed that their job standing would

be affected by their answers during the interview, but because of the codes and pseudonyms used, no one other than the researcher knows the answers given by any specific participant. There was no risk of physical harm to the participants. The researcher has applied to the Pepperdine University Institutional Review Board (IRB) for Exempt status and has received approval.

Summary

This chapter has summarized the methodology that was used to conduct this research project. The use of a convergent parallel research design was used to gather information on the use of iPads at two charter high schools in Southern California. This chapter discussed the identification of data sources and how they were selected, and a detailed account of how data was collected. The validity and reliability of the instrumentation used in this study was discussed as well as the data analysis processes and finally the IRB and Human Subjects considerations.

The central research question that was used to guide this study was: How are iPads influencing the academic learning environment? The sub-questions that were used support this central question were:

a) How does the experience of teaching and/or learning change with the use of an iPad?

b) What is the influence of an iPad on the interactions among friends and colleagues?

c) What is the influence of an iPad on the relationship between students and faculty?

d) How do the participants assess their training for using iPads?

e) What changes/improvements should be made to the iPad and its accessories?

These research questions, and this case study design were developed with methodological congruence (Richards & Morse, 2002) to provide the researcher with an in-depth understanding of the use of iPads within this case study in order to create a detailed case description.

Chapter 4: Results

Introduction

This study sought to explore the installation and educational use of iPads at the secondary level through a case study. The purpose of this study was to examine the implementation of the iPad as an instructional tool through the experiences of the participants using it. The goal of this research was to generate a detailed case description and to identify and define those variables that were deemed most important by the participants in the study, in order to sharpen the focus of future research. The research began with the gathering of quantitative data, continued with qualitative interview data and concluded with observational data. Thus, the methodology is categorized as a case study utilizing multiple methods.

This chapter analyzes and discusses the findings from the data collected through an online survey administered to students over the age of 18 and interviews conducted with the teachers, administrators and staff at two charter high schools using iPads. The results include both quantitative and qualitative analysis. Answers from 73 students on the online survey were used for the quantitative aspects of this study. The qualitative aspects of this study were generated from the open-ended questions on the student survey and the interviews of 18 teachers, administrators and staff participants. In addition, qualitative data were supplemented by the field notes gathered through the researcher's observations. The research questions were addressed individually as well as unanticipated findings, which resulted from the qualitative analysis of the open-ended questions in both the survey and interview. Before presenting these findings, the research questions and a description of the data-gathering process are reviewed, and a description of the participants is presented.

Restatement of the Research Questions

The central research question that was used to guide this study was the following: How are iPads influencing the academic learning environment in two charter high schools in Southern California?

The sub-questions that were used support this central question included the following:

a) How does the experience of teaching and/or learning change with the use of an iPad?

b) What is the influence of an iPad on the interactions among friends and colleagues?

c) What is the influence of an iPad on the relationship between students and faculty?

d) How do the participants assess their training for using iPads?

e) What changes/improvements should be made to the iPad and its accessories?

Description of the Data Gathering Processes

Survey data gathering process. An email with an invitation to participate in the electronic survey was sent during the last 2 weeks of school year, 2012-2013, from an administrator of the school to all of the senior students over the age of 18. The students could then click on a link to begin taking the survey about their experiences with the iPads. The students took between 1 minute and 33 minutes on the survey. SurveyMonkey was used to gather all of the responses. 87 students participated in the survey from May 26- June 4, 2013. The researcher closed the survey on June 13, 2013. It was determined, based on the completeness of the responses, that students who had three or fewer missing answers, which represented 10% of the total number of questions, should be kept in the data analysis. As a result, the answers from 73 students, or 84%, were used in the quantitative analysis for this study.

Interview data gathering process. An email invitation was sent by an administrator to all of the teachers, staff and administrators at both schools to participate in interviews about the

iPads. Participants responded to the researcher to schedule interview times. All of the participants who requested an interview were granted an interview.

The researcher spent one day on site conducting interviews and recorded 14 interviews. The remaining four interviews were conducted over the phone. 17 of the 18 interviews were recorded using a recording device, but there was a technological problem with one interview and the recording was accidently erased. The researcher took handwritten notes during all 18 interviews and for the one interview that was erased, the problem was detected immediately following the interview, and an attempt at recreating the transcript was completed within an hour following the interview. Thus, comments from all 18 interviews were used.

After conducting all of the interviews, the recordings and the researcher's notes were used to create transcripts for each interview. The research software, HyperTranscribe, was used to create the transcript. The completed transcripts were then uploaded into the research software, HyperResearch, for coding and analysis.

Observation data gathering process. The researcher conducted observations on both campuses for three days during the final 2 weeks of the school year. The researcher did not engage in the use of iPads but used a notebook and pen to record field notes. While gathering field notes, the researcher was focused on addressing the research questions of this study. The researcher observed students and teachers using the iPads in classrooms, students using the iPads between classes and staff and administrators using and discussing their impressions of the iPads.

Description of the Respondents

Description of the survey respondents. As indicated above, the electronic survey was sent to seniors at the two high schools who were over the age of 18 at the time of the research. There were 87 responses of varying levels of completeness. 73, or 84%, were deemed usable.

Description of the interview respondents. An invitation to be interviewed, either in person or on the phone, was extended to all faculty, staff and administrators working at both high schools. Two administrators, two staff members, two IT professionals and 12 teacher interviews were conducted for a total of 18 interview subjects.

Description of the observation subjects. The observations were conducted on both campuses during the last 2 weeks of the school year. The researcher used field notes from the observations to address the research questions and understand the way that teachers and students at the schools used iPads.

Answers to the Research Questions

Research question 1a. How does the experience of teaching and/or learning change with the use of an iPad? Quantitative survey items that related to Research Question 1A included: 1A, 1C, 1D, 1E, 2A, 2B, 2C, 2D, 5A, 5B, 5C, 5D, 6A, 6B, 6C, 6D, 6E, 6F, 6G, 6H, 6I, 6J, 6K, 6L, 7A, 7B, 9D, 9E, 9F, 9G, and 9H. Qualitative survey items that related to Research Question 1A included: 1F, 2E, 3, 5E, 6M, 9I and 14. Qualitative interview questions that related to Research Question 1A included: 1, 2 and 7.

Quantitative data from the survey supporting RQ1a. Research Question 1a asked, "How does the experience of teaching and/or learning change with the use of an iPad?" Table 1 displays the descriptive statistics for survey items pertaining to the experience of teaching and/or learning changes with the use of an iPad sorted by the highest level of agreement. These items were rated using a 5–point Likert scale (1 = *Strongly Agree* to 5 = *Strongly Disagree*). Most agreement was for Item 6J, "I can do Internet research on my iPad (M = 1.25, SD = 0.43)" and Item 6F, "I can access and read PDFs on my iPad (M = 1.32, SD = 0.52)." Least agreement was

for Item 6A, “The iPad helped with the digital portfolio (M = 3.14, SD = 1.31)” and Item 1C, “My BigCampus was helpful when using iPads (M = 3.00, SD = 1.27)” (Table 1).

Qualitative survey results supporting RQ 1a. Research Question 1a asked, “How does the experience of teaching and/or learning change with the use of an iPad?” This section will summarize the main themes from students’ responses to open-ended questions pertaining to this research question.

Survey results of the seniors indicated that they recognized changes in the way they were learning in school due to the use of iPads. Some of the major themes that they noticed were the change in eReading and textbooks, the differences between their experiences with other computers, the portability of the device which allowed for studying in new locations and the benefit of a 1-1 program which gave each student access to their own device for the entire school year.

Textbooks and eReading. When students were asked about the use of textbooks for learning, 29 students replied that they did not use paper textbooks, but instead were using the iPads to reference materials such as “trusted websites,” “Online articles and essays,” “eBooks” and “online textbooks”. There were two students who added that they were using “other reference books” and “printed worksheets” to supplement their learning in class.

When students were asked about what they did in their free time on the iPads, 12 students replied that they were spending their free time reading. Some of the reading materials mentioned were “free iBooks,” “articles,” and “eBooks”. One student even said that the iPad allowed for “non-stop reading”. Two other students commented that the advantage of an iPad for eReading was that they could save space in their backpacks and lockers. As one student indicated, s/he

Table 1

Survey Items Pertaining to the Experience of Teaching and/or Learning Changes with the Use of an iPad Sorted by Highest Level of Agreement (N = 73)

Survey Item	*M*
6j. I can do internet research on my iPad.	1.25
6f. I can access and read PDF's on my iPad.	1.32
2c. I liked having an iPad for fun.	1.33
2d. I sometimes spend free time on the iPad.	1.36
6i. I can access and read eBooks on my iPad.	1.37
1d. The iPad is a helpful tool when doing work for classes.	1.40
6h. I can access and watch videos on my iPad.	1.41
7a. My friends at other schools think it is cool that I got to use an iPad.	1.42
2b. I liked having an iPad for learning.	1.45
6k. I can video conference on my iPad.	1.49
1e. I used the iPad to study in a non-traditional location (not a classroom).	1.51
9g. I like having something other than a textbook as a reference.	1.51
5b. I found at least one free or inexpensive app that helped with my schoolwork this year.	1.52
7b. My parents/guardians think the iPad is good for learning.	1.52
6g. I can read and annotate documents on my iPad.	1.53

Note. Ratings based on 5-point metric: 1 = *Strongly Agree* to 5 = *Strongly Disagree*.

(continued)

Survey Item	*M*
5c. I downloaded fun apps onto my iPad.	1.55
5d. I downloaded learning apps onto my iPad.	1.59
9d. We use digital textbooks that we read on the iPad.	1.71
6e. I can create movies on my iPad.	1.89
1a. I learned more this year because we were using iPads.	1.93
9f. I like reading digital textbooks on the iPad.	2.07
6b. I can create written documents on my iPad.	2.10
2a. I sometimes do leisure reading on the iPad.	2.11
6d. I can create presentations on my iPad.	2.22
9e. I like e-Reading better than p-Reading. (I like reading electronically better than I like reading on paper.)	2.60
6c. I can create spreadsheets on my iPad.	2.63
6l. The iPad alone would suit my needs. I don't need a computer or laptop when I have an iPad.	2.67
9h. We did not use textbooks either in print or digital format.	2.96
5a. The iPad came preloaded with all of the apps I *needed* to complete coursework.	2.97
1c. My BigCampus was helpful when using iPads.	3.00
6a. The iPad helped with the digital portfolio.	3.14

Note. Ratings based on 5-point metric: 1 = *Strongly Agree* to 5 = *Strongly Disagree*.
could, "Use the iPad for downloading numerous books instead of having to buy books and taking up space".

Mobile and portable devices. When the students were asked where they studied this year in a non-traditional location, there were a wide variety of responses. The most common response (n = 38) was at home. One student responded, "usually I study at home, but the versatility of the iPad basically allows me to study wherever I feel comfortable." The next most common place to study was at a Starbucks or other café (n = 14). One student commented "when I went to Starbucks to study I would take it (the iPad) instead of my bulky laptop". The portability and size of the iPad were factors in the student's decision on what device to take along for studying. Starbucks, Barnes and Noble, McDonalds and the library are all locations that offer free wifi to their customers and patrons. One student said s/he was, "able to do homework anywhere where there was wifi, so it helped me get things accomplished more easily."

Wifi connectivity is also expanding beyond coffee shops and bookstores and some restaurants, as some cities now offer wifi in public spaces such as parks and community centers. There are also devices and some phones that create their own wifi hotspot and will allow connectivity of the iPad through their own wifi. The possibility of wifi connection can now occur almost anywhere.

While there was sometimes a need for students to have access to wifi, there were also tasks that could be accomplished without an Internet connection. "With the iPad I was able to access iTunes U and get readings for English on PDFs that made studying anywhere so much easier." By downloading a copy of the reading directly onto the iPad, the students were free to study without limits on their wifi accessibility. Thirteen students mentioned that they studied in the car, six mentioned studying outdoors, and five studied anywhere and everywhere. One student described the benefit of having an iPad as: "Being able to have a super portable way to access and complete most of my homework assignments. I used my computer way less this year,

which was nice because I hate carrying around my computer all the time." The portability of the device allowed students to study in non-traditional locations.

1-1 iPad program. Students mentioned benefits of being involved in the 1-1 implementation of the iPads. They mentioned "being able to take it home" and the fact that "everyone had one of their own" and they didn't have to share, as part of the benefits of having an iPad in a 1-1 ratio. The seniors appreciated having their own devices and one described this benefit for the students as, "always being able to have your own (iPad) and everybody would have their own, so you didn't have to be sharing with so many people and looking at only one screen." There were also a few students who mentioned that the 1-1 program gave them access to a computer because they did not have access to one at home. One student described the difference in learning this year with the iPad as "using certain apps to do schoolwork, for example, when you don't have a working computer at home."

Best part of having an iPad. When students were asked, "What was the best part of having an iPad" one student replied, "I was given freedom to use an advanced piece of technology to do tasks that other high schools didn't have." 33 other students responded that the iPad was useful because it was a small, portable device, which had wifi capabilities and could complete multiple functions including a quick platform for research. These students made comments such as, "You can take it everywhere and it is easy to hold" or "the amount of productivity and accessibility we had (with the iPads was helpful)" or "It has easy access to the Internet and it helped me keep up with college stuff" or "the ease of being able to use it. I was able to do assignments without worrying about taking my computer."

The next most common response fell into the category of apps for the iPad. Eight students commented that the best part of the iPad was the apps that they were running. One

student commented, “Everything you need was always available to you. There are many apps in the store that provide unlimited sources for the students to use.”

Seven students mentioned that the best part of the iPad was that they were rolled out in a 1-1 format, meaning that each student was given his or her own device. One student commented that “having all school materials in one place and (on a device) that can be taken anywhere” was the best thing about the iPads. Because these devices were checked out to the students at the beginning of the year for the entire year, the students could save all of their work on this device and take it with them wherever they went.

Six students commented that the best part of the iPads was an ability to be more “green” by saving paper and books. One student replied, “being able to read and have everything without wasting paper” while another added that “being able to finish projects and turn them in on the iPad” was the best part of having the devices.

Six students mentioned using the iPad for entertainment and communication was the best part of having an iPad. One student said, “listening to music, using an electronic textbook and becoming more savvy with Apple technology.” Two added that they enjoyed reading books on the iPads and one commented on the games available. There were two students who commented on the communication available through the iPads. One student said, “The best part about having he iPad was instant communication. I could send emails and iMessage my peers or teachers so that I had answers to my questions right away.”

Finally, three students commented on using the iPad as a backup for other technology and three additional students were grateful for the opportunity to learn a new piece of technology. One student said, “The best part of having an iPad was coming out of my comfort zone by using technology at another level.”

While there were many benefits of having the iPads, students also mentioned the difficulties of having an iPad and suggested what would have made them better. Eleven students suggested integrating the iPads more into the classroom learning environment. Five students requested better educational apps for high school students. Five students requested fewer restrictions on websites. Five students replied that the iPads would be better with keyboards. Two students commented on the inability of the iPad to run Flash and two students commented on the desire for more training at the beginning of the year on shortcuts and tricks.

Differences between iPads and laptops and other computers. While there were pros and cons to using the iPads this year, the students most frequently compared them to their previous experiences with laptops and desktop computers. 56 students said that they would still need a laptop or computer to support their schoolwork, while 11 students said that they would not need a laptop or computer because the iPad would be sufficient.

Of the 56 students who said they would need a laptop or computer to support their schoolwork, 28 of these responses indicated that typing on the iPad was the primary concern. When students encountered assignments that required long essays, they preferred having a laptop or computer with a physical keyboard. 11 students required a computer or laptop because they needed Microsoft Office programs or formatting for their work. Four students required a laptop or computer because the iPad lacks the capability to run Flash, Three students needed a computer to print, and two students mentioned the lack of a USB/CD ROM drive as the reason they would need an alternate device.

Desire to keep the iPads. One of the unasked questions that appeared voluntarily by the students was the desire to keep the iPads at the end of the year. 15 students mentioned this desire to keep the iPads and some made impassioned requests. One student said,

> Can we please buy them from you? I kind of need one for college now and I'm attached to this one… But on a more serious note, I am so thankful for being able to use this iPad for free this year, it made my senior year a lot easier and I never would have even considered getting one before this. I love iPads now and, like I said before, I'm definitely getting one for college.

"Please let us buy them" and "it is going to be hard to say goodbye to my iPad. I feel very attached to it now, and now I think I'm going to have to buy one for college" were some of the other comments made by students.

Interview data supporting RQ 1a. Research Question 1a asked, "How does the experience of teaching and/or learning change with the use of an iPad?" To answer this question, this section will summarize the main themes from the interview questions of teachers administrators and staff pertaining to the experience of teaching and/or learning change with the use of an iPad sorted by frequency of response. When the teachers, administrators and staff were asked, "How does the experience of teaching change with the use of an iPad?" there were many different responses to the question, but every single interviewee responded that the iPad made tasks easier or more efficient to use in some way. The teachers commented on the ease of use with the iPads for students to perform quick research. Teachers were commonly using the iPads to engage students at the beginning of their lessons with spark learning activities, which help teachers to peak the student's interest in a lesson by having the students perform a quick search to gather information on an upcoming topic. The students were more engaged in the lesson because of the internet research on the iPads and the teachers compared it to the hassle of using laptops the previous year, which required a few minutes each time for starting up and logging in to the device. The teachers reported that the use of iPads made performing quick searches much more manageable because of the lack of startup and shutdown time.

Another beneficial time saver that was mentioned by the teachers was the lack of logins on the iPads. One of the practices on campus is that the students sign up electronically for office hours. When they are using laptops, the laptops must have a login for each individual student. Each access point in the school could have a maximum of 30 logins, which meant that sometimes the students would not be able to log in to the school internet system until another student had logged off of the system. Because the iPads did not require separate logins, there were no longer complaints by the students of not being able to log in to the system.

The counselors on campus also teach a course in college readiness so they work as both counselors and teachers. The counselors mentioned the ease with which the iPads allowed them to help students edit and revise their college applications. One counselor said, "It was rare that I had a senior in my office without their iPad open" and these iPads were allowing the counselors to guide the students on their essay writing and proof reading quickly and efficiently. The iPads also gave the students constant access to learning because they would always have their iPads and therefore their college application work with them.

The IT department had two interviewees and both technology personnel mentioned that the iPad rollout was the easiest of any device they have managed.

The front desk administrators were also given iPads to use for the duration of the year and the two interviewees responded that the iPad allowed them for the first time to accept payment by credit card. This was a benefit to the front desk employees because it gave the parents more options for payment and the iPad then could send an immediate eReceipt to the parent. The iPad made their job easier.

Making videos to enhance student learning. Some of the teachers responded that the iPads made it easy to make videos to help enhance student learning. Some of these teachers

found that they could record their lesson as they were teaching in class and post that video for students to reference. The students would then have access to the lesson if they wanted to review the material at a later date or if they were absent and had missed class. Some of these teachers began making videos outside of class to show explanations for how to solve problems from a test. The availability of all of the problems allowed students to have a more personalized learning experience as they tried to learn from their missed answers and they could focus on the problems where they needed more instruction.

Using the iPad to instruct as they walk around the classroom. Some of the teachers responded that they were using the iPad as a tool to enable them to teach from any place in the classroom. One teacher mentioned that the ability to present to the class from the back of the classroom gave her a proximity to students, which allowed her to give more personalized attention to students. Also, walking around the classroom allows teachers to look at the work that students are doing as they are doing it. This will allow for "just in time" learning and coaching. The presence of the iPad as a presentation tool also allows students to present their work during the lesson. Teachers commented on the ease with which they could hand an iPad to a student and ask them to present their work.

Distribute readings and books. Five of the teachers mentioned that they have begun using the iPads for in-class readings. These teachers traditionally had printed out copies of articles or books, but with the presence of the iPads, they began posting PDFs of these articles for the students to read. Some of these teachers had opted for the use of an electronic textbook and were utilizing the iPads to access the electronic textbook (eText) for their course. They found that the iPads were much easier than the laptops that were used previously for students to view the eText and to zoom in and move around on the page.

Going green. Some of the interview subjects also commented on the savings in paper that the iPads had created. By performing tasks such as reading articles and books electronically, these teachers were using much less paper than they had in previous years. Some teachers had opted to use the iPads for tests and quizzes, which also reduced paper use. In addition, some of the student projects were completed electronically. The counselors were also impressed with the amount of paper saved by completing college applications electronically. There were no longer drafts of college essays being printed, proofread and then reprinted to mail to multiple colleges. There were no longer printed transcripts for each college applied to by each student as well as the envelopes and stamps. The electronic college application process was an impressive savings in paper and the presence of iPads allowed students to create, edit and send work electronically.

New teaching responsibilities and new management issues. The iPads gave the students a tool for learning, but with new technology comes new management issues. One of the things to manage was coaching the students how to prevent the iPad from becoming a distraction. Some teachers explicitly instructed their students at the beginning of the year how to use the iPads in their class and what not to be doing on the iPads during class time. Often, teachers found themselves responding to student misbehavior, as it evolved through the year, especially from students who constantly found new ways to work around the system. One teacher commented that the iPads were quite distracting to her students on a daily basis, but on the day when they were working on a particularly engaging lesson, all of the students were engaged in the lesson and on task. She reflected that the more engaging lesson had eliminated the distraction of the device and allowed it to be a tool for learning.

There was also the issue of the management of the new device and the new applications. While some teachers found applications that worked well for their classroom goals, there were

some teachers still struggling to find acceptable applications that would complete instructional tasks. Managing both the teaching applications to utilize the iPad as a presentation tool and the learning applications to help students use the iPads for meaningful classroom work meant additional time spent researching and testing new applications. Along with this, the management of files became an issue for some teachers. These teachers and their students were struggling because there was not a predetermined way for one to save and send files. Some teachers found systems that worked for themselves, using cloud management systems, but there was not a universal system that was explained, purchased, or managed by the school IT staff.

Student projects. Many of the teachers told stories about the special projects that their students were able to complete this year because of the presence of iPads in the school. Some of these were short projects, which allowed for more interactive lessons using online sites with prepared educational activities. Some of these projects were larger and required the use of the iPad in multiple varied functions. One of the student projects was completed in a psychology class and the students were asked to violate social norms and gather evidence. Here the teacher explains this project and how the iPads were used:

> We did a social psychology experiment where [students] had to go out into public and violate norms. So they picked a norm and then consistently violated it in a controlled and consistent manner. They had to do that same behavior, that atypical behavior, in two different cities. And what they had to do was predict in advance which city would react a certain way more than the other. They had to design it themselves but one of the components of the project was that they had to get some kind of proof that they actually did it. So they went out and they did secret filming with the iPads, which was very exciting. Some of them were in an elevator doing strange things and their accomplice would be standing there with the iPad tucked under their arm on record and they would be recording people's reactions. The iPads were very good for this project.

Safety and loss. The administrators found themselves with a new challenge this year as their teaching of students and staff now required that they address the potential for the iPads to make their students targets of theft. The administrators worked with students to coach them on

how to manage the iPad outside of school, particularly at bus stops and in other public places. The administrators were satisfied with their coaching as there were no cases of their students being targeted during this first year.

Electronic administration of tests and quizzes. Some of the teachers used the iPads to allow students to take tests and quizzes electronically. These teachers commented on the ease with which they could design and deliver these assessments, because when they are presented electronically, the program shuffles questions and answers to prevent easy copying from one student to another. The assessment programs also corrected multiple choice answers and provided immediate feedback to students, which eliminated grading time for teachers. One teacher even noted that the assessment program was helping her to analyze the results of assessments to help her transform her teaching by using the student data to inform her instruction.

Teaching tools designed for the iPad to aid in a classroom. Some of the teachers mentioned specific applications or tools that were available on their iPads, which specifically helped in the administrative parts of teaching. One teacher used the iPad to take attendance and saved 2-3 minutes every day as compared to using his computer. Another teacher used the iPad to enter grades while walking around the classroom. Yet another used the iPad to monitor student activity in his classroom by viewing all of the student screens at once on his iPad to get a feel for the type of work the students were working on. Another teacher commented on the iPad and its calendar function as a replacement for student planners, which had previously been printed for each student. These are just some of the examples that were mentioned by teachers. In the interviews, many of the teachers were excited about continuing to find new ways to utilize the iPads in their classrooms to improve teaching and learning.

Research Question 1b. What is the influence of an iPad on the interactions among friends and colleagues? Quantitative survey items that related to Research Question 1B included: 8A, 8B and 8C. Qualitative survey items that related to Research Question 1B included: 8D. Qualitative interview questions that related to Research Question 1B included: 1, 3 and 7.

Quantitative data from the survey supporting RQ 1b. Research Question 1b asked, "What is the influence of an iPad on the interactions among friends and colleagues?" To answer this question, Table 2 displays the descriptive statistics for the survey items pertaining to the influence of an iPad on the interactions among friends and colleagues sorted by highest agreement. As before, these items were rated using a 5–point Likert scale (1 = *Strongly Agree* to 5 = *Strongly Disagree*). Highest agreement was for Item 8B, "I learned about good apps from friends (M = 1.51)" while least agreement was for Item 8C, "I use the iPad for social networking (M = 1.97)" (Table 2). Survey items 8A, 8B, and 8C were used to help answer this research question.

Qualitative survey results supporting RQ 1b. Research Question 1b asked, "What is the influence of an iPad on the interactions among friends and colleagues?" To answer this question, this section will summarize the main themes from the student's open-ended survey prompts pertaining to the influence of the iPad on their interactions among friends and colleagues sorted by frequency of response. The survey asked students how they learned about good apps, and many students reported on the survey that they learned about good apps from their friends.

Table 2

Survey Items Pertaining to the Influence of an iPad on the Interactions among Friends and Colleagues Sorted by Highest Agreement (N = 73)

Survey Item	*M*
8b. I learn about good apps from friends.	1.51
8a. I share information on good apps with friends.	1.62
8c. I use the iPad for social networking.	1.97

Note. Ratings based on 5-point metric: 1 = *Strongly Agree* to 5 = *Strongly Disagree*.

Moreover, the survey asked about their social networking usage and which sites they used for social networking. According to the survey, the students are using Facebook, Twitter, Tumblr, and other sites for social networking with their friends and peers. There was an indirect question about what students do in their free time on the iPad and 47 students mentioned social networking as a way that they chose to spend their free time on their iPads.

Interview data supporting RQ 1b. Research Question 1b asked, "What is the influence of an iPad on the interactions among friends and colleagues?" To answer this question, this section will summarize the main themes from the interview questions of teachers, administrators and staff pertaining to the influence of the iPad on their interactions among friends and colleagues sorted by frequency of response. As part of the culture at the school teachers share their successes with one another. So as the iPads became part of the toolkit for the teachers, it naturally became part of their discussions with one another. One of the new teachers mentioned her excitement at being able to share an app for the iPad via email and to celebrate her success in

the classroom with all of her colleagues. She was encouraged by her administrators to send out the email and to share great ideas and her successes with her colleagues. She said:

> it's actually one of the great things as a new teacher that I found really encouraging … was that anytime I had a success I could share with people and they would be happy about it and want to know more about it.

Since all teachers, regardless of years of teaching experience, were all new to learning about the iPads, there was a level playing field for new teachers. Another new teacher noted that she was particularly inclined to share about "the iPads, since they were such a new thing this year. Anytime we found something cool, we would want to share it just because no one else probably figured it out yet."

Along with the iPad being a new tool for all teachers, and leveling the playing field, it was also something in common as a potential conversation topic between all teachers. Even if the teachers were not using the iPads for instruction (e.g., they might only be using them for replying to email), the iPads were still a common tool that all of the teachers were trying to figure out how to use effectively. One teacher replied that he did not think his interactions had changed with his colleagues, but that he did talk with them about the iPad and how to use it in the classroom. One of the IT staff reiterated that sentiment about colleague interactions:

> To me I didn't see any difference. The only thing now was that they (the teachers) had something in common- using this iPad. So I just saw that interaction of them discussing their iPads- what apps they were using for their classrooms.

Another teacher commented that there was sharing of information between colleagues based on having a common device.

> I saw grade level teams sharing apps back and forth- things that they would use in the classroom. And every professional development we have, teachers would do a share out- we went around and teachers did a share out of apps that they use in the classroom. So there was a lot of collaboration across subjects.

According to the interviews, it was common (10/16) for the faculty and staff to volunteer examples of the good work of other teachers and to credit those who had helped them learn about the iPads. This showed that these discussions were happening among colleagues and as a result, the teachers were aware of how their colleagues were using the iPads in their classes.

The implementation of the iPads did spark some discussions about how to best use this tool appropriately in the classroom. The math teachers mentioned that they were frequently meeting with one another to discuss how to manage the iPads in the classroom, which accessories to buy, which apps were working best to accomplish their learning goals and they were teaching one another how to get the most out of the iPads. One of the math teachers commented "amongst the math teachers, we talked a lot about how to use them (the iPads) in class. We were all trying to find the best stylus, and then we talked about what programs, and what apps were good."

The administrators noted that along with the conversations of how to best use the iPads and the sharing of apps, there was also a "cool" factor associated with having iPads at the school. One administrator noted:

> in terms of staff culture- every time one of our staff members, sends an email his signature at the bottom says: from my School's iPad- Yes my school is that cool. So in terms of staff culture there was an element of wow- my school gave me this iPad to use in the classroom, and for me to do my emails and for whatever I need to use it for.

This administrator added that it was that level of trust that the teachers felt by being responsible for the iPad that might have contributed to positive feelings toward the implementation of iPads this year.

Research Question 1c. What is the influence of an iPad on the relationship between students and faculty? Quantitative survey items that related to Research Question 1C included: 7C, 9A, 9B, and 9C. Qualitative survey items that related to Research Question 1C included: 4

and 14. Qualitative interview questions that related to Research Question 1C included: 1, 4 and 7.

Quantitative data from the survey supporting RQ 1c. Research Question 1c asked, "What is the influence of an iPad on the relationship between students and faculty?" To answer this question, Table 3 displays the descriptive statistics for survey items pertaining to the influence an iPad on the relationship between students and faculty sorted by highest agreement. Highest agreement was for Item 7C, "My teachers like using the iPads in class ($M = 1.71$)" while least agreement was for Item 9B, "In class, students spend more time talking than the teachers do ($M = 2.82$)" (Table 3).

Table 3

Survey Items Pertaining to the Influence of an iPad on the Relationship between Students and Faculty Sorted by Highest Agreement (N = 73)

Survey Item	*M*
c. My teachers like using the iPads in class.	1.71
9c. My teacher understands how I want to learn.	1.95
9a. In class, my teachers spend more time talking than the students do.	2.55
9b. In class, the students spend more time talking than the teachers do.	2.82

Note. Ratings based on 5-point metric: 1 = *Strongly Agree* to 5 = *Strongly Disagree*.

Qualitative survey results supporting RQ 1c. Research Question 1c asked, "What is the influence of an iPad on the relationship between students and faculty?" To answer this question, this section will summarize the main themes from the student's open-ended survey prompts

pertaining to the influence of the iPad on the student's relationship with faculty sorted by frequency of response.

Students recognized the investment the school made in supplying iPads for the students and they made remarks such as "The fact that we got iPads from (our school)- no one gets iPads from their high school. That's crazy!" and "Thanks so much for letting us use iPads! And thank you, (a teacher at the school) and friends, for helping this dream of a more technologically advanced (school) come true."

Along with the appreciation for the opportunity to use iPads, the students were also aware of the trust placed in them. One student wrote, "I was given freedom to use an advanced piece of technology to do tasks that other high school students didn't have." Another responded, "I really am thankful that we were able to use the iPads all year long, they were very useful for projects and reading."

Interview data supporting RQ 1c. Research Question 1c asked, "What is the influence of an iPad on the relationship between students and faculty?" To answer this question, this section will summarize the main themes from the interview questions of teachers administrators and staff pertaining to the influence of the iPad on the faculty's relationship with students sorted by frequency of response.

The teachers, administrators and staff noted that the students were aware of the trust placed in them when they were issued the iPad for their usage. One administrator said "I think there was value in that the students were like "wow- you guys are going to trust us with this", and they did very, very well." And then the administrator added "So in terms of school culture it was really good because it made the kids feel like we saw them as trustworthy."

The students were also appreciative of the work that teachers were doing to incorporate iPads into the classroom. They were grateful for the effort that went into making videos for the personalization of their learning. One teacher reported on the feedback he had gotten from students about the videos he created and he said,

> their response was "thank you for doing that" and "this was cool." It's not everybody, but anytime somebody can get something from that- gleans something, learns something more- or feel better about what they know- then that's a good thing. Sometimes it did take time if I was doing a whole test and writing the answers to all the questions but then it might be two or three questions that helped somebody out. Otherwise (if they didn't have the videos) they would get home not knowing how to answer that or they would have to wait to the next day. A lot of times, I don't think they would have gotten their question answered in a timely manner. This helped them solve things that probably would have taken longer for them to solve.

The extra effort that teachers were investing in making videos to have the learning accessible to students also had the added benefit of showing the student a part of the teacher's home life. One teacher was at home making videos for his class and his son was in the background. "Sometimes they got to hear my little children at home and they were like "Oh your kid is so funny"!" The next day, the students would ask the teacher who was in the background or comment on the funny things the child said. This surprised the teacher and then he also had determined that the students were really paying attention and listening because those interruptions were at the end of the video. Those snippets of life became an added topic of conversation for the teacher and his students.

Just as the iPad added a conversation topic among teachers, the iPad also functioned as a commonality and conversation topic between students and teachers. One teacher remarked that, because of the iPads,

> there was always something that they (the students) could reference that I'll be able to understand, because I also had an iPad. So they would talk about things on their iPads and iPhones and I'm an android-PC-person, but because of the iPad, I had a little bit more of an understanding of the Mac world, which most of my students know.

Another teacher remarked that she always knew that if she had difficulties with the technology, she was able to go to the students in her class and ask them for help.

The use of new technology in the classroom meant that both teachers and students were learning how to use the new device. One teacher noted a change in the culture of the class with the use of iPads.

> I think there was definitely a change in the culture of the class. With the videos I've made more of a connection, I've made a personal connection with the students. Because the students say "he's going to spend time outside and actually make these videos." I was surprised, they actually think that? It's like planning. We are all planning on the outside, but you know- they don't see it. All of a sudden they see this video, and it's like 6, 7, 8 minutes long sometimes- and they know I spent that time creating this for them. But of course there are a bunch who are like - go ahead, make a video for me... but I think there was a good number (of students), who know it's not easy. So I think they appreciated that.

Because all of the senior students had access to iPads for the school year, they were able to communicate electronically with the teachers more easily. As one teacher noted,

> I think that it gave them an easier way to communicate with me. If a student missed work, or if they were absent one day and they wanted to get in touch with me they could email me. I've had a lot more student email this year, so I think that it's really good how it helps us keep in touch.

Teachers also noted that they used their school issued iPads for email and chatting with students over a wide platform of tools to answer questions outside the school day. The students and teachers "were able to communicate through email, iChat, even Facebook using the iPad…so it made it easier for them to have that constant contact with their teacher."

In addition to traditional modes of communication, organizing the course content on a cloud-based program enhanced the methods of communication between teachers and students. Along with the implementation of iPads, the school also started using a cloud-based program called MyBigCampus, where teachers could organize the content of their courses.

> It (the iPad) was a really good way of keeping in communication with your teachers and keeping up to date in the classroom. So even if a student was out absent, he knew that he could go to MyBigCampus and follow what was going on in the classroom even though he wasn't there.

So the iPad provided accessibility to the course content which was available and organized on the MyBigCampus cloud. This served as an added benefit for students who were absent from class and those were present but who wanted to review and reference a previous lecture to review their notes.

Finally, the iPads influenced the relationships between teachers and students in the classroom as the material available to the teacher changed. As the teachers began using the iPads, they were able to find more online resources to share with students and to let students share in the research. One teacher commented:

> I think it allows me to give them a lot more independent and fun assignments where they can look things up in class using their iPads instead of me having to always provide the reading. The iPads gave them access to so much stuff that I could use in the classroom so I think it made my classrooms more interesting and it took a lot of the work off of me because I could use online resources that were already prepared. Yes, I do think it was very valuable.

Research Question 1d. How do the participants assess their training for using iPads? Quantitative survey items that related to Research Question 1D included: 1B. Qualitative survey items that related to Research Question 1D included: 10, 11 and 14. Qualitative interview questions that related to Research Question 1D included: 1, 5 and 7.

Quantitative data from the survey supporting RQ 1d. Research Question 1d asked, "How do the participants assess their training for using iPads?" To answer this question, Table 4 displays the survey item pertaining to the participant's assessment of their training for using iPads. The sole item was Item 1B, "The training I got on the iPad was suitable to get started (M = 1.90)" (Table 4).

Table 4

Survey Item Pertaining to the Participant's Assessment of their Training for using iPads (N = 73)

Survey Item	*M*
1b. The training I got on the iPad was suitable to get started.	1.90

Note. Ratings based on 5-point metric: 1 = *Strongly Agree* to 5 = *Strongly Disagree*.

Description of the student training. The students were given training on the iPads as part of their advisory. One of the counselors described the student training like this:

> Every student has an advisor here on campus. Every teacher is set up with an advisory of about 20 students and they meet three times a week and we have themes. For the first five weeks of school we do a lesson on your digital footprint and it goes through cyber security, cyber bullying, so we kind of prep and talk about things like that before they can happen and anticipate the pros and the cons. It is a discussion and we play a PowerPoint and so every student across the school has seen the same lesson in that day.

Qualitative survey results supporting RQ 1d. Research Question 1d asked, "How do the participants assess their training for using iPads?" To answer this question, this section will summarize the main themes from the student's open-ended survey prompts pertaining to their assessment of their training for using iPads sorted by frequency of response. On the electronic survey, the students were asked, to describe their training for the use of iPad. 32 responses indicated a positive response to the prompt "When I got the iPad, the best part of the training was…" and the responses from students included: "taking pictures", "learning how to use certain apps", "I already know how to use an iPad", and "learning how to restart the iPad when it froze on me". 16 responses indicated that there was a lack of training with comments such as "what training?" or "I don't remember getting training". There was one negative comment about the training, which was "I didn't like the training".

Students were also asked in the survey what they wish someone had included in their training for the use of iPads. Most students responded with questions about the apps available to them on the iPad. They wanted to know "How to use each app," "shortcuts and useful apps," "which apps are the best apps," "what apps are helpful in school learning," "how to use the preloaded apps," and "what document apps do I need to download first". The next most common suggestion for what to include in training was to instruct students on how to complete tasks that have been traditionally done on computers, such as how to make movies and PowerPoints on the iPad. The student's responses on the survey included items such as the following: "making movies on the iPad," "references and PowerPoint," and "PowerPoints". There were a few students who asked for "more tutorials" and for more time learning how to use the iPad with "more time to try it and ask questions". Lastly, there was a group of students who said that training would not be necessary. One student stated, "Your friends, teachers, or the Internet can clear up anything you don't know."

Interview data supporting RQ 1d. Research Question 1d asked, "How do the participants assess their training for using iPads?" To answer this question, this section will summarize the main themes from the interview questions of teachers, administrators and staff pertaining to their assessment of their training for using iPads sorted by frequency of response beginning with a description of the training.

Description of the teacher training. One teacher described the training received by teachers with the following description:

> We had a staff day last spring when we were all handed our iPads and we were all given a task over the summer. Our goal was to find our favorite apps for the classroom and be prepared to report back at the start of school. I already had an iPad at home, so I already knew how to kind of play around with it. But it was mostly just gathering in our groups and finding some things that would work and be able to implement those things into the classrooms.

When the teachers reported back to school in the fall, there was a sharing day on each campus where each teacher presented their app and described how it could be used in the classroom. , Most teachers reflected on this app-sharing day as a significant experience in their training. Most of the teachers reported a positive experience related to their training; however, some reported that they were lacking training and there was one negative comment related to the training.

Positive reflections on the training. One of the teachers commented,

> I think the best way to learn is to play and I think that's also Apple's philosophy; they don't give you a lot of instructions and so they just said we want you to play, we want you to download apps and we want you to come back for our professional development week when summer is over and have an app that you want to share and teach out to the staff so that was our summer assignment, it was to, just to get to know it and see how we could use it in the classroom and that's what we did.

Another teacher added, "It was nice in the sense that you got to see other apps and I think I ended up using a few of those apps. But we didn't get to practice it or walk through the app." Most teachers agreed with these sentiments and one teacher added,

> I think that our staff is so young and tech savvy that we didn't really need a whole lot of education, because we all have iPhones and smart phones. I don't think that we needed any more [training] than we got. It was perfect amount of time to play around with them and get creative without overwhelming us with explanations like "this is what you must use them for."

One of the teachers stated in the interview that he was part of the iPad team helping to bring the iPads onto campus and the initial plan was to have training, but partially due to a small budget and "another element of that was that our admin team really trusted us as a staff that we are capable, intelligent people that are going to figure out ways to use (the iPad)." He continued in his reflection of that decision to add, "so I feel like it was actually good that we didn't do a

training and we were just forced to kind of run on our own because we all figured out how to use it."

One of the administrators shared their view of professional development, which confirmed what the teacher above had stated about the administrators' belief in the staff at the schools.

> It's our philosophy on PD [Professional Development]. We have really smart people. The people on our staff are really smart and hard-working and talented. And basically, if you can get them to share what they do or what they think is good with other people, that's how the greatness spreads.

Another one of the teachers commented on the excitement from attending trainings, but the difficulty of applying those new skills when she returned to her classroom. She said,

> I've been to trainings before, and I felt like I walked out of them really excited to use whatever it was that they were showing us and I never followed through on it. I'm pretty good at following through on things I hear, but I'm not sure if that's the best way to give that kind of training to teachers.

These schools have a lot of professional development as compared to the average school and they see training for the iPad as more of a continuous series than a single event. One of the administrators described how sharing the best practices of integrating iPads into the classroom became part of the professional development time throughout the school year.

> We would have best practices share outs in weekly staff meetings. So if I saw a teacher using some cool app in class, then they would share it on Friday and then everyone picks up on it. It's not like we are going to wait until summer and then have a three day training on the iPad, it's ongoing because all of them are constantly looking and finding new and cool ways to use it.

The sharing of best practices was not limited to organized meetings; as one teacher described, "I think it kind of happened organically, we will sit at lunch and talk about stuff." Some teachers felt that they received good training from their colleagues as they needed to know

new information. One teacher commented that he learned about the iPads by talking within his department and each person taught him something different to apply in his class.

> So [a colleague in the same department] trained me on how to use the iPad to create the videos and how to post them and I would see [another colleague] use them in class to show lecture material.

One teacher learned from a neighboring teacher how to set up quizzes and tests to administer on the iPad:

> He showed me how it works and then after that it was pretty easy. I ended up doing all of my multiple-choice tests on (the iPad) after that. I did other tests and assessments using other formats but for multiple-choice quizzes and tests, it was all online after that.

As an interviewer, it was interesting to hear teachers relate stories of learning throughout the year from their colleagues on campus. It was interesting because there were a few teachers that were identified as the "go-to" folks on each campus, but it was more interesting that the teachers were relating stories of learning from not only those folks, but also their colleagues who did not have the reputation of being tech savvy.

Throughout the school year, the use of iPads continued to develop with some teachers "And it's our environment here, isn't how my environment was at my other school. Here we are always doing professional development; we are always trying new things or talking about what we are doing. So it is almost like, I don't know when I started to use the iPads all the time. Because it was slowly becoming a part of the class and then bam it was that we needed to charge them because we were using it the entire period."

Negative report on training. There was only one teacher who had a negative report of the training and stated "I came out of this year with the awareness that dumping 20 iPads in a classroom can be detrimental." This teacher was a first year teacher on campus, and expressed a desire for direct instruction on the management and implementation of iPads in the classroom.

This teacher was frustrated by the student's off-task behavior and the resulting demands on the teacher to manage and discipline students around the use of the iPads.

Suggestions for future teacher training. The suggestions from teachers, administrators and staff varied from not needing training, maybe getting some suggestions or examples provided by experienced teachers, and desiring formal training on multiple topics from management to pedagogical application.

The most prevalent reaction and most common first response to a question on what would be desired for future training was that training on the iPad was unnecessary. When the researcher asked if it would be important to have pedagogical training of how to incorporate an iPad in the classroom for improved learning, one teacher responded:

> I did in the beginning. But then I feel like a lot of us figured it out, and then just shared what we were doing with each other. That would be helpful for me- I would like to hear from the other teachers that are on campus what they're doing. I think there were enough resources online and blogs and whatnot- we could look it up. We sought out ways to use in our classroom.

Another teacher replied, "They're pretty intuitive so it was really like if you ever used an iPhone before or any of those kinds of devices, I think it was pretty easy for most of us to figure out." Yet another teacher brought up the culture of these schools where sharing best practices is a common occurrence.

> [Formal training] might be necessary at other schools, but I don't know about here. I feel like for here, it kind of just happens and for us, we like to share things that we are doing with each other. I would really appreciate a day where each of us sat down in groups and shared the way we were using our iPads because I feel like I could learn a lot from that, and I would implement the things that other people are telling me about but I don't know about.

While many of the teachers, staff and administrators responded that training would be unnecessary, there was a thoughtful response from a teacher in an interview where she reflected on her previous statement that training would be unnecessary and she added:

> I don't think you need training, but I wonder maybe if there is stuff that I don't know about, that I missed out on by not realizing about it. But I don't think you need training, [the iPads] are pretty self-explanatory. I always found that if I needed to do something, anything computer related, if I need help, the kids always know what to do. So, yea, no training necessary But I think you could provide a list of ideas, and potential ways to implement rules or administer the usage of them... I think a list of suggested things that work that are successful for other teachers, I think that would be useful.

This idea of providing suggestions for the use, management and integration of the iPads, or best practices by their colleagues was echoed by a number of other teachers. It was emphasized by a number of individuals that it was essential to get this information from a teacher who was actually using iPads in the classroom, and preferably from one of the teachers at their schools.

> I think if we get more professional training we should have someone like XXX (one of our teachers) show what he is doing in his classroom. I think the teachers would get a better sense of what you can do- the potential of the iPad.

One teacher proposed that if there was to be training for the use of iPads, not only should it come from the other teachers here at the school but it should be in this format: "we could have stations and everybody could have an area and people could walk to what they want. We would all pick up at least one thing."

Then there were teachers who desired more standardization of the training, use and implementation of iPads. From one teacher who taught students of multiple grade levels, she commented that she found it difficult to make plans and set ground rules because there was not a consistent presence or absence of iPads in her classroom. She would like to:

> set ground rules. I think that would be a lot easier to do if everybody had one (an iPad). My classes were mixed (grade levels) and part of the students had iPads and then part of them didn't. For next year, I will definitely have norms set, just so there is not that ambiguity of management with having a mixed group in the class.

The issue of classroom norms vs. school wide norms came up in another interview. One teacher noted the lack of classroom norms to guide the use of iPads in the classroom and suggested that establishing a working set of rules at the beginning of the year would be helpful.

> Next year I'm going to be a lot stricter about how and when the iPads can be used. Because this year I didn't have a policy that I established at the beginning and I think some of them wanted to write notes on their iPad. So I would let them, but then you don't know if they are writing notes or reading something else. So I think next year I will not let them write notes on the iPad. They will have to have them away unless we are actually using them because I feel like kids would often be off playing on their iPads. Literally playing games and things rather than paying attention to the class. So in that sense you know the iPads were a distraction, but I think the overall benefit of having them way outweighs any time that they lost by not paying attention.

And she continued to add that having school wide norms might be too rigid and not allow for teacher flexibility and differing styles. She would like to have a list of suggested norms provided at the school level, which then each teacher could adopt at their discretion. This sentiment was echoed by a number of teachers that they did not desire a set of school wide norms or expectations on the use and management of the iPads because it could damper the creativity and individuality of the teachers. While they did desire suggestions, they wanted to decide what to implement for their own classroom.

Then there was a group of teachers who did want more standardization in the apps that would be used, in the school wide management of the iPads and in their training for the implementation of iPads as well as a common training for the students. One teacher noted that the training should have direct application to use in the classroom along with a standardized set of apps that would be preloaded onto the device.

> I think that when you give us iPads, you should have a series of projects, like deliverables, or formative things that you're going to be able to do with them and they should already have the applications on there. And I hate saying we should all be using the same applications. But to teach a kid how to use an application or for a kid to have that learning curve for how to use that app, unless they're using it consistently across all their classes, then it falls on the teachers to now be teaching technology and not the

> content. Even though the technology is going to help them get the content, but it's like now we're doing two things at once, and you don't really have enough time to do the first thing.

Another mention of the desire for standardization came from the IT department: "That is something that we have been constantly petitioning for- standardization of technology. We have a lot of different things that we offer the teachers and the kids, and because we're busy with other things, we can't specifically go there and tell them, these are our recommendations on how to use this stuff. We can only just tell them here this is available." The IT department is hoping for a tech mentor who can help teachers integrate the technology into their classes in pedagogically appropriate ways. This tech mentor could support teachers because they would actually understand what is happening in the classroom.

One of the teachers added that if there was more training, it was likely that the adoption of the iPad would be greater "I think if we end up pushing that (the training) a little more, I think the adoption of the iPad into the classroom would be greater." As an example, a different teacher noted that he had high hopes for his ability to integrate the iPad but without training, and knowing which apps to use, he ended up only using it for taking attendance each day.

> But maybe if we had some type of training with the iPad that was like … here's some really awesome apps that are out there that you can use with the iPad or if it was somehow integrated more into our professional developments, I'm sure I would have found more ways to use my iPad other than just taking roll. But I'm optimistic about next year and how I'm going to use them the next year.

Potential new section on training for students. Regarding training for students, one teacher noted the constant problem of new teachers in that they are often one step ahead of the students

> See, the thing as a new teacher is you often, problem solve as problems arise, so I would say, "Go on the Internet and research this." And then as I walked around and I would tell

the class, "You should also not be on Facebook. You should also not be taking selfies, you should probably not be then Instagramming or snapchatting those selfies."

Research Question 1e. What changes/improvements should be made to the iPad and its accessories? There were no quantitative survey items that related to Research Question 1E. Qualitative survey items that related to Research Question 1E included: 4, 12, 13 and 14. Qualitative interview questions that related to Research Question 1E included: 1, 6 and 7.

Quantitative data from the survey supporting RQ 1e. There were no quantitative questions in survey that addressed this research question.

Qualitative survey results supporting RQ 1e. Research Question 1e asked, "What changes/improvements should be made to the iPad and its accessories?" To answer this question, this section will summarize the main themes from the student's open-ended survey prompts pertaining to their suggestions for changes and/or improvements that should be made to the iPad and its accessories sorted by frequency of response. To display the responses to this question, Table 5 displays the themes represented by the survey participants in open-ended questions.

Table 5

Survey Comments Pertaining to the Participant's General Suggested Changes to the iPads (N = 73)

Survey Comment	*n*
I wish we used them more in class	9
I wish it ran Adobe Flash	4
I wish students could print directly from their iPads	4
I wish it was easier to type	3
I wish it had a USB port	2
I wish it had Siri	2
I wish spell check worked better	1
I wish I could access documents more easily	1

(continued)

Survey Comment	*n*
I wish we could take more tests on the iPads	1
I wish it was easier to do file conversion	1
I wish it had better resolution	1
I wish it was solar powered	1
I wish it had the swipe function on the keyboard	1
I wish it could format documents	1
I wish it could have internet access everywhere	1
I wish it had a longer charging cord	1
I wish the iPad had a CD ROM, but then it wouldn't be an iPad it would be a MacBook	1

Note. These are the responses from student open-ended survey prompts.

To display the responses to this question, Table 6 displays the themes represented by the survey participants in open-ended questions that were categorized as pertaining to the Apps that function on the iPad.

Table 6

Survey Comments Pertaining to the Participant's Suggested Changes to iPads Apps (N = 73)

Survey Comment	*n*
I wish there was a better app for Office	3
I wish it had an app for Microsoft Word	2
I wish students could take notes in an app	2
I wish there was a better app for MyBigCampus and Edmoto	2
I wish the iPads had more helpful apps for education	1
I wish there was a version of Photoshop or Adobe Illustrator for the iPad	1

Note. These are the responses from student open-ended survey prompts.

To display the responses to this question, Table 7 displays the themes represented by the survey participants in open-ended questions pertaining to their desired accessories to use with the iPad.

Table 7

Survey Comments Pertaining to the Participant's Desired Accessories for the iPads (N = 73)

Survey Comment	*n*
I would have liked to have had a keyboard	9
I would have liked to have had a stylus	4
I would have liked a stand to position it in every direction	1
I wish it had an attached keyboard case	1
I wish it had a keyboard that could attach and detach	1
I wish it had earphones	1

Note. These are the responses from student open-ended survey prompts.

Interview data supporting RQ 1e. Research Question 1e asked, "What changes/improvements should be made to the iPad and its accessories?" To answer this question, this section will summarize the main themes from the interview questions of teachers, administrators and staff pertaining to their suggestions for changes and/or improvements that should be made to the iPad and its accessories sorted by frequency of response. The teachers, administrators and staff also had some suggestions about potential changes to the iPad and its accessories.

Changes to the iPad accessories. The most common request in accessories for the iPad was for charging stations (10 times). It seemed that there was a need for charging in both the senior classes, which were 1-1, and in the other classes, which were using a class set of iPads for many classes of students through the day. One problem that was mentioned was that the few chargers they had seemed to disappear or break. One teacher summarized the problem with the chargers in a classroom environment:

> I think one of the issues was those cables can come disconnected from the actual adapter and the students use those cables for their own chargers, so they just walk into my room and take a cable and then go and charge their phone and forget to bring them back. So it would be nice to have a charging station where they wouldn't have access to those cables.

Then there was also a problem getting the adapters to fit into a power strip for charging in one central area. Because of the size of the adapters, the students would have to spread out around the room using all of the available plugs in order to charge their devices. Here is a description of a desired charging station from a teacher who was managing a class set of iPads:

> a nice 35 unit charging station that actually was organized where I just stuck them all- stacked them straight up and down- and that was designed with school in mind. But it can't just be for a case-less iPad, so the cases have to be coordinated to the charging station.

In addition to the requests for a charging station, some teachers (2) also requested carts designed for organizing and tracking the iPads. Ideally, as it was described by that last teacher, the charging station and the cart could be the same accessory.

After teachers, staff and administrators had considered the management issues within the classroom, they were concerned with the productivity and learning of their students. There were three teachers who mentioned that they desired keyboards for kids to aid in typing on an iPad, but there was one teacher who specifically said that he didn't want keyboards for kids in his class because they were simply too bulky. One teacher requested a stylus for each of her students so that they could draw prototypes directly into their iPads rather than scanning them in at a later date. One teacher mentioned that he hoped that all students would have headphones because he tried a lesson where students were listening to podcasts in his classroom and it was distracting without headphones for each student. Each of these requests can be personalized to each classroom by purchasing either school sets that teachers could check out, or by purchasing class sets of the desired accessories.

Changes to iPad apps. As seen above, there was a request by teachers and students for better apps geared toward education and I think this teacher summarized the problem,

> it's not that there aren't education apps, but they are designed too generally (for elementary school) and it all depends on the grade level. In the elementary school there are apps that actually were able to help the students because they are doing more of a general study. Now when we got into the high school it was harder to find apps that fit for that specific curriculum. Take for instance, we have a program about using engineering software, and it was harder for the teachers to use an iPad effectively in that class because there are not that many engineering apps out there that are friendly for students in a high school level.

Another teacher provided an example of an app that would be useful at the high school level:

> What I would really love as a teacher who works inside of a classroom that was not designed for a science teacher, because it's designed as an elementary school, I would really love to be able to see animated labs and experiments. Especially those that would allow you to adjust variables, and can include human error, and show- here are all the things that can go wrong, why do you think they went wrong? Or here is what happened, why do you think this happened?

This teacher was looking for the iPad apps to provide experiences for great learning about the nature of science concepts in her classroom that were lacking because of insufficient laboratory materials. This would be a great app in many older classrooms in the US as well as overseas.

Desired functionality and suggested changes to the iPads. The first problem mentioned by the teachers, administrators and staff was the issue of battery life. Because students are using the iPads in their classes, the battery power gets depleted and they need to charge the device in the middle of the day. As discussed earlier, some of the teachers suggested charging stations to be made available to recharge the devices.

The next most common issue was the lack of traditional functional applications like Microsoft Office including Word and PowerPoint. Said one teacher, "I feel like we've tried a lot

of them (the substitutes), and none of them really work best." Then another teacher was also stressing the need for these programs, or something better and she commented,

> It needs PowerPoint. Let's see here, I think it needs a way for the students to perform in the normal ways in which students present things. It either needs those things (Microsoft Word and PowerPoint), or it needs something better. Because I feel that's a very PC way of thinking, when I thought, "I already have PowerPoint, let's make an iPad that works with PowerPoint." But this is not necessarily necessary. If they make something better, we can use that something better.

The other concern about functioning with programs was that the programs don't seem to be designed by teachers in a classroom. For the classroom management programs, there are some parts that work well, but then other things that are very poorly designed. There was a concern that classroom teachers should be providing input into how these programs work for the best functionality in a classroom. This concern was echoed as a number of teachers suggested in their interviews that the apps available in the app store are too general for high school use.

Along this line of functional programs and the operating of the device, there were a few teachers who mentioned the desire to run two or more things at the same time. One teacher wanted a split screen where he could run monitoring of the student iPads on part of the screen and continue with his presenting on the top of the screen. Another teacher mentioned the desire to have windows running different programs or applications at the same time.

The next most common concern after finding functional programs is how to save and share that information. There is a limited amount of storage on the device. Therefore cloud-based storage is necessary for saving work from the iPad and then accessing it on other devices. There should be a set way for kids to access documents and save and send to teachers

> The problem is that kids are still emailing themselves stuff- its like that's their way of saving something. So they do work in a document or a PowerPoint or a spreadsheet or whatever and then they email it to themselves and it's just a mess because they don't know where things are and it's hard finding it.

The management by teachers trying to establish workarounds by having students email classwork to themselves to finish at home was challenging. The hope of the teachers, administrators and staff is that there will be an easy way for students to manage the saving and sharing of their work.

When the iPads were being considered for the school, one of the hopes of the teachers, administrators and staff was that the iPads could be used to access textbooks in electronic format. One of the problems that was encountered was that the "JAVA applets in our eTextbook won't run on the iPad." Another problem that was encountered in the classroom is that the iPad doesn't play Flash. One teacher noted that the lack of Flash compatibility "was annoying because there are sites that are interactive, but the kids couldn't use them."

Then there were two things that were mentioned that do not fit into any other categories. First, the administrators and IT staff mentioned the difficulties of attempting to track devices that were lost or potentially stolen. When they attempted to locate the devices, the GPS indicated that it was over 30 miles away when the device was actually sitting in a classroom down the hall. They then tested this with known locations of iPads and found a similar problem in using GPS to locate devices.

The next thing that was requested was based on the difficulty of typing on a touch screen with no physical indicators of where they keys are located. This teacher has purchased a phone with a distinct keyboard because of this preference and while a simple workaround would be to purchase a keyboard, the teacher requested, "bumps or sensations on the touch screen to give you the home keyboard positions."

Summary of Themes from the Research

The previous sections have addressed the data separately by qualitative and quantitative strands as they pertain to each subquestion of the research question. In order to address the overarching question, "how are iPads influencing the academic learning environment" there are 5 themes that have emerged from the data. The themes are: hardware, software/apps, training, use in class, maintenance and pedagogy. These themes will be introduced in this chapter and then expanded upon and correlated to the literature in Chapter 5.

Hardware. The selection of the iPad was intentional at these schools as the Apple company has a reputation for working in education. The selection of this device was also intentional as there is a "cool factor" associated with the iPad from its emergence on the market. The two main issues that pertain to hardware from the data were the presence of a keyboard and the battery life of the device. The desire for a physical keyboard was desired by some and specifically not desired by others. There was a mention of wanting a case with an attached keyboard, which can be purchased, and a mention of a detachable keyboard, which can also be purchased. The size and portability of the iPad seemed appropriate to the users. The battery life was the other issue that was mentioned in the survey and interviews. While most participants could manage a full school day with a fully charged device, there was a need to charge devices if they were being used heavily in all classes. Increasing the battery life of the device would be desirable. These two hardware issues were concerns, but they were not severely limiting the productivity of the participants.

Software and apps. The iPads run apps and for consistency, the participants desired to have the same apps running on their iPads as they use on their other computing devices. All of the participants desired the MS Office suite including Word, PowerPoint and Excel so that they

could create and format documents and seamlessly transfer the work between devices. These participants also requested Flash and JAVA to make the iPads more useful in the school setting. The electronic textbooks and some of the web resources that were being utilized to support learning in the school run Flash and JAVA and are not visible on the iPad.

After these top two concerns, there were concerns that the apps available in the Apple App store are not appropriate for high school and difficult to find good apps. The first concern is that that the apps are too general for High School use and more appropriate for a younger audience. The second concern was that participants mentioned a desire for getting to the best apps without having to sort through all of the apps that are for a different age level or are poorly designed. Eventually, as more apps are written and as more apps are tested and reviewed in the App Store, these two issues may resolve themselves.

Training. All types of participants said that the iPad was intuitive and did not require training on the basic use of the device. After that statement, however, the participants varied along the spectrum of desiring explicit training for applying it in the classroom, to wanting some suggestions for applications of use in the classroom, to not wanting any training, as they would figure it out for themselves. Based on these varied responses and the suggestions of the participants themselves, a desired course of action would be to provide optional courses from their own teachers and students on an as-needed basis.

Use in class. The students responded that they appreciated the effort that teachers were making to integrate the iPads and wanted more integration into all of their classroom activities. While there were some classes where the iPad was used frequently, there were others where they saw potential for more use. The teachers at these schools were already using project-based learning, and a student-centered learning environment, some teachers found that iPad usage in

class helped them to created a flipped classroom and helped them to make their jobs easier through the presenting tools, learning apps, online testing and ease of access to quick research in the classroom. Both students and teachers suggested having a predetermined and supported word processing program and file management system.

Maintenance of the iPad. The administrators rolled out the iPads this year with a suggestion from another school to have the students purchase their own covers. The administrators, the teachers and the IT staff all commented on the ease of use, ease of rollout, and lack of major problems with the devices on campus. They also noted that the students took care of their devices for the year and the decision to have them purchase their own covers seemed to have an effect on the student feeling of ownership of the device. The IT staff noted that the amount of damage to devices was similar to all of the other devices on campus (~10% breakage).

Summary

The findings from this research show the emergence of five themes which relate to the implementation of iPads in an academic learning environment: the selection of hardware, the software and apps available for the device, the training, how the device is used in class and the maintenance of the device. These themes will be discussed in further detail and related to the literature in Chapter 5.

Chapter 5: Conclusions and Suggestions for Further Research

Introduction

The purpose of this case study was to examine the implementation of the iPad as an instructional tool through the experiences of the participants using it. The goal of this research was to generate a detailed case description and to identify and define those variables that are deemed most important by the participants in the study in order to narrow the focus of future research on the implementation of tablets in a secondary school setting.

Chapter 5 compares what was found in the interviews, surveys and observations to the literature, draws conclusions and implications and makes a series of recommendations. This chapter also presents the findings from this research alongside the literature, and is organized by the research questions used to conduct this research.

In order to investigate the experience of the participants' use of iPads in two charter schools in Southern California, the following global research question was used to guide the research study:

How are iPads influencing the academic learning environment?

The sub-questions that support this central question are:

a) How does the experience of teaching and/or learning change with the use of an iPad?

b) What is the influence of an iPad on the interactions among friends and colleagues?

c) What is the influence of an iPad on the relationship between students and faculty?

d) How do the participants assess their training for using iPads?

e) What changes/improvements should be made to the iPad and its accessories?

Brief Restatement of the Findings

Fully discussed in detail in Chapter 4, the findings from the analysis of the qualitative and quantitative data are summarized here. The key findings from Chapter 4 include three aspects of the implementation of iPads: the culture of the schools, the preparation in advance of the iPad rollout, and the usage of the devices in the classroom.

The culture of the schools. The two charter secondary schools that were studied in this research are places where the entire population is focused on trailblazing in education. It seems as though the students, teachers, staff and administrators have all signed a pact that they will work together creatively to create an effective and engaging learning environment. The students are not the only ones learning on campus. The teachers, staff and administrators are constantly exploring ways to continually improve on their educational performance. What surprised the researcher in the interviews and surveys of these participants was the level of trust in and respect for one another. The administrators spoke highly of the teachers and staff and trusted them to be high performing professionals, so they do not see a need for outside providers of professional development to teach them how to use the devices. The administrators expected that the teachers would think creatively, be resourceful, and develop appropriate applications of the iPads and, then, that they would share their experiences with one another. The teachers had great respect for the administrators and they recognized that they were entrusted to do this job without micromanagement. These teachers then placed high expectations on their students by allowing them the freedom to play around with the iPads, to a certain extent, with the understanding that the students would then contribute to the discussion of how to integrate the iPads into their learning environment. The students recognized the trust that was placed in them when they were given these expensive devices, and they took their responsibility seriously. Students were

responsible with their devices, they offered suggestions and encouragement to their teachers, and they worked together with their instructors to overcome any technological glitches. The trust and respect of the participants in this study created a culture where it was acceptable to experiment and try new methods, where it was looked upon highly to help one another, and where everyone was focused on improved learning with these devices.

The culture at these two schools also provided a rich environment for learning how to use the iPads. The participants were not stopped by first order challenges, such as learning new skills and addressing problems, and they worked together to overcome these technology glitches. They also found ways to work around the discipline, management and usage issues that frequently occur with new device implementations. Also, because of their culture of sharing best practices frequently with one another, they were continually learning new ways of being successful with the iPads as they became more comfortable with the devices. Finally, this community of practice helped to strengthen the culture of the school by allowing everyone involved to share their successes and failures with one another. From these honest conversations, growth occurred, and the participants seemed to become even more strongly tied to these schools and to one another.

Preparation for the rollout. In preparation for the rollout of the iPads in the fall of 2012, the teachers were issued iPads in the spring of 2012. Their instructions were "to play around with" the devices over the summer and to find an app that would be worthy of sharing with their colleagues when they returned to school in the fall. This play time was valuable to the teachers as it allowed them unstructured time to investigate their own interests at their own pace. When the teachers returned to school in the fall, they shared their apps with their colleagues, and how these apps could be used in the classroom. This sharing day was the first of a continual reporting of best practices. These schools have professional development meetings weekly and sharing their

iPad successes became a routine part of these meetings. It was suggested by some of the teachers, that during this early phase of experimenting, it might be helpful to have a challenge to use the iPad in a creative way during the first month of school and then to share these experiences with one another. The suggestion came from a teacher who was felt that if he had been required to apply the iPad in a new and creative way and share it with his colleagues within the first six weeks of school, he would have had an urgency to incorporate the iPads early in the school year.

In addition to having play time and sharing best practices with one another, it was suggested by students, teachers, staff and administrators that in preparation for these devices, it would be beneficial to select some productivity apps and a file management system that would be functional and supported. Having this organizational plan in place would take some of the trial and error out of the early stages of implementation. All parties added that they did not want to be limited by being allowed to use only one option, but they would like a common starting point.

The first consideration in preparation for the rollout of new devices is to consider the hardware that will be purchased. In this case, the iPad was selected approximately 1 year before the rollout. The most important consideration was to identify a device that is durable, functional and has functional systems. It was noted by the IT professionals at the schools that this was the easiest rollout and management of any device they had ever managed. It is also important for the device to have functional systems (wifi, charging, covers and keyboards if necessary) so that the device can be used to its fullest potential.

Usage of the device in the classroom. There were three primary findings on the use of the iPads in the classroom: first, the importance of student-centered pedagogy of the classroom; second, the desire for more use; and third, the potential green benefits of using a digital device.

The pedagogy of the schools did not change to a more constructivist learning style because they had already been operating in such an environment. The schools in this study were already committed to learning in a way that is project-based, before the implementation of iPads. Because of this, there was little change in the pedagogy of the classroom, but there was a continued emphasis on project-based learning, now utilizing the iPads to support that learning. There was some "flipping" of the classroom instruction for those teachers who tried this method. These teachers found that the iPad allowed them to easily record their instructions and explanations, and that having the videos available to students on a website made their job easier and made them feel more effective.

Because of the student-centered nature of these schools, the students were an important voice in the study. The students appreciated the opportunity to use the iPads, and recognized the efforts that their teachers were making. While they were grateful for their teacher's efforts, they longed for more frequency and more authentic uses of the devices. The students were not alone in their desire for more use of the iPads. The teachers were also longing for more ideas of ways to use the iPads in their classes. While they did not want to be instructed on the many possible applications because in their words, "those methods are not effective at initiating new behaviors," they did want a peer-reviewed resource that would provide an "idea bank." The problem with searching for these things on their own is that there are so many partially functional apps (not fully functional), and the culling through age-appropriate, subject-

appropriate and paid vs. free apps is very time consuming. Therefore, instructors requested a set of resources that had been vetted by similar educators.

Finally, pertaining to the use of iPads in the classroom, the participants were conscious of the "green" benefits of working digitally. Teachers found that they were using less paper to print for test reviews, and the digital reviews were of higher quality because they could better personalize the learning for their students. Teachers were also appreciative of the benefits of being able to mark work digitally so that they could help students to grow through each iteration of a draft. Moreover, college counselors remarked on the tremendous amount of paper saved through using the iPads to digitally create, manage and submit college applications, essays, and transcripts. Students were conscious of and positive about the reduction in paper resources, including textbooks. The students appreciated the added benefits of electronic textbooks, which included animation, hyperlinks to other sources and the ability to "mark" in their textbooks.

Significance of the Findings

From the researcher's perspective, the most significant contribution of this case study was creating a detailed case report on the 1-1 integration of iPads in two, four-year charter public high schools in Southern California. The literature showed a lack of research on the installation of emerging technology, such as iPads, specifically at the high school level. This research contains the reflections and experiences of students, teachers, staff and administrators paired with observations of the researcher. These findings are mapped to the literature on technology integration and learning and will provide a foundation for future research on the implementation of technology.

Research question 1a. Research question 1a asked about the experience of teaching and learning with the use of an iPad. Some of the reactions from participants were concerning the

"cool" factor of the device, the ability to have flipped classrooms and ubiquitous learning, the hope of the iPad as an efficiency tool, the distraction of the device and the ability to go green by saving paper and using online resources instead of textbooks. These five factors were supported in the literature.

Students are more engaged and the device is cool. The students in this study responded with agreement to the statement, "I learned more this year because we were using iPads" and even more strongly agreed that "my friends at other schools think it is cool that I got to use an iPad". These findings are consistent with the literature. Increased student engagement was reported by Schroeder (2004) with tablet PCs because of their high level of interactivity and Barack (2011) noted the "wow factor" of eReaders and Larson (2009) and Allison (2003) reported on the students' preference for digital reading because of the "cool tools" available through a digital format. Bebell and O'Dwyer (2010) showed increased student engagement when students are participating in 1-1 programs. Further, Enriquez (2010) showed the cool factor of utilizing wireless communication, which helped with classroom engagement such as real-time feedback with quizzing and polling to engage students with thinking about how to solve problems.

Opportunity for ubiquitous learning. Students responded that they "used the iPad to study in a non-traditional location" and in the open-ended questions students followed up with where they study and most said that they study at home. One student responded, "Usually I study at home, but the versatility of the iPad basically allows me to study wherever I feel comfortable." Many students mentioned studying in cafes and other places that offer free wifi, and still others were able to work on schoolwork offline "anywhere and everywhere." While some students preferred the iPad because as an alternative to a bulky laptop, others stated that it was their only

access to electronically access their work when they left school. The iPad in its 1-1 implementation also allowed for some students to have access to a computer because they did not have access to a computer at home. This agrees with the findings of S. Li et al. (2010) that also showed that the 1-1 implementation of technology would help to assist students in creating a learning space, which would span school and home.

Teachers also commented on the iPad as a tool to allow for ubiquitous learning through the flipping of their classes. Some of the teachers commented on the ease with which the iPads allowed them to make videos of classroom content and share those videos with their students. These videos were sometimes used to flip the instruction in their classes and other times the videos were used as a resource to personalize the student's learning and to allow them to access this content whenever they wanted to review the material. This finding most closely correlates with and supports the findings from the research conducted by Murphy (2011) where teaching and learning can take place any time, in small bursts, convenient to all, asynchronously or real time.

Efficiency tool for teachers, students, staff and administrators. The students agreed with the statement, "The iPad is a helpful tool when doing work for classes," and one student added that the best part of having an iPad was "the amount of productivity and accessibility we had." Teachers and students alike commented on the ease with which they could do quick research on the iPad.

Students appreciated the device as a way to access digital content for their courses. M. Berson and Balyta (2004) found that technology could enhance student productivity. Every interviewee (teachers, staff and administrators) commented on the iPad as an efficiency tool and appreciated the lack of startup and shutdown time. This finding is supported by the literature that

technology can act as an efficiency tool by enhancing content delivery (M. Berson & Balyta, 2004; Steinweg et al., 2010), content sharing and storage (Toto et al., 2006), allowing teachers to utilize handwriting in their presentations (Lim, 2011), and aiding teachers in expediting grading with digital marking of student work (Manuguerra & Petocz, 2011; Steinweg et al., 2010; Toto et al., 2006). All of these benefits of technology were experienced and mentioned by the participants in this study. Additionally, teachers mentioned the ease with which they could create and grade assessments using the iPads. They also mentioned the time savings from using the iPad to perform administrative tasks such as taking attendance or replying to email. Counselors mentioned the ease of managing college applications with the iPads. Front desk staff at both schools noted that the iPad made their jobs easier by allowing them to accept credit card payment and to email a receipt immediately to the credit card holder.. The administrators commented that the iPad helped them to manage communications with all personnel at the school through email and social media. Finally, the IT staff commented that the rollout of the iPads was the easiest of any device they have ever managed.

iPad as a distraction. While the participants found the iPad to help them become more efficient in many ways, there was also a concern with the new device becoming a distraction. Teachers found that there was a classroom management issue with the use of iPads. Some teachers dealt with this explicitly at the start of the school year and others managed the student misbehavior as it arose (and evolved) through the year. Literature supports this concern that technology can become a distraction when students navigate away from the instructional task to non-educational activities (Grace-Martin & Gay, 2001; Barak et al., 2006). However, as one teacher noted, on the day when the students were working on a particularly engaging lesson, the device was no longer a distraction and was being used solely as a tool for learning.

Going green. Students, teachers, staff and administrators commented that one of the best parts of having an iPad was the ability to be more "green". One student commented that "being able to read and have everything without wasting paper" was his/her favorite part of having an iPad this year. By utilizing digital readings, eTextbooks, and sharing assignments digitally, the school was able to eliminate much of the paper it had previously used. The sustainability or "going green" of digital devices was noted as a valuable principle in the literature as well (Hall & Smith, 2011, Steinweg et al., 2010).

Students are not concerned about the reliability of Internet connections. Jalali and colleagues (2011) reported on the use of iPads in a multiple-choice testing situation at the college level. While students liked the idea and it saved significant paper resources, students reported extra stress from a potentially unreliable Internet connection and concerns about their responses being correctly recorded and submitted. These student concerns mentioned by Jalali and colleagues (2011) were not mentioned by the students in this study. In this study, there was not a concern about extra stress due to an unreliable Internet connection, and the students were not concerned about their responses being recorded and submitted correctly. One possible explanation for the difference in findings could be the trust that the students had in their teachers, administrators and staff to provide a mostly functional learning environment. While not everything worked all of the time and there were technology glitches, the students in this study expressed gratitude for being allowed the opportunity to use the iPads for the school year. They seemed to understand that the school was willing to try something new and the researcher felt that the students trusted the iPad and its apps to correctly submit their responses.

Research question 1b. Research question 1b asked what the influence of an iPad was on the interactions among friends and colleagues.

For teachers, the iPad was another tool that they could use to support project based learning at the school. They discussed the iPads with one another and how to integrate and manage these devices. The manner in which they engaged in these discussions follows the community of practice put forth by Lave and Wenger (1991). Lave and Wenger suggest that the community of practice is built around the domain where the participants are located, which in this case is the school, where they are bound together by the shared interest of being trailblazers in education. Through this community, they pursue this interest through joint activities and shared information. As a practice they develop shared stories, resources and experiences. The community of practice as described by Lave and Wenger was exemplified by the teachers working to implement iPads.

Likewise, the students among their friends also engaged in a community of practice as they implemented iPads. The students were in a shared domain where they were bound together by being proud members of the charter school and taking pride in their education. These students pursued their interests through their community with joint activities and shared information through mediums of social networking with one another. Their practice helped them to develop shared stories, resources and experiences to use iPads. That fact is exemplified by official school tee shirts that some students wear. On the back is printed, "We do things differently here."

Research question 1c. Research question 1c asked about the influence of the iPad on the relationship between students and faculty. The students noted that they felt trusted by the faculty to use these devices for learning. These interactions were similar to those discussed by Barak et al. (2006) who showed that there were more meaningful interactions between students and instructors with technology. Because of the portability of the iPads, the teachers were able to teach from the anywhere in the classroom. One teacher noted that this proximity to students

allowed her to spot check and assist students on an as-needed basis, which helped her to create a better learning environment. The iPads also allowed students to easily present their work, enhancing the student-centered atmosphere of the classroom, which was similar to the findings of Schroeder (2004).

Research question 1d. Research question 1d asked about how the participants assessed their training for using iPads. The comments pertaining to training for the use of an iPad in class focused on the training event, the barriers frequently encountered and the teacher as the primary implementation tool.

Formal professional development is not desired. Penuel (2006) and Trotter and Zehr (1999) found that along with time for experimentation, the teachers also need formal professional development. This was not the case for most of the participants in this study. As noted above and in Chapter 4 of this dissertation, the teachers specifically denied that they needed training on the iPad to get started. The students also reported that that they did not need training on the iPad's to start working with the device. One possible explanation for the difference in findings here from the findings in the literature is the fact that this study was focused on the iPad, which is similar in operation to other technological devices such as smart phones. It is possible that the learning curve for general operation of the iPad does not require explicit training. Because this study only researched the implementation year of the device, it cannot be determined if the participants would have benefited from a formal training, even though they specifically denied needing such training.

Webb (2005) developed a schema for professional development to implement technology. The following 10 factors were necessary for professional development: evaluation driven, contextual, learner-centered, duration of process, engaging, inquiry based, theory

research based, collaborative, supportive and sustainable. This was not the format followed in this researched study. However, there were some factors that were present. At the two schools in this study, there was a collaborative environment with supportive personnel. In this study, the incorporation of the iPads was done in a way that was sustainable by integrating it into their frequent discussions as a staff and was not reliant upon training provided by outside sources. While all 10 factors were not present at these schools, there were some factors present, and the strong community of practice helped to support this initiative.

Suggestions for successful training to implement technology. While most of the participants in this study did not think that formal training was necessary to integrate an iPad into their classrooms, they did provide suggestions for other schools based on what they have learned. Teachers and students appreciated the time and space they were given to explore the iPad as they worked to integrate the devices. One teacher commented, "I think the best way to learn is to play and I think that's also Apple's philosophy". This is supported by the research, which shows that teachers must have time to experiment and become comfortable with new equipment (Maninger & Holden, 2009; Schmid et al., 2008; Trotter & Zehr, 1999). Trotter and Zehr (1999) add that the experimentation time with new devices, allows a teacher to make the new skills his or her own and to adapt or create appropriate uses for the technology in their classrooms. The teachers in this study were provided with the iPads in the spring before the fall rollout with students so that they could experiment during summer. This advance rollout was helpful, but it was paired with weekly professional development sharing sessions throughout the school year, which allowed for teachers to develop the necessary technical skills to facilitate student-centered activities in the classroom. This approach is supported by Becker (1994) who stated that collegiality among staff, school support for the implementation and resources allocated to the implementation were

factors that would improve the likelihood of teachers being exemplary users of computers. Further, Littlejohn (2002) says that the technical skills should be provided on a need-to-know basis, which was the case in this study. The sharing of best practices with the iPads occurred not only at the weekly PD sessions, but also informally through the active communities of practice (Lave & Wenger, 1991), which followed the technological implementation model of Frank et al. (2004) where information is shared first with friends. This implementation model of giving teachers time to experiment with the devices, and to provide time continually throughout the year to allow for their reflection and sharing of best practices follows the suggestion of Barab and Luehmann (2003) to not use a cookie cutter approach, but to train teachers in a way that allows them to adapt the curriculum to meet the needs of their students. In this case, the teachers and students at the schools in the study were comfortable working at the leading edge of new technology, and they were comfortable learning together with their students how to best integrate the devices.

Teachers and students mentioned the first order barriers (e.g. selecting apps and saving documents) they encountered while learning how to best utilize the iPads. The difficulties they encountered are similar to those discussed by Ertmer (1999) and Ertmer et al. (1999) in technology implementations. As noted by Penuel (2006), when teachers try to implement technology, they adapt technological productivity tools from adult job requirements to implement into school projects, and in this study, one of the difficulties was finding acceptable apps to create written documents, spreadsheets and presentations. However, as one of the teachers in this study suggested, “I already have PowerPoint, let’s make an iPad that works with PowerPoint.” And she continued with this reflection, “But that is not necessarily necessary. If

they make something better, we can use that something better." The challenge going forward is to have a resource available to teachers and students that provides a vetted source of trusted apps.

Sutherland-Smith (2002) remind us that technology changes so quickly that teachers are always playing a game of catch-up and they suggest that teachers be willing to enlist students in troubleshooting. Likewise, Couse and Chen (2010) showed that although students frequently encountered technological difficulties, they still preferred working with the new devices. There was resilience among the participants in this study that allowed them the freedom to test out new things and to make mistakes to learn better ways of doing things. One possible explanation for this resilience is the trust among participants as part of the culture of the schools, which were dedicated to learning at all levels.

With all of these above factors in place, research suggests that crucial component in technology implementations is the classroom teacher and his or her pedagogical decisions (Kinash et al., 2011; Manuguerra & Petocz, 2011; Webb, 2005). Additionally, in order for teachers to develop a rich learning environment with technology that is appropriate for their students, they must consider their pedagogical content knowledge as well as their knowledge of their students (Webb, 2005). This study supported the research by Webb (2005) as the teachers who had been teaching at these schools for more than 1 year discussed more applications of the iPad in their classes. One possible explanation for this is the sharp learning curve that accompanies experienced teachers as they transition to teaching in new schools.

Research question 1e. Research question 1e asked about the changes or improvements that should be made to the iPad and its accessories. Participants noted the factors they most liked and most desired from the iPad and this is similar to the research by Kinash et al. (2011) where students reported favorably that the iPad was cool, had a long battery life, was good for games,

was good for learning on the go, was a good potential substitute for textbooks and had the potential of helping the school go green as they saved paper. Students and teachers reported were not pleased with the iPad's lack of USB port, inability to access software programs such as Microsoft Word and Flash. The students reported that typing was difficult and some of them have opted to purchase keyboards or use other computers when more typing was necessary.

Unanticipated Outcomes and Surprises

Based on the findings from this study, there were some surprises and unanticipated outcomes for the researcher. The implementation of iPads in both high schools was predicted to have some impacts on the teaching and learning that was occurring in the schools, but there were some surprises associated with the use of iPads. Some of these items were hinted at through the literature review, and others were aspects that the researcher never would have suspected.

Some of the findings that were hinted at through the literature review were the ubiquity of the device, that formal training might not be necessary, and there might be "green benefits" to working digitally.

First, the ubiquity of the device was predicted to be a strength of the iPad 1-1 implementation in that it would allow the students to study outside of the four walls of the classroom. However, it was not predicted how widely the students would expand their time and space for studying. Students reported studying "anywhere and everywhere" and they really meant it. They were not only studying at school, home and coffee shops, but they were also using the iPads on busses and in parks and other places to complete video projects, readings, and research. The functional reach of the device was greater than was anticipated, and the researcher thinks it surprised the students as well. Some of them commented that they could, with a little

advance notice, download work, either readings or videos, so that they could complete work without a wifi connection and then they were free to work wherever they were.

Another surprise that was hinted at through the literature review was the ease of use of tablets. In an experiment conducted by the OLPC program with tablets (Talbot, 2012) workers delivered the tablets in sealed boxes to remote Ethiopian villages. Within 4 minutes, one child had opened the box, found the power switch and turned the tablet on. Within 2 weeks, the students in the village were reciting the alphabet, and within five months, the students had learned how to bypass the locked desktop settings in order to personalize their desktop preferences and to use the camera, which had been disabled. While this investigation was to determine if learning to read without a teacher was possible, it does hint at the intuitive nature and ease of use of tablet devices. The fact that students in a remote Ethiopian village with little access to technology were able to teach themselves about the workings of the device, indicates that students and teachers in a tech savvy environment would require even less training on the operations of the device.

Participants did not desire formal training because a) the learning curve of the device is so similar to phones and other devices used daily as well as being intuitive and b) the tech fluency of the staff is shifting. However, one insightful teacher added- I don't know if I missed out on something because we didn't get the formal training. Participants did desire to learn more about how to authentically integrate the iPads, but they recognized that they are at the beginning of the learning curve and they were the pioneers. They would be interested in a vetted list of suggestions from a trusted source (preferably one of their own teachers).

Third, students, teachers and administrators, unsolicited, mentioned the "green" benefits of working digitally as it was a valuable part of the iPad implementation for them. Participants

commented on how much paper they saved by working digitally. Teachers posted PDF's of readings or videos rather than paper copies they had done in previous years. Students turned work in digitally, and teachers graded and returned it digitally. Teachers commented on the improved quality of the digital products they were creating for their classes over the paper worksheets and feedback that they had previously provided. College counselors managed all of the papers for college applications digitally (letters of recommendation, transcripts, essays, application papers...) and the digital systems even track when items are submitted making the process sun more smoothly. The improved quality of working digitally was an added benefit to the paper savings and a deciding factor to continue utilizing digital resources.

Within the classroom, some of the unanticipated findings were related to the ease of use of the device and the lack of logins and startup time and shutdown time. Teachers commented on the ease of using the iPads for quick learning activities because there was so little time required to activate and begin using the device as compared to the computers and laptops that they had used previously. Teachers also commented on their own time savings in using the iPad for administrative tasks such as taking attendance, checking email, presenting while walking around the classroom and making videos to personalize their instruction. Teachers estimated that they were saving 2-3 minutes per class every day, which over the course of the year is an additional six to nine hours of instruction.

The researcher thinks that students were surprised by the usefulness and attachment they developed with their iPads. After spending a year with the iPad, they not only enjoyed the portability and connectivity of the device, but they had also become reliant on having access to their work and entertainment. Students were pleading to get to keep them at the end of the year-

they had become very attached to their iPads and "now I need one for college" was a common statement.

Counselors shared the benefits of having a 1-1 implementation of iPads with the seniors for working on their college applications because the students always had their work with them. They noted the difficulty in working with juniors on similar material without 1-1 access even though they were still using the same programs on the iPads through a cart at the school.

Another unanticipated finding dealt with the culture of the school from issuing iPads to the seniors. Administrators noted that the students felt like they were seen as trustworthy because they had been entrusted with an expensive and cool device for the year. This acknowledgement by the students created a positive culture toward learning. The students acknowledged the investment, both financially and with trust, that was being made in them and they responded positively.

Some of the findings that were unanticipated dealt with the peripheral aspects to teaching and learning in the school. The IT staff said that the iPad implementation was the easiest rollout they have ever done. Also, the front desk personnel at each school were issued iPads for the school year and they benefitted from having iPads as it allowed them to collect credit card payments and receipts were immediately emailed. While these factors are not directly related to teaching and learning with the use of iPads, they do contribute to an environment where the teaching and learning can more easily occur.

Summary of Findings

Table 8

Summary of the Findings by Research Question

Research Question	Finding
RQ1a- How have teaching and learning changed?	• Opportunity for ubiquitous learning • Efficiency tool for teachers, students, staff and administrators • iPad as a potential distraction • Going green • Students are more engaged and the device is cool • Students are not concerned about the reliability of the Internet connection
RQ1b- How are teacher-teacher and student-student interactions different?	• Implementing the iPad was a shared experience between teachers, a point of discussion, and part of what bound them in their Community of Practice • Students shared information through mediums of social networking.
RQ1c- How has the student-teacher relationship changed?	• More meaningful interactions between students and faculty • Teachers are enabled to teach anywhere in the classroom allowing for more personalization
RQ1d- How do the participants assess their training for using iPads?	• Formal Professional Development is not desired • Suggestions for successful training to implement technology o Play time o Share with colleagues as needed o Personalize instruction to the needs of the learners o Teacher's pedagogical decisions are key

(continued)

Research Question	Finding
RQ1e- What changes should be made to the iPad and its accessories?	• Pros: Cool, long battery life, good for games, good for learning on the go, good potential substitute for textbooks, potential "green" benefits • Cons: lack of USB port, lacking Word, PPT & Flash, typing could be difficult • Wish List from Students: o I wish we used them more in class o I wish it ran Adobe Flash o I wish students could print directly from their iPads o I wish it was easier to type o I wish it had a USB port o I wish it had Siri o I wish spell check worked better o I wish I could access documents more easily o I wish we could take more tests on the iPads o I wish it was easier to do file conversion o I wish it had better resolution o I wish it was solar powered o I wish it had the swipe function on the keyboard o I wish it could format documents o I wish it could have internet access everywhere o I wish it had a longer charging cord o I wish the iPad had a CD ROM, but then it wouldn't be an iPad it would be a MacBook • Wish List from Teachers: o Charging station/cart that fits iPads with covers on o Cables that attach to the power plug o Keyboard options o Stylus options o Split Screen functionality

Final Thoughts about the Literature

There are many similarities in the literature to past implementations with other technological devices. One possible explanation is that educators approach technology implementations with the same paradigm as what worked with the last device. While this approach to use a new device in a way that is familiar based on an old device makes sense, the pioneering and inventive uses are likely to catapult the creative destruction process of the devices and to enhance education dramatically.

Conclusions

The findings from this study suggest that the success of this iPad implementation at two charter high schools was dependent on three primary factors; the culture of the school, the shared vision of the participants, and the nature of their professional development.

First, technology success at these schools was a function of the culture of the school. The strong connection from the Board of Regents to the CEO to the administration to the teachers to the students supports a collaborative learning environment. This collaborative learning environment supported the community of practice between the students, teachers, staff and administrators. As a result, the culture of these schools was built on a foundation of trust and respect of one another, which supported and encouraged the experimentation required to be on the leading edge of this iPad implementation.

Second, the shared vision of the participants contributed to their success with this iPad implementation. Peter Senge (2006) in his book, *The Fifth Discipline*, discusses the importance of shared vision in fostering risk taking and experimentation. Senge states, "you cannot have a learning organization without shared vision" (p. 195) and in the case of an iPad implementation where the path is uncertain, it is essential to have a learning organization where people willingly test and experiment how best to use these new devices in the classroom. Senge adds, "People aren't saying 'give me a guarantee that it will work.' Everybody knows that there is no guarantee. But the people are committed nonetheless" (p. 195). Because of the trust and respect between all parties on campus, they do have a shared vision of the purpose of their school and their community. The determination and focus by the participants in this study and the purposefulness of their experimentation toward the implementation of iPads is an example of Senge's description of shared vision.

After considering the culture of the school and the shared vision of the participants, the final conclusion to be drawn from the findings is that the success of this iPad implementation was due to the nature of their professional development. The nature of professional development was appropriate for this audience because there is so much emphasis on ongoing professional development (21 days in the last school year). The culture of the school and their shared vision as pioneers contribute to their willingly experimental and cooperative approach to learning how to utilize new technology through their communities of practice. This was an appropriate delivery system for the audience. It is important to consider the learning styles, goals and comfort levels of the learners to best instruct them.

Implications

Implications for Scholarship. The results from this study indicate that there are some new considerations when implementing new technology that should be included in the literature. One of these considerations is the culture of the school as seen in the following quote from an administrator:

> We have really smart people. The people on our staff are really smart and hard working and talented. And basically, if you can get them to share what they do or what they think is good with other people, that's how the greatness spreads.

The trust and respect that this administrator has for the personnel on campus is evident and it was noticed and shared by a number of the other interviewees. In this case, to create greatness does not require hiring outside coaches, but to trust one's own staff to be excellent professionals and to provide opportunities for them to share with one another.

Another sentiment that was shared by almost all of the participants in this research was the aversion to training. One of the teachers shared that the teachers on campus are:

> tech savvy that we didn't really need a whole lot of education, because we all have iPhones and smart phones. I don't think that we needed any more [training] than we got.

> It was the perfect amount of time to play around with them and get creative without overwhelming us.

From quotes like this one, a new contribution to the literature may be the lack of needing training for devices that are designed on similar platforms to other common devices and the changing demographic of teachers. When the technology functions similarly to other devices that are used daily, it might not be necessary for technology implementations to involve training on these devices. There is still a pedagogical concern for how to best utilize the functionality of these new devices, which might benefit from training. But when these devices are emerging and there is a lack of testing in education, the best approach might be to experiment. Plus, as the teaching workforce changes to include more digital natives among its ranks, the fluency they bring will confer a new take on the experimentation with these new devices.

Implications for practice. The literature to support best practices in technology implementations has been combined with the findings and results of this research into Table 9 to illustrate the key considerations for a successful technology implementation.

Table 9

Best Practices and Citations

Best practices for technology implementations	Citations
Strong School Leadership utilizing trust which supports the culture of the school. • Culture of collaboration and experimentation through communities of practice • Teacher empowerment • Local control	Barab and Luehmann (2003), Becker (1994), Lave and Wenger (1991), C. Li (2010), Wong, Li, Choi and Lee (2008)
Positive attitude of the participants • "Cool Factor" of a device • There must be a positive attitude toward the device, both individually and socially with peers and faculty • Positive attitude toward exploring new ways of learning	Cotten, Hale, Moroney, O'Neal and Borch (2011), El-Gayar, Moran and Hawkes (2011)

(continued)

Best practices for technology implementations	Citations
Support for Technology • IT helpdesk (ongoing) • sufficient bandwidth • access to necessary software and storage • appropriate covers and accessories	El-Gayar, Moran and Hawkes (2011)
1-1 implementation of technology • having 1-1 access should create the strongest impact of technology on teaching and learning. • Provides access to reduce the SES gap	Bebell and O'Dwyer (2010)

Based on this research, there are some specific suggestions for the day to day implementation of iPads at a secondary school level that have been provided by the participants in this research. The first set of suggestions concerns selecting an appropriate device with functional hardware, durability, support and accessories. The second suggestion concerns the organization of the device for effective learning such as selecting the productivity applications to be used, and the file management system for saving and sharing files. The third suggestion is to provide examples for the teachers and students of successful integrations of the technology in similar classrooms.

The adoption of the iPad does not seem to require explicit training if the school culture is one where teachers willingly share best practices with one another through their communities of practice. However, the participants did appreciate the time they were allowed to "play" with the devices before the implementation occurred in the fall. It was essential that the weekly professional development meetings involved the sharing of best practices of their teaching experiences and the use of the iPad became another type of experience to share.

Finally, for all persons involved in trying something new, it is important to remember that there will be difficulties and growing pains even with the best laid plans. An honest and open approach to learning through these events will produce the best results.

Implications for policy. Sutherland-Smith (2002) remind us that the technology is changing so rapidly, that the strategies used by educators will always be a form of catch-up. Teachers must understand this dilemma and be willing to learn through technological changes. Also, teachers should find ways to recruit students to help in the classroom. Given this information, and the continual release of new devices and operating systems, the teacher credentialing programs should incorporate training and skills on the need to be lifelong learners and to develop skills that help teachers to function in flexibly changing environments. While the teacher preparation programs can help teachers to develop an appropriate learning stance toward technology, it is essential that the teachers' learning is continuous throughout their career. Therefore, schools should invest in ways to share best practices among staff and consider having a technology coach, or a team of coaches, available for just-in-time learning.

In addition to the best practices listed above that teachers and administrators can make to incorporate technology effectively, an implication of this research toward developing an appropriate school culture would be a necessary part of administrator credentialing programs. The trust that an administrator has in their school personnel can create an atmosphere where learning will thrive. More schools should be built on this foundation of professional trust with high expectations of results and it needs to happen with local control to best personalize this experience for the teachers, students and community members.

Recommendations for Future Research

Methodological enhancements. This study was designed based on the goals of this research and with the most recent literature to support the methodology. One of the delimitations of this study was to intentionally limit the stakeholders in the data collection due to a lack of time and resources. However, if this study were to be repeated, it would be interesting to include the

perspective of the grant writers, the parents and community members. Each of these groups would bring another layer of depth to the understanding of the impact of the iPads on learning in the academic environment.

At the time when this study was designed, it was known that the 1-1 implementation would occur with senior students, but it was not known that there would be carts available to teachers and students in other grades. It would be interesting to include the feedback from all students, both those in the 1-1 and those younger students who used the iPads from a cart in the classroom. The difference in their access to the devices may have led to differences in their impressions of the effectiveness of the iPads on their learning.

Given unlimited time and resources, it would be interesting to collect data at multiple points throughout the implementation year, and to follow the project for multiple years to see how the staff progress in their implementation of technology and to compare that with a similar school where there was formal professional development.

Also, considering the releases of many competing tablets, it would be interesting to follow a new school site while they performed the same implementation of tablets and then to compare those results with this study of the iPads and their impact on learning.

Proposed future research. This case study research provides a detailed report of the implementation of iPads into two charter high schools and suggests themes for researching iPads in high schools and sets the foundation for future researchers to further investigate technology implementations. Proposed research projects are presented below.

1. To examine the differences between students using the iPads through a 1-1 implementation and those using it on carts during the school day. In other words, what is the impact of being able to take the iPad home?

2. To investigate the difference between students using another brand of tablet computer through both 1-1 implementations and/or on carts in the school. In other words, does the difference in brands and their available apps have an impact on learning?
3. To explore the differences of iPad usage at different grade levels. In other words, is there an age when it is most appropriate for a 1-1 implementation to provide the best learning outcomes?
4. To compare the differences on the integration of the device between receiving formal professional development and creating one's own professional development at the school/district level.
5. To conduct a longer-term study to examine the impact of the iPad on learning during the second, third and fourth years of implementation.

Final Summary

This case study was designed to tell the story of two charter high schools through their first year of the iPad implementation. The success of these schools was based in large part on the culture of the schools and the shared vision of the participants. The two schools operate with a culture of trust from the Board of Regents to the CEO to the principals to the teachers and the students. All of these people are bound together in a community of practice through their shared belonging to these schools. They identify as pioneers and take pride in finding creative solutions to make learning more authentic and to continuously improve on their teaching and learning. This is a unique environment. While case studies are not designed for generalizability, the findings from this study may help to inform other schools as they implement iPads.

In order to create the best learning environment that meets the needs of the students today, it is essential to consider technological enhancements. These ever evolving technologies

require continuously learning how to incorporate new devices, and often the research on best practices lags behind the device implementation. The flexibility and resilience of the participants to experiment with these new devices will determine their success at implementing the new devices or abandoning their efforts to resort to past methods. The best way to support people in encouraging their experimentation is through a culture of trust and respect. This culture can be created and supported by a strong administration that believes that the teachers are excellent professionals who just need a way to be excellent and then to have an opportunity to share those experiences with others. Another consideration is to begin with the end in mind and to set goals for the use of the device and to make a plan for the implementation that will best position the participants to have success.

Because little is known about the implementation of the iPad at the secondary level, this case study research attempted to provide a foundation to explain the factors associated with the use of iPads within the academic environment. The findings show that a number of factors are important to the successful implementation of iPads including: the consideration of hardware, software (apps), maintenance, training, and planned use in classrooms. The results from this research make a significant contribution to the literature and provide a baseline for future research on the use of iPads and other tablet devices at the secondary level.

Additionally, this research provides an important connection between the culture of a school and the success of innovative educational practices. Schools all around the United States and all around the world are looking for ways to improve the quality of education to best prepare their students. Continued research on these innovative best practices will provide not only strategies for implementing technology successfully, but will also allow for greater learning that is appropriate to the needs of students today.

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APPENDIX A

Pepperdine University Institutional Review Board Approval Letter

PEPPERDINE UNIVERSITY

Graduate & Professional Schools Institutional Review Board

May 21, 2013

Margaret Alice Matthews Pettit

Protocol #E0413D10
Project Title: A Case Study of the Implementation of iPads with High School Seniors at Two Charter High Schools in Southern California

Dear Ms. Pettit,

Thank you for submitting your application, *A Case Study of the Implementation of iPads with High School Seniors at Two Charter High Schools in Southern California,* for exempt review to Pepperdine University's Graduate and Professional Schools Institutional Review Board (GPS IRB). The IRB appreciates the work you and your faculty advisor, Jack McManus, have done on the proposal. The IRB has reviewed your submitted IRB application and all ancillary materials. Upon review, the IRB has determined that the above entitled project meets the requirements for exemption under the federal regulations (45 CFR 46 - http://www.nihtraining.com/ohsrsite/guidelines/45cfr46.html) that govern the protections of human subjects. Specifically, section 45 CFR 46.101(b)(2) states:

> (b) Unless otherwise required by Department or Agency heads, research activities in which the only involvement of human subjects will be in one or more of the following categories are exempt from this policy:
>
> **Category (2) of 45 CFR 46.101**, research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior, unless: a) Information obtained is recorded in such a manner that human subjects can be identified, directly or through identifiers linked to the subjects; and b) any disclosure of the human subjects' responses outside the research could reasonably place the subjects at risk of criminal or civil liability or be damaging to the subjects' financial standing, employability, or reputation.

In addition, your application to waive documentation of consent, as indicated in your **Application for Waiver or Alteration of Informed Consent Procedures** form has been **approved**.

Your research must be conducted according to the proposal that was submitted to the IRB. If changes to the approved protocol occur, a revised protocol must be reviewed and approved by the IRB before implementation. For any proposed changes in your research protocol, please submit a **Request for Modification Form** to the GPS IRB. Because your study falls under exemption, there is no requirement for continuing IRB review of your project. Please be aware that changes to your protocol may prevent the research from qualifying for exemption from 45 CFR 46.101 and require submission of a new IRB application or other materials to the GPS IRB.

A goal of the IRB is to prevent negative occurrences during any research study. However, despite our best intent, unforeseen circumstances or events may arise during the research. If an unexpected situation or adverse event happens during your investigation, please notify the GPS IRB as soon as possible. We will ask for a complete explanation of the event and your response. Other actions also may be required depending on the nature of the event. Details regarding the timeframe in which adverse events must be reported to the GPS IRB and the appropriate form to be used to report this information can be found in the

6100 Center Drive, Los Angeles, California 90045 ▪ 310-568-5600

Pepperdine University Protection of Human Participants in Research: Policies and Procedures Manual (see link to "policy material" at http://www.pepperdine.edu/irb/graduate/).

Please refer to the protocol number denoted above in all further communication or correspondence related to this approval. Should you have additional questions, please contact me. On behalf of the GPS IRB, I wish you success in this scholarly pursuit.

Sincerely,

Doug Leigh, Ph.D.
Chair, Graduate and Professional Schools IRB
Pepperdine University
Graduate School of Education & Psychology
6100 Center Dr. 5th Floor
Los Angeles, CA 90045
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cc: Dr. Lee Kats, Vice Provost for Research and Strategic Initiatives
Ms. Alexandra Roosa, Director Research and Sponsored Programs
Dr. Jack McManus, Graduate School of Education and Psychology

APPENDIX B

Email to recruit teachers, staff and administrators using iPads

Dear Teachers, Staff and Administrators,

Thank you for your work this year on the iPad initiative.

I am a Doctoral Candidate at Pepperdine University and as part of my studies, I will be conducting research on the use of iPads at the XXXXX schools. This research is being conducted in partial fulfillment of the requirements for my dissertation.

The purpose of this study is to understand the influence of iPads in the academic environment. We hope to gain valuable information on the ways in which you and your students use iPads for learning.

If you volunteer to participate in an interview, your answers will be confidential. The final report will not contain identifying information that will link you to your statements. The data will be summarized and presented in a manner such that it will not be attributable to you.

The interviews will be recorded using a digital recording device in order to help me capture the interview data and analyze it appropriately. At the conclusion of this research, the recording will be destroyed.

If you volunteer to participate in an interview, you may stop at any time or skip any question without penalty. While there is no direct benefit to you for participating in this research, there may be a benefit to the academic community from this research.

Your feedback is desired to help this program as well as to help future iPad implementations. If you choose not to participate or to withdraw from the study, your job status or reputation will not be affected. Your participation is voluntary, and if you choose to participate we will set up an interview either on campus, or via Skype or over the phone.

Please reply to this email if you are willing to participate in a 20-minute interview.

Thanks for your time,

Margaret Pettit
Pepperdine University, Doctoral Candidate
Margaret.pettit@pepperdine.edu

Chairman of this dissertation Research: Dr. Jack McManus
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Chairman of the IRB: Dr. Doug Leigh
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APPENDIX C

Informed Consent Form for Interviews of Teachers, Staff and Administrators

Dear Teachers, Staff and Administrators;

My name is Margaret Pettit, and I am a Doctoral Student in Organizational Leadership at Pepperdine University. I am currently in the process of recruiting individuals for my study entitled, "A Case Study of the Implementation of iPads with High School Seniors at two charter high schools in Southern California." The professor supervising my work is Dr. Jack McManus. The study is designed to investigate the implementation of iPads as an instructional tool, so I am inviting teachers, staff and administrators to participate in interviews and students over the age of 18 to participate in an electronic survey. Please understand that your participation in my study is strictly voluntary. The following is a description of what your study participation entails, the terms for participating in the study, and a discussion of your rights as a study participant. Please read this information carefully before deciding whether or not you wish to participate.

If you would like to volunteer for an interview you may reply to the invitation email. The interviews will be conducted at a mutually agreeable time either in person or electronically. The interview, if you should volunteer, should take approximately twenty minutes.

Although minimal, there are potential risks that you should consider before deciding to participate in this study.

The potential risks for your participation in the study include a breach in confidentiality. Although the interviews will not collect identifying information, and the final report will not contain information linking you to your answers, this information could be stolen and then your answers could be linked to you. This is a minimal risk as the researcher will only be storing your contact information in a single password protected document and the nature of the data collected is not considered to be sensitive. In the event you do experience a breach in confidentiality, you can contact the researcher, her chairperson or the director of IRB to discuss your concerns.

There is no potential benefit to you for participating in the study. There is a potential benefit to the research community.

If you should decide to participate and find you are not interested in completing the interview in its entirely, you have the right to discontinue at any point without being questioned about your decision. You also do not have to answer any of the questions in the interview that you prefer not to answer--just decline to answer.

If the findings of the study are presented to professional audiences or published, no information that identifies you personally will be released. The data will be kept in a secure manner for the duration of the study at which time the data will be destroyed.

If you have any questions regarding the information that I have provided above, please do not hesitate to contact me at the address and phone number provided below. If you have further questions or do not feel I have adequately addressed your concerns, please contact my dissertation research chairperson: Jack McManus at jack.mcmanus@pepperdine.edu. If you have questions about your rights as a research participant, contact Dr. Doug Leigh Chairperson of the GSEP IRB, Pepperdine University, doug.leigh@pepperdine.edu.

Thank you for taking the time to read this information, and I hope you decide to participate in an interview. You are welcome to a brief summary of the study findings in about 1 year. If you decide you are interested in reviewing the summary, you will find the results linked to the school website.

The interview questions are included below.

Sincerely,

Margaret Pettit
Doctoral Candidate
Margaret.pettit@pepperdine.edu

Dissertation Advisor
Dr. Jack McManus
Pepperdine University
Jack.mcmanus@pepperdine.edu

IRB Chairperson
Dr. Doug Leigh
Pepperdine University
Doug.leigh@pepperdine.edu

By checking the box, I [] Agree [] Disagree to be recorded.

| --- | --- | --- |
| Printed Name | Signature | Date |

Teacher, Staff, Administrator Interview questions

1. **What are your general impressions of the iPad as a tool for learning?**
   What works well, what does not work well?
   Did the iPad help or hurt your instruction, classroom management?
   Did you use it as an eReader? Did your students?
   Were you at home, at school, in the library?
   Which applications did you use most frequently?
   What feedback have you gotten from parents?
2. **How does the experience of teaching and/or learning change with the use of an iPad?**
   How was your experience of teaching different because you were using an iPad?
   Did you teach or grade in a non-traditional location this year because of the portability of the device?
   Did you notice a difference in the quality of learning on the part of the students?
   Did you experience a difference in the effectiveness of your teaching?
   Did you make fewer paper copies this year?
   Did you grade student work electronically?
   Can you provide an example of an assignment/lesson that could not have been possible for students to accomplish/learn in your class without having an iPad specifically?
   If you hadn't been provided with an iPad, do you believe your instruction would have been much different? Please explain.
   Has having an iPad enriched student learning? Please explain.
3. **What is the influence of an iPad on the interactions among friends and colleagues?**
   Did you share good teaching strategies?
   Did you share good apps?
   Did you use social networking?
4. **What is the influence of an iPad on the relationship between students and faculty?**
   Has the pedagogy in your classroom changed?
   Did the iPad support critical thinking? How?
   Did the iPad help to differentiate instruction in your class?
5. **How would you describe your training for the implementation of iPads?**
   What would you have done differently knowing what you know now?
6. **What changes/improvements should be made to the iPad and its accessories?**
   Did you have accessories (covers, cables, keyboards, stylus, charging stations, carrying cases…) that worked or didn't work?
7. **What else would you like to share with me about your experience using and implementing the iPad?**
   Was there anything that you loved or hated about using an iPad?
   What advice would you give to schools and teachers considering an iPad implementation?

APPENDIX D

Email to recruit students over the age of 18 using iPads

Dear Students;

My name is Margaret Pettit, and I am a Doctoral Student in Organizational Leadership at Pepperdine University. I am currently in the process of recruiting individuals for my study entitled, "A Case Study of the Implementation of iPads with High School Seniors at two charter high schools in Southern California." The professor supervising my work is Dr. Jack McManus. The study is designed to investigate the implementation of iPads as an instructional tool, so I am inviting students over the age of 18 to participate in an electronic survey. Please understand that your participation in my study is strictly voluntary. The following is a description of what your study participation entails, the terms for participating in the study, and a discussion of your rights as a study participant. Please read this information carefully before deciding whether or not you wish to participate.

If you should decide to participate in the study, you will be asked to complete an electronic survey. The electronic survey should take approximately 15 minutes to complete. Please complete the survey alone without consulting others.

Although minimal, there are potential risks that you should consider before deciding to participate in this study.

The potential risk for your participation in the study includes a breach in confidentiality. Although the survey system will strip the data of identifying information (such as your email address or your computer's IP address) this information could be leaked or hacked into and then your answers could be linked to you. This is a minimal risk as there are many layers of security at SurveyMonkey for securing data. In the event you do experience a breach in confidentiality, you may contact me, my chairperson or the director of IRB to discuss your concerns. All of our contact information is below. You may also contact SurveyMonkey at www.surveymonkey.com for follow-up support.

There is no potential benefit to you for participating in the study. There is a potential benefit to the research community.

If you should decide to participate and find you are not interested in completing the survey in its entirely, you have the right to discontinue at any point without being questioned about your decision. You also do not have to answer any of the questions on the survey that you prefer not to answer--just leave such items blank or decline to answer.

If the findings of the study are presented to professional audiences or published, no information that identifies you personally will be released. The data will be kept in a secure manner for the duration of the study at which time the data will be destroyed.

If you have any questions regarding the information that I have provided above, please do not hesitate to contact me at the address and phone number provided below. If you have further questions or do not feel I have adequately addressed your concerns, please contact my dissertation research chairperson: Jack McManus at jack.mcmanus@pepperdine.edu. If you have questions about your rights as a research participant, contact Dr. Doug Leigh Chairperson of the GSEP IRB, Pepperdine University, doug.leigh@pepperdine.edu.

If you want documentation linking yourself to the research, you may choose to sign a paper copy of the informed consent form in your school office. This is not necessary, as this email contains all of the information to properly inform you, but if you choose to, you may sign a paper copy.

Thank you for taking the time to read this information, and I hope you decide to complete the survey. You are welcome to a brief summary of the study findings in about 1 year. If you decide you are interested in reviewing a summary of the research, it will be posted on your school website. Your interest in a summary of the research will not be connected in any way to your answers, or your decision to participate or not in the study.

By clicking on the link to take the survey you are acknowledging that you have read and understand what your study participation entails, and are consenting to participate in the study.

Click HERE to take the Survey!!

Thanks for your time,

Margaret Pettit
Doctoral Candidate
Margaret.pettit@pepperdine.edu

Dissertation Advisor
Dr. Jack McManus
Pepperdine University
Jack.mcmanus@pepperdine.edu

IRB Chairperson
Dr. Doug Leigh
Pepperdine University
Doug.leigh@pepperdine.edu

APPENDIX E

Informed Consent for Students: Hardcopy available in office if they decide to sign

Dear Students;

My name is Margaret Pettit, and I am a Doctoral Student in Organizational Leadership at Pepperdine University. I am currently in the process of recruiting individuals for my study entitled, "A Case Study of the Implementation of iPads with High School Seniors at two charter high schools in Southern California." The professor supervising my work is Dr. Jack McManus. The study is designed to investigate the implementation of iPads as an instructional tool, so I am inviting students over the age of 18 to participate in an electronic survey. Please understand that your participation in my study is strictly voluntary. The following is a description of what your study participation entails, the terms for participating in the study, and a discussion of your rights as a study participant. Please read this information carefully before deciding whether or not you wish to participate.

If you should decide to participate in the study, you will be asked to complete an electronic survey. The electronic survey should take approximately 15 minutes to complete. Please complete the survey alone without consulting others.

Although minimal, there are potential risks that you should consider before deciding to participate in this study.

The potential risk for your participation in the study includes a breach in confidentiality. Although the survey system will strip the data of identifying information (such as your email address or your computer's IP address) this information could be leaked or hacked into and then your answers could be linked to you. This is a minimal risk as there are many layers of security at SurveyMonkey for securing data. In the event you do experience a breach in confidentiality, you may contact me, my chairperson or the director of IRB to discuss your concerns. All of our contact information is below. You may also contact SurveyMonkey at www.surveymonkey.com for follow-up support.

There is no potential benefit to you for participating in the study. There is a potential benefit to the research community.

If you should decide to participate and find you are not interested in completing the survey in its entirely, you have the right to discontinue at any point without being questioned about your decision. You also do not have to answer any of the questions on the survey that you prefer not to answer--just leave such items blank or decline to answer.

If the findings of the study are presented to professional audiences or published, no information that identifies you personally will be released. The data will be kept in a secure manner for the duration of the study at which time the data will be destroyed.

If you have any questions regarding the information that I have provided above, please do not hesitate to contact me at the address and phone number provided below. If you have further questions or do not feel I have adequately addressed your concerns, please contact my dissertation research chairperson: Jack McManus at jack.mcmanus@pepperdine.edu. If you have questions about your rights as a research participant, contact Dr. Doug Leigh Chairperson of the GSEP IRB, Pepperdine University, doug.leigh@pepperdine.edu.

Thank you for taking the time to read this information, and I hope you decide to complete the survey. You are welcome to a brief summary of the study findings in about 1 year. If you decide you are interested in receiving the summary, please complete the stamped postcard found in your school office and mail it to the researcher. Your interest in a summary of the research will not be connected in any way to your answers, or your decision to participate or not in the study.

By clicking on the link to take the survey you are acknowledging that you have read and understand what your study participation entails, and are consenting to participate in the study. {insert link to SurveyMonkey}

Please print and sign your name on the lines below if you wish to complete a paper copy of the informed consent. Please note that this is NOT necessary for your participation. You DO NOT need to complete this form. If you decide to complete this form, please place it in the attached envelope.

_____	_____	_____
Student Name (printed)	Student Name (signed)	Date

Thanks for your time,

Margaret Pettit
Doctoral Candidate
Margaret.pettit@pepperdine.edu

Dissertation Advisor
Dr. Jack McManus
Pepperdine University
Jack.mcmanus@pepperdine.edu

IRB Chairperson
Dr. Doug Leigh
Pepperdine University
Doug.leigh@pepperdine.edu

APPENDIX F

Title: Interview Protocol for teachers, staff and administrators using iPads

Date_____ Place _____
Interviewer _____ Interviewee _____

Instructions for the interviewer to follow:

Please have the volunteer read and sign the informed consent form.

Please read the following statement to the interviewee:

Thank you for agreeing to participate in this interview. I would like to remind you that your participation is voluntary and you may decide to stop at any time. The questions in this interview are designed to inquire about your experiences with the iPad and the training you received as part of the implementation process. It is anticipated that this interview will take between 15 and 20 minutes. The information that you provide will be used, with your permission, to find themes and identify future areas of research. Your statements will be generalized to ensure that you will not be identifiable. This interview will be recorded with a recording device if you have agreed to be recorded, but I will also be taking notes as a backup. Do you have any questions before we get started?

1. **What are your general impressions of the iPad as a tool for learning?**
   Prompts: What works well, what does not work well?
   Did the iPad help or hurt your instruction, classroom management?
   Did you use it as an eReader? Did your students?
   Were you at home, at school, in the library?
   Which applications did you use most frequently?
   Are you using the wifi/3G capabilities?
   What feedback have you gotten from parents?
2. **How does the experience of teaching and/or learning change with the use of an iPad?**
   Prompts: How was your experience of teaching different because you were using an iPad?
   Did you teach or grade in a non-traditional location this year because of the portability of the device?
   Did you notice a difference in the quality of learning on the part of the students?
   Did you experience a difference in the effectiveness of your teaching?
   Did you make fewer paper copies this year?
   Did you grade student work electronically?
   Can you provide an example of an assignment/lesson that could not have been possible for students to accomplish/learn in your class without having an iPad specifically?
   If you hadn't been provided with an iPad, do you believe your instruction would have been much different? Please explain.
   Has having an iPad enriched student learning? Please explain.
3. **What is the influence of an iPad on the interactions among friends and colleagues?**
   Prompts: Did you share good teaching strategies?

Did you share good apps?
Did you use social networking?

4. **What is the influence of an iPad on the relationship between students and faculty?**
   Prompts: Has the pedagogy in your classroom changed?
   Did the iPad support critical thinking? How?
   Did the iPad help to differentiate instruction in your class?
5. **How would you describe your training for the implementation of iPads?**
   Prompts: What would you have done differently knowing what you know now?
6. **What changes/improvements should be made to the iPad and its accessories?**
   Did you have accessories (covers, cables, keyboards, stylus, charging stations, carrying cases…) that worked or didn't work?
7. **What else would you like to share with me about your experience using and implementing the iPad?**
   Prompts: Was there anything that you loved or hated about using an iPad?
   What advice would you give to schools and teachers considering an iPad implementation?

Thank you for your time and insights. I hope that your experience in this interview has been positive and if you have any questions or concerns about this interview, please contact me using the contact information provided on your consent form. Thank you and have a good day.

APPENDIX G

Survey Comparison Chart

This document shows a comparison of the original survey submitted to IRB alongside the revised survey after the content validation panel of experts provided feedback.

General Questions

Original	Revised	Reason for the change. (Blank if no change)
	Dear Students, Thank you for taking the time to complete this survey about the iPads you have been using this year in school. Your opinions and experiences are important, and we hope to learn more about the iPads from this survey. If you don't know an answer, you may either leave it blank or click "neutral".	Introductory statement added to the electronic survey system.

General Questions

I learned more this year because we were using iPads.	I learned more this year because we were using iPads.	
The training I got on the iPad was suitable to get started.	The training I got on the iPad was suitable to get started.	This was an original question from a later part of the survey. It was moved to the beginning for organizational balance.
MyBigCampus was helpful.	MyBigCampus was helpful when using iPads.	This question was clarified based on the feedback of the campus IT director.
The iPad is a helpful when doing work for classes.	The iPad is a helpful when doing work for classes.	
I used the iPad to study in a	I used the iPad to study in a	

non-traditional location. (Not in a classroom)	non-traditional location. (Not in a classroom)	
Where?	Where did you study in a non-traditional location?	This question was expanded for clarity.

General Questions

		Page breaks were added for clarity on the SurveyMonkey site.
I sometimes do leisure reading on the iPad.	I sometimes do leisure reading on the iPad.	
I liked having an iPad for learning.	I liked having an iPad for learning.	
I liked having an iPad for fun.	I liked having an iPad for fun.	
I sometimes spend free time on the iPad.	I sometimes spend free time on the iPad.	
What were you doing?	What were you doing in your free time on the iPad?	This question was expanded for clarity.

What was the best part about having an iPad?	What was the best part about having an iPad?	
What would have made the use of iPads better?	What would have made the use of iPads better?	

Downloading apps

The iPad came preloaded with all of the apps I *needed* to complete coursework.	The iPad came preloaded with all of the apps I *needed* to complete coursework.	Italic font was not available on the website so asterisks were used for emphasis.
I found at least one free or inexpensive app that helped with my schoolwork this year.	I found at least one free or inexpensive app that helped with my schoolwork this year.	
I downloaded fun apps onto my iPad.	I downloaded fun apps onto my iPad.	
I downloaded learning apps onto my iPad.	I downloaded learning apps onto my iPad.	
Where do you learn about good apps?	Where do you learn about good apps?	This is an original question from a later part of the survey, moved here for organizational clarity.

Functioning on the iPad

The iPad helped with the digital portfolio.	The iPad helped with the digital portfolio.	
I can create written documents on my iPad.	I can create written documents on my iPad.	
I can create spreadsheets on my iPad.	I can create spreadsheets on my iPad.	
I can create presentations on my iPad.	I can create presentations on my iPad.	
I can create movies on my iPad.	I can create movies on my iPad.	
I can access and read pdf's on my iPad.	I can access and read PDF's on my iPad.	PDF's were capitalized.
I can read and annotate documents on my iPad.	I can read and annotate documents on my iPad.	
I can access and watch videos on my iPad.	I can access and watch videos on my iPad.	
I can access and read ebooks on my iPad.	I can access and read ebooks on my iPad.	
I can do Internet research on my iPad.	I can do Internet research on my iPad.	Internet was capitalized.
I can videoconference on my iPad.	I can videoconference on my iPad.	
The iPad alone would suit my needs. I don't need a computer or laptop when I have an iPad.	The iPad alone would suit my needs. I don't need a computer or laptop when I have an iPad.	
If you would need a computer or laptop to support your learning, why?	If you would need a computer or laptop to support your learning, why?	

How others view the iPad

My friends at other schools think it is cool that I got to use an iPad.	My friends at other schools think it is cool that I got to use an iPad.	
My parents/guardians think the iPad is good for learning.	My parents/guardians think the iPad is good for learning.	
My teachers like using the iPads in class.	My teachers like using the iPads in class.	

How the iPad influences my relationships with friends

My interactions with friends are better this year because of the iPad.	My interactions with friends are better this year because of the iPad.	
I share information on good apps with friends.	I share information on good apps with friends.	
I learn about good apps from friends.	I learn about good apps from friends.	
I use the iPad for social networking.	I use the iPad for social networking.	
What sites do you use for social networking?	What sites do you use for social networking?	

How the iPad influences class time and eReading

In class, my teachers spend more time talking that the students do.	In class, my teachers spend more time talking that the students do.	
In class, the students spend more time talking that the teachers do.	In class, the students spend more time talking that the teachers do.	
My teacher understands how I want to learn.	My teacher understands how I want to learn.	
We use digital textbooks that we read on the iPad.	We use digital textbooks that we read on the iPad.	
I like e-Reading better than p-Reading.	I like e-Reading better than p-Reading. (I like reading electronically better than I like reading on paper.)	This question was expanded for clarity.
I like reading digital textbooks on the iPad.	I like reading digital textbooks on the iPad.	
I like having something other than a textbook as a reference.	I like having something other than a textbook as a reference.	
We did not use textbooks either in print or digital.	We did not use textbooks either in print or digital format.	This question was expanded for clarity.
What did you use instead?	If you didn't use a textbook, what did you use instead?	This question was expanded for clarity.

The best part of the training was….	When I got the iPad, the best part of the training was…	This question was expanded for clarity.
The part that I wish someone had included in	The part that I wish someone had included in	

my training was…	my training was…	

Did you have accessories (covers, cables, keyboards, stylus, charging stations, carrying cases…) that worked or didn't work?	Did you have accessories (covers, cables, keyboards, stylus, charging stations, carrying cases…) that worked or didn't work?	
What do you wish the iPad had, either as part of the iPad, or as an accessory?	What do you wish the iPad could do, either as a part of the iPad, or as an accessory?	This question was expanded for clarity.

	Do you have any other comments or suggestions about the use of iPads?	This question was added to gather any additional feedback.

Thank you for taking the time to complete this survey. If you have any questions, please refer to the information contained in the email, including contact information for the researcher. Have a nice day.	Thank you for taking the time to complete this survey. If you have any questions, please refer to the information contained in the email, including contact information for the researcher. Have a nice day.	