TEACHER PERCEPTIONS OF EFFECTIVE PROFESSIONAL DEVELOPMENT PRACTICES FOR A ONE TO ONE TECHNOLOGY INITIATIVE

The undersigned, approved by the Department Chair of Graduate Studies in Education, have examined a dissertation entitled:

TEACHER PERCEPTIONS OF EFFECTIVE PROFESSIONAL DEVELOPMENT PRACTICES FOR A ONE TO ONE TECHNOLOGY INITIATIVE

Presented by Katherine A. Tackett a candidate for the degree of Doctor of Education and hereby certify that in their opinion it is worthy of acceptance.

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TEACHER PERCEPTIONS OF EFFECTIVE PROFESSIONAL DEVELOPMENT PRACTICES FOR A ONE TO ONE TECHNOLOGY INITIATIVE

A Dissertation
Presented to
The Faculty of the Graduate Education Department
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In Partial Fulfillment
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By

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ABSTRACT

This quantitative study focused on teacher perception of professional development practices in a one to one technology initiative. Missouri teachers working in a district having implemented a one to one technology program were surveyed to determine their perception of effective professional development practices in relation to software, hardware, and instructional strategies. Teacher perceptions were analyzed to determine which of the three scales was most important. Specific strategies within each scale were identified as being the most effective professional development topics.

The study also focused on effective professional development methods. Teachers were asked to compare specific methods of professional development and determine the one they believed was most effective. Method comparisons included collaboration versus individualized professional development, in-district professional development versus out-of-district professional development, and ongoing workshops versus short, one-time workshops.

Findings suggest teachers believe professional development is a necessary piece of an effective one to one technology program and professional development on software, hardware, and instructional strategies are all effective. Teachers ranked the most effective professional development area as instructional strategies with software as the second most important area. Hardware was rated the third most important. Teachers believe software training on video creation and learning management systems, and hardware training on using a projecting device, SmartBoard device, and web camera are the most effective professional development topics in each area. The most important topics for instructional strategies training are problem-based learning, project-based learning, integrating technology into the core curriculum, and inquiry-based learning.

Statistically significant responses were found. Older teachers and teachers with more experience believe professional development on hardware devices is more important than do younger teachers and teachers with less experience. Older teachers believe professional development on instructional strategies is less important than do younger teachers. Teachers with more experience believe professional development on software is more important than teachers with fewer years of experience.

Significance was also found in responses to professional development methods. Older teachers and teachers with more experience prefer ongoing workshops held inside the district more than do younger teachers and teachers with less experience. Teachers with more years of experience prefer to learn from an in-district instructional coach more than do teachers with fewer years of experience.

CHAPTER I

INTRODUCTION

Technology has saturated society in the workplace, in homes, and in education. The use of technology by preschool children through adulthood requires the educational system change to meet the needs of today's students and the marketplace where they will be expected to work and be contributing members of society (Kung-Teck, Swee Choo Goh, & Osman, 2013; Lepicnik & Samec, 2013; McPake, Plowman, & Stephen, 2013). One to one technology initiatives in schools across the nation and the world are changing the way teachers teach and students learn. Technology integration into the educational environment is vital to the success of students who will be living in the 21st Century (Leech, 2010). What once was a small geographical area where students would grow up and live the rest of their lives, has been replaced with a world where students will not only live, work and contribute to society but compete with students all over the world for the same jobs. Angus King (as cited in Greaves, et. al., 2012) said, "the fact is that everybody in the world wants our jobs and the standard of living that comes with them, and for the first time ever, they have the means to take them" (p. xv). King (as cited in Greaves, et. al. 2012) also said, "it is no longer good enough for schools to send out students who know how to do what they were taught. The modern world needs citizens who can do what they were not taught" (p. xvi). Educational institutions should move out of the status quo and teach today's students in a way that will engage them and bring relevance for their lives (Daggett, 2008; Schwahn & McGarvey, 2011).

Every year, more schools across the nation continue to implement a one to one laptop initiative with the belief it improves student achievement (Donovan, Hartley, & Strudler, 2007). There have been several studies indicate a one to one technology initiative does improve student

achievement (Bebell & Kay, 2010; Bebell & O'Dwyer, 2010; Lei & Zhao, 2008). A prominent factor affecting the success or failure of a one to one program is teacher understanding of technology and incorporating it into the classroom (Hu, 2007; Schaffhauser, 2012; Tomassini, 2012). Teachers are a key component of an effective one to one technology program because research indicates teachers are the dominant factor affecting student achievement (Hattie, 2009; Marzano, 2003).

Teachers must be provided professional development to be effective in a one to one or ubiquitous educational atmosphere. Teaching effectively in a one to one technology system requires different methods and techniques than teachers were given during pre-service training programs for certification. Teacher pedagogy must evolve in a successful one to one classroom and teachers must be given effective professional development to facilitate growth (Stephens, 2012). Teachers who receive little or no professional development rarely use the laptops in a one to one technology environment rendering the program ineffective (Brodzik, 2012). Professional development practices and strategies are the key to a successful one to one technology initiative.

Theoretical Framework

The founding fathers first legislated schools for America's children in 1785 and 1787 (McIntosh, 2005). Education in the 21st Century is considerably different than education in the late 1700's one room school house. Education has evolved and the search for excellence in educational pedagogy continues today. The teacher was the leader of the one room schoolhouse but students were also taught by other students due to the multi-aged schoolhouse. Student learning was mostly rote memory and recall due to lack of materials and time ("One-room," 2007).

Traditional classrooms are those classroom structures that have been in place for many years. Traditional classrooms are taught using transmission or objectivism theory. Transmission theory of learning is derived from the teacher as the disseminator of all information. Students take the information and memorize it to regurgitate answers. Traditional theoretical belief is visualized by the original, teacher-led classroom where the teacher talks and the students listen, with little communication or collaboration on the part of the learners (Murphy, 1997; Stephens, 2012).

A contrasting view of the transmission or objectivism theory of learning is the constructivism theory. Constructivism is commonly thought to be the best way for students to learn, comprehend and retain new information. In a constructivist classroom, students are given information in a problem-based format (Stephens, 2012). The constructivist theory of learning has been in existence for many years.

> Jean Piaget (1896 – 1980) was the first to state that learning is a developmental cognitive process, that students create knowledge rather than receive knowledge from the teacher. He recognized that students construct knowledge based on their experiences, and that how they do so is related to their biological, physical, and mental stage of development (Hammond, Austin, Orcutt, & Rosso, 2001, p. 6).

Studies show effective one to one technology programs are taught by teachers with constructivist pedagogy techniques while most traditional pedagogy methods use the transmission pedagogy. Teachers continuing to use transmission pedagogy do not effectively utilize the laptops (Stephens, 2012).

There are many one to one technology initiatives in the nation today. Some have been successful while others have not. Much has been learned about effective one to one technology

programs with teacher professional development found as a requirement of a successful one to one technology implementation (Naffziger, 2012).

Problem Statement

Because one to one technology initiatives are being implemented consistently in Missouri and across the nation, specific professional development practices to promote effective one to one technology programs showing gains in student achievement should be well defined.

Research is available showing an overall need for professional development in a one to one implementation. Specific topics and types of professional development required for an effective one to one technology program should be conducted (Sell, Cornelius-White, Chang, McLean, & Roworth, 2012). While there are studies that have been conducted articulating the need for professional development through collaboration and technology training, studies have not gone far enough in outlining the specific professional development needs of a one to one implementation (Beaudry, 2011; Haight, 2011; Lewis, 2010; Skoretz, 2011). This research presents specific needs identified by teacher perceptions for effective one to one implementations and adds to the body of research by refuting or corroborating existing research study findings.

Rationale for the Study

This study is important for the success of students in educational settings, school districts spending millions of dollars on infrastructure, personnel, equipment and training and for the moral obligations of the district to be good stewards of the money given to them by the patrons of the districts implementing a one to one program. Districts can implement one to one programs with much fanfare and pride but without teacher buy-in and a change in teacher instructional practices, the implementation will not be effective, wasting millions of dollars. Greaves et al (2012) found the implementation of a one to one program improves student

achievement when it is implemented correctly. Additional studies indicate without teacher professional development, one to one technology implementations will not be effective (Brodzik, 2012; Stephens, 2012).

This research focused on teacher perception regarding the most important areas of professional development. Teacher perception of effective professional development strategies for a one to one implementation is important because without belief and buy-in to the change, teachers will not reach their full potential with the initiative (Jeck, 2010). The implementation of a one to one technology program will decline student achievement, keep student achievement flat, or show only minimal signs of increased student achievement if teachers are not committed to the change. Understanding the fears and apprehension teachers have in putting a laptop in the hands of their students is important. Some teachers believe it is disruptive to the classroom setting and are unwilling to utilize it. Other teachers may want to utilize the equipment and software, but do not have the technology skills needed to do so while yet other teachers may see the benefit in using laptops for students and be technology savvy yet do not have the pedagogical skills to implement sound and effective instruction (Berry & Wintle, 2009; Brown-Joseph, 2010; Marcum, 2010).

Teachers generally instruct based upon the way they were taught. Most teachers were taught using transmission pedagogy. With the advent of personal computing, constructivist pedagogy is now required but most teachers have not been taught this instructional method (Stephens, 2012). Effective professional development is necessary to gain teacher belief in the program, teach technology skills, and address pedagogy issues.

This study attempts to identify the most effective professional development strategies for a one to one technology implementation based upon teacher perception. There has been a shift

in education since the early 1970's in relation to the notion teachers were autonomous entities, doing whatever they thought was important in the classroom. Teachers taught whatever they believed was important for the students to know in the manner they were most comfortable. Educational practices transitioned from no universal standards and no designated methods for teaching to common standards and professional development for teachers (Hargreaves & Shirley, 2009). Governing officials became involved in education during the early 1980s with the implementation of educational standards. The early 1990s brought educators numerous standards to teach. There was not enough time in the day to teach each standard well. Teachers resorted to skimming the surface of each of the standards, not going in-depth on any topic. Students were given information about many standards but did not know any of those standards well (Hargreaves & Shirley, 2009). New research during the early 2000s indicated there must be a strategic focus on what is taught so students have an in-depth knowledge of subject matter and can take the knowledge with them to other classes, in life and on state assessments (Ainsworth, 2003).

There are multiple strategies and methods that can be used for professional development. School districts may provide short, one-time workshops on multiple strategies, giving teachers a surface understanding of the topic or school districts may focus on strategies that will change belief and provide commitment to the initiative. Identifying the most effective professional development strategies will allow an in-depth focus so school districts implementing a one to one technology program can determine the best place to spend their professional development dollars so the strategies can be transferred successfully to the classroom. Where there were no specific strategies, school districts incurred the possibility of missing the main purpose of the implementation or putting their time and money into an ineffective strategy.

The art of educating the nation's schoolchildren has historically been left up to the states to determine what is best for the students in each particular area. Implementing a one to one program will vary in districts due to multiple factors and what works in another state may not be the exact fit for what works in Missouri. Learning standards, demographics and state guidelines may differ from state to state. This study seeks to determine the most effective professional development for Missouri teachers when implementing a one to one technology program. Results of this study may be utilized by Missouri school districts who will implement a one to one technology program in the future or who have implemented the program but may need additional professional development. Other states looking for the most effective way to provide professional development in a one to one technology program implementation may learn from this study and replicate the strategies, modify the strategies or use them to help build their own professional development program.

Research Question

For this research, there is an overarching concern and three supporting research questions. The research question for this study is what are the perceptions of teachers about effective professional development practices for a one to one technology implementation? There are three supporting research questions. Supporting research questions include:

1. What do teachers perceive is effective training for software, hardware, and instructional practices?
2. Is professional development on using hardware, software, *or* professional development on implementing new instructional methods the most critical to teachers?
3. What methods of professional development are preferred by teachers?

Limitations/Delimitations

A delimitation of this study is the definition of a one to one technology program. A one to one technology program was defined as any school where each student has an internet-connected, wireless computing device for use in the classroom 24 hours a day, seven days a week, in any district building or grade level. Another delimitation of this study is the results were based upon teacher perception. The practices identified as the most effective were based upon teacher perception rather than a comparison of student achievement data. Future studies should address the effectiveness of professional development based upon student data.

There are four limitations of this study. This study does not define the grade levels implementing a one to one technology program. There were varying grade levels included in the results not addressed in the study. Determining grade levels implementing a one to one technology program as defined by this study and differentiating responses based upon those grade levels is an area for future study. This study did not address school size or financial status or any time period the one to one program had been in place in the district. This study did not address whether a teacher received professional development during the district's initial implementation of the one to one program or if the teacher moved into the district after the implementation of the district's one to one program. A future study should be conducted to determine if professional development needs differ if a teacher moves into the district after the initial implementation of the one to one program.

Chapter Two

Review of Related Literature

Introduction

The review of literature is separated into five sections. The first section will discuss the history of the one to one computing movement and address its necessity in the 21st century. The purpose of this section is to demonstrate how far the influx of technology has saturated society, the home and the workplace so the reader understands the need for technology penetration in schools.

The second section addresses the benefits and limitations of implementing a one to one program along with the effect of a one to one program on student achievement. The purpose of this section is to validate research has been completed on one to one implementations and there are both positive and negative results from one to one implementations. The reader will find positive and negligible results outweigh negative results making one to one implementations justified.

Section three of the review will discuss educational instructional practices. The purpose for this section is to show the need for differing instructional practices in a one to one environment. This section of research will focus on a description of 21st Century instructional strategies required for students to achieve 21st Century skills. A discussion of the history of transmission pedagogy and instruction through constructivist pedagogy will be presented and examples and explanations of 21st Century instructional practices will be delineated.

Section four of the review discusses change theory and best practices for implementing change in general and in an educational setting. The purpose is to show change issues must be

addressed before implementing a one to one program within the school and to show effective change theory and strategies.

The final review section discusses professional development theory, practices and strategies effective for human learning and then specific needs and requirements for teacher growth in a one to one program setting. This section will be used to analyze and describe the results of the one to one professional development survey.

History of One to One Computing

The Nation at Risk report, 21st Century Schools Initiatives and the No Child Left Behind Act have all been an impetus for utilizing technology in schools. Since the Nation at Risk report was released in 1983 startling the world with its information the United States would be left behind if educational institutions did not begin making considerable changes, including the utilization of technology in the classroom, technology has increasingly grown common in classrooms across the nation (Dufour & Marzano, 2011; Leech, 2010). The education industry has made a dramatic swing in philosophy about technology in recent years. In 1982, Harvard did not allow students to use a computer the size of a suitcase to take a test in fear students using the computers would have an advantage over other students (Koblentz, 2012). Today, students can use laptop computers, iPads and smartphones as a core instructional tool and one to one programs are being implemented across the United States from Maine to California and most states in between (Tomassini, 2012). Society is changing "four to five times faster than the rate of change in schools" has made it difficult to keep up with 21st Century teaching demands (Daggett, 2008, p. 10).

A review of the advent of technology in the schools shows rudimentary technology tools were first used in the 1790s with the invention of the chalkboard by James Pillans in Edinburgh,

Scotland. In 1937, the first photocopier was created and in 1982, the internet was standardized. Computer gaming was created in 1985 and Leapfrog published its first electronic book in 1995. Online learning became available in 1997 and the largest one to one program in the country began in 2001. In 2006, a school district first chose to drop traditional textbooks in favor of electronic sources, Apple created the iPad in 2010 and then in 2012, during the first ever Digital Learning Day, the United States Secretary of Education, Arne Duncan, challenged states to adopt digital textbooks within five years (Sapers, 2012). In 1995, Apple Computers was the first to put laptop computers into the classroom. Since then, the number of computers in the classroom has increased (Dunleavy, Dexter, & Heinecke, 2007).

With the increase in technology, changes in the industrialized world and the ever-expanding world, new terms and organizations related to technology have been created and are common place. The term "21st Century" has become a household word and is seen written in and referred to in many discussions about educational reform. The term is followed up by words such as 21st Century Skills or 21st Century Learning although other forms of the word are also used (Partnership for 21st Century Skills website, n.d.; Project RED Revolutionizing Education website, 2013).

There are now multiple associations, research organizations and standards created to address the use of and implementation of technology within the classroom and for students today. Some of these groups include The International Society for Technology in Education (ISTE), which wrote ISTE Standards for students, teachers, administrator and coaches, Partnership for 21st Century Skills, Project RED (Revolutionizing EDucation,) and in Missouri, the Missouri Educational Technology Leaders (METL) and the Missouri Education Technology Strategic Plan (METSP). The overall mission of these groups is to emphasize the need for the

incorporation of technology in education and to help make educational and instructional changes in schools across the country. These groups provide multiple areas of support to schools such as training webinars, support documents, blogs, state and national conferences and standards to guide focus and instruction (ISTE website, 2012; Missouri Educational Technology Leaders website, 2011; Partnership for 21st Century Skills website, n.d.; Project RED Revolutionizing Education website, 2013).

The Partnership for 21st Century Skills has written the Framework for 21st Century Learning identifying specific skills students need to be successful in the future. These skills include core academic knowledge and 21st century themes, learning and innovation skills including creativity and innovation, critical thinking and problem solving and communication and collaboration. Information, media and technology skills and life and career skills are also necessities in this framework. Support systems for the 21st Century framework have been delineated and include 21st Century standards, assessment of 21st Century skills, 21st Century curriculum and instruction, 21st Century professional development and 21st Century learning environments (*Framework*, 2009).

Common Core State Standards (CCSS) have been written and will change the course of education for the future through the written standards but also through technology. Common Core State Standards have been adopted by 45 states and three territories. Assessments are being written to be administered in an electronic format only. These electronic assessments are an impetus for school districts to improve and increase the equipment within their schools but also to improve instruction with technology tools (Common Core State Standards Initiative website, 2012). The SMARTER Balanced Assessment Consortium and Partnership for Assessment of Readiness for College and Careers (PARCC) are two consortiums that have agreed to write

electronic assessments of the CCSS entitled Next Generation Assessments. These two consortium have written technology specifications for schools and are currently working together to create a national technology survey to help states identify changes needed to be made within schools to be ready for the CCSS assessments in 2014-2015 (Smarter Balanced Assessment Consortium website, 2012). The CCSS and the Next Generation Assessments are game-changers in education.

There have been numerous studies, such as Bebell & Kay (2010), BuSchell (2012), and McNew (2008), on technology in schools but the speed technology has been adopted and integrated into education has been so rapid concrete data on one to one programs is not available. In Missouri, Tom Ogle, Director of School Core Data and Claranne Vogel, with the Office of Data System Management, stated there were no district statistics on the number of districts in Missouri having adopted a one to one initiative. (C. Vogel, personal communication, January 3, 2013; T. Ogle, personal communication, January 2, 2013). Jim Warford, Senior Advisor for the International Center for Leadership in Education, stated there are numerous studies and projects being conducted in the nation but he was unaware of any studies specific to determining the number of one to one programs in the country (J. Warford, personal communication, September 23, 2013).

One difficulty in determining the number of districts implementing a one to one initiative is the definition of a one to one initiative. One to one programs can be defined both broadly and narrowly. A broad definition of a one to one program is any district that has purchased electronic tools for all students K-12 with in-school use only or even a district allowing students to bring and use their own devices, known as Bring Your Own Device (BYOD). A narrower definition of a one to one program could be it is a district that has purchased an electronic tool,

with internet access, for student use 24 hours a day, seven days a week. The definition used as a basis for this research project is “a school in which each student and teacher has one Internet-connected wireless computing device for use both in the classroom and at home” ("ADS," 2008, p. 1). The use of the wireless computing device will be 24 hours, seven days a week.

Ubiquitous computing is also a term used in relation to education and technology. Webster’s Dictionary defines ubiquitous as “existing or being everywhere at the same time: constantly” ("Ubiquitous," n.d.). Both one to one technology and ubiquitous are used to reference technology in schools today and the broad aspect of each makes it difficult for a unified agreement on the definition.

Data is available indicating the strength of technology within schools districts. The 2011 Census of Technology for Missouri Schools K-12 indicate 93 percent of Missouri schools have T1 internet connectivity or higher, 405,992 computers were located in school buildings across the state with 94 percent of these located in instructional rooms. The amount budgeted for technology in Missouri in 2010-11 was a little over $148 million (*2011 Census*, 2012).

National statistics from the National Center from Education Statistics (NCES) 2009-2010 report indicated 55 percent of school districts enrolled students in distance education courses, up from 36 percent in 2002-2003 (Institute of Education Sciences [ies], 2011, table 110). Computers used in schools for instructional purposes rose from 5,621 in 1995 to over 15,000 in 2008. Internet access in school buildings increased from 8 percent in 1995 to 98 percent in 2008 (Institute of Education Sciences [ies], 2011, table 109). The percentage of students using a computer at school in 1993 was 60.1 percent increasing to 70.4 percent using computers in school in 1997 and 83.5 percent in 2003 (Institute of Education Sciences [ies], 2011, table 19). In its May, 2010, report, the United States Department of Education reported 97 percent of

teachers had one or more computers located in the classroom every day with the ratio of students to computers in the classroom 5.3 to 1. Teachers reported students used computers in the classroom during instructional time often, 40 percent, or sometimes, 29 percent (Gray, Thomas, Lewis, & Tice, 2010).

Today, most students have access to an electronic device such as a cell phone, ipod touch or MP3 player (Rogers, 2011). A study of African-American school-aged children showed most students spend an hour a day or two to three hours per week using the computer and most have internet access in their homes (Barrett, 2010). Over 420,000 people surveyed in the National Speak Up 2011 survey indicated a rise in the use of technology equipment and tools by students both outside of school and inside school. Outside of school, 59 percent of students in Grades 9-12 surveyed maintained a social networking site along with 48 percent of students in Grades 6-8. Fifty-six percent of students in Grades 9-12 and 45 percent of students in Grades 6-8 participated in online discussion boards, communities and chats and 30 percent of 6-12 graders used web tools for collaborative writing. One in five students used a mobile app to help with organizing schoolwork and 1 in 4 used a video found online to help with homework. Fifty percent of 9-12th graders own smartphones and 82 percent of students own an MP3 player. Over 70 percent of the respondents indicated they had fast internet access at home. Fifty-nine percent of students say they would use their own technology equipment in schools for educational purposes if allowed. Students would use these tools for research, communicating with others, accessing online textbooks, collaborating with classmates and videoing lessons for later use (Evans, 2011).

The Institute of Education Sciences (2011), 2011 Census (2012), and Lepicnik, Samec (2013) are examples of studies and reports showing an exponential rise in the use of technology in both personal and educational life. Children of today are digital natives. Schools today are

"accompanied by a generation of students more comfortable with tapping keys than turning pages" (McTighe, 2012, p. 1). Schools across the country are attempting to meet these challenges and the use of technology is increasing. According to the Summer 2013 Scholastic Administrator journal, "275,000 students attended fully online schools in 2011-2012" (Shein, 2013, p. 33). It is reported "2 out of 3 school districts in the United States currently offer some sort of online or blended-learning program" (Shein, 2013, p. 34).

Although few peer reviewed studies are available with current and concrete data showing how many school districts have implemented a one to one program, studies of the topic of one to one programs are available and increasing. Finally, Arne Duncan, United States Secretary of Education, was quoted as saying, "we should be moving from print to digital absolutely as fast as we can over the next couple of years. Textbooks should be obsolete" ("Rising," 2013, p. 37). With the rapid change in technology advancements, it is difficult to keep current information available concerning one to one programs.

Benefits and Limitations of One to One Computing

There are few avenues of life completely positive or completely negative so a balance is necessary. Technology integration and the implementation of one to one programs follow this philosophy. There are both benefits to implementing a one to one program and limitations to implementing a one to one program. There are currently more studies indicating a positive or null effect on student achievement than there is indicating technology integration and the implementation of a one to one program causes student achievement to decline.

Although there are some negative effects of a one to one implementation in school districts, one to one initiatives are so popular across the country many states are holding one to one conferences with hundreds of school personnel attending each year (Sauers, 2012). Across

the country, a Poll Position survey indicated 47 percent of Americans believe technology will have a positive effect on youth in the United States (Register, 2012). The popularity of one to one programs and the belief technology will have a positive effect on youth has been accompanied by a substantial amount of literature regarding one to one initiatives, touting its benefits and pitfalls. The literature varies from specific use of a tool or program to an overall view of technology in the classroom and the results are mixed depending upon the criteria being studied.

Identifying common studies to help validate the research of previous work is challenging because multiple variables can be studied or variables unrelated to the technology implementation can have an effect on the results of the study. One study conducted by Apple and Houghton Mifflin showed a 20 percent improvement in achievement for the students using technology with an accompanying electronic textbook versus the students who used traditional textbooks and learning materials. Nevertheless, the researchers agree this study was not without errors (Keim, 2012). Results of one to one studies are reported in multiple ways. Some research studies focus on success on standardized assessments, others on student engagement, others focus on reading and writing skills, and still other research reports focus on attendance or discipline. Multiple measures can be addressed when reviewing the literature so it is imperative to understand the data being reported. An overview of these areas was reviewed and the compilation of this data indicates the implementation of a one to one program had either a positive impact on student achievement or no impact on student achievement, with few studies indicating one to one programs had a negative impact on student achievement.

The first one-to-one project with Apple products was conducted in the state of Maine in 2002. Maine implemented a state-wide one to one initiative in its middle schools in conjunction

with the Maine Learning Technology Initiative (MLTI). Since that time, studies of the Maine implementation have been undertaken focusing specifically on student achievement in several disciplines. Research in Maine on the effect of one to one computing on student achievement in writing and science indicated student achievement and retention of content was higher in the students who used a personal laptop for instruction and completion of assignments and writing scores improved overall for students who used a computer to simply complete a project. This research indicates the one to one laptop initiative does have a positive effect on student achievement (Silvernail, 2009).

Improvement in student achievement and teacher practice due to a one to one technology program has been confirmed (Bebell & Kay, 2010). There is a belief the technology piece, used as a supplement to instruction, enhances the educational achievement of students ("School CIO," 2010). Other studies found student understanding lasted longer for students who utilized electronic media to learn (Chiu, 2010). In a survey of students who had taken online dual credit courses, personal development characteristics and online learning self-efficacy improved (Muhammad, 2011). Student roles in the classroom have changed in one to one environments from passive learners to active learners, taking ownership of their own learning (Stephens, 2012). In a study analyzing one to one handheld computers and mathematics instructions, student achievement improved (McNew, 2008). BuSchell (2012) report the impact on homes with a school-provided laptop indicated student self-efficacy and excitement was high and homework time increased and was more productive because computers were with the students daily, all day. Parents indicated the laptops reduced their stress levels dealing with homework (BuShell, 2012).

Other benefits of one to one laptop initiatives indicate the one to one program improved classroom engagement and participation, motivation and organization, along with improved

research, writing, and editing skills, increased student responsibility and increased communication with teachers and parents. In addition, gains were seen in math test scores of students using the laptops (Burgad, 2008; Marcum, 2010; Meyer, 2007). In a Florida research study on the impact of laptops on teaching practices results indicate the benefits of a one to one program are abundant (Dawson, Cavanaugh, & Ritzhaupt, 2006).

A meta-analysis of 156 research studies where less than half were characterized as peer reviewed studies, improvement in writing was found to have the largest increase in student achievement due to a one to one implementation. Other content areas showed either minimal improvements, no improvement due to the one to one implementation, or were not addressed in the study. This same study did show a probability of improvement in areas other than content including collaboration, student engagement and student motivation. Student technology use and literacy increased with one to one program implementations (Sell, Cornelius-White, Chang, McLean, & Roworth, 2012).

Analyzing the effect of a one to one program on all students has been examined by researchers. There are additional studies to evaluate the improvement on demographic characteristics due to a one to one implementation. Research studies comparing the effect of a one to one program on differing demographics indicate there is either an increase in student achievement with the use of the one to one program or no impact was seen on these demographic groups (Overall, 2007; Smith, 2012; Weber, 2012). Demographic groups analyzed in various studies included free and reduced lunch students compared with non-free and reduced lunch students, male students compared to female students, students with disabilities compared with students without disabilities, and white students compared to black students. In a study comparing the effect of the one to one program on closing achievement gaps of several

demographic populations, it was found the gap between female and male scores on an End of Course English 1 and Algebra 1 test had closed yet no evidence was found the gap between white and black students or the gap between limited English proficient students and non-limited English proficient students had closed (Smith, 2012).

The effect of one to one technology on mathematics and literacy achievement has been studied. One to one calculator usage had a positive effect on mathematics performance for both boys and girls while one to one laptop usage had no direct relationship to mathematics achievement (Overall, 2007). The achievement gap in eighth grade literacy declined for students eligible for free and reduced lunch and students not eligible for free and reduced lunch due to a one to one laptop program (Weber, 2012). Consistent studies of the same demographic area are not available but current studies of the effect of one to one programs on different demographic populations indicate variability in the results.

Both a positive and negative effect of a one to one technology program on student achievement has been found (Bebell & O'Dwyer, 2010; Weber, 2012) Although there are multiple studies indicating a positive relationship in various aspects of student achievement due to a one to one initiative, other studies have found no significant differences in the implementation and use of one to one programs and student achievement or a decline in student achievement in a one to one implementation. In a study of one to one use of a laptop in online dual enrollment courses, results indicated there was no measurable impact on student performance or participation (Muhammad, 2011). When comparing demographic differences in students participating in a one to one laptop program, there was no difference in achievement between free and reduced lunch students and non-free and reduced lunch students. In addition, there was a decrease in national percentile rank scores in standardized achievement tests (Weers,

2012). In a whiteboard technology usage study, Campbell (2010) found no significant difference in mathematics achievement by those who had been taught using the whiteboard. In an additional study comparing white board usage with student achievement on end of course assessments, students reported being satisfied with white board instruction but only one academic area tested showed improvement (Evans, 2010).

Although there was an increase seen in mathematics achievement in a laptop initiative in North Dakota, the same study found there was a significant negative difference in reading and language arts of junior and senior students using the laptop (Burgad, 2008). The effect of one to one computing on student achievement in a middle school environment found the one to one environment did not have any effect on student achievement (Jamison, 2008). In each case of either improved student achievement, consistent student achievement or a decline in student achievement, circumstances behind the implementation of the one to one program had an effect on the results of the studies.

Concerns are abundant when discussing a one to one initiative focusing around time on task and appropriate use of the computers, cost, socialization factors, teacher preparation and student achievement on standardized assessments. Parents have indicated concerns over one to one technology initiatives. A qualitative study conducted in 2008 on the use of one to one technology indicated parental involvement improved and a majority of parents were pleased their child was able to learn with the computer. There were other parents who indicated they were worried laptop use was negating their child's educational experience and was detrimental to the health of their child because of too much time on the computer (Lei & Zhao, 2008). A New York Times article reported a school in Liverpool, New York, had suspended its use of laptops

because it did not see any gains in student achievement after seven years. Teachers felt students had not used the laptops appropriately and felt the laptop got in the way of education (Hu, 2007).

Project RED research indicates "that properly implemented educational technology leads to improved student outcome" (Greaves et al., 2012, p 23). Without proper implementation of a one to one program, teacher understanding and self-efficacy in a one to one environment can lead to dire consequences. In a study on teacher and administrator perceptions of technology use in the classroom, researchers found teachers feared technology use could lead to student distraction and a lack of content retention (Marcum, 2010). Teachers in many districts choose not to use technology because they do not understand how to use it, integrate it and make it a meaningful part of their instruction (Brown-Joseph, 2010). The lack of knowledge and lack of self-efficacy can lead to other problems such as understanding how to check student work on computers rather than on paper (Berry & Wintle, 2009). This communication challenge can also pose issues with communication between and among teachers (Donlevie, 2011).

Teachers are moving toward replacing textbooks for digital content. Challenges with this change include the quality of the content found by teachers and the frequency teachers must continue the search for new, updated content. Teachers must have the expertise to determine the best resources and then the time and energy in order to continue finding updated resources (Drayton, Falk, Stroud, Hobbs, & Hammerman, 2010; Schaffhauser, 2012). Without teacher professional development, the one to one equipment will not be used or it will be used ineffectively (Tomassini, 2012).

The cost to move to a one to one program can be daunting and there are reports indicating the move to a one to one program is both financially prudent and fiscally irresponsible. When moving to the purchase of digital textbooks, initial reports indicated it would be less expensive to

move to an iPad with online textbook software but later information surfaced it was actually three to five times more costly than the traditional paperback textbook (Tomassini, 2012). The acquisition of an iPad can improve student achievement but if its applications (apps) are used only as a supplement to instruction, it will not improve student achievement (Norris & Soloway, 2012). Project RED research indicates the cost savings can be found in a one to one program with the proper implementation (Greaves et al., 2012). There is difficulty in determining if cost savings can be guaranteed in a one to one implementation due to the varying methods one to one programs are initiated and the procedures budgeting is done in various school districts (Sell et al., 2012).

Student cheating can be an issue in a ubiquitous setting. The computer has made access to essays, math answers, and quizzes much easier to access (Keilman, 2012). Teachers have uncertainty about the amount of electronic information available for student access, the accuracy of the information available, and how to tell if the work is from the student or from an outside source. Teachers also are uncertain about breaking the old tradition of memorizing facts versus allowing students to access outside sources for the information. Cell phones and computers give students easy and quick access to information once difficult to acquire. Students can now text answers immediately across a room or store answers to test questions within their smartphones (Pheifer, 2009). Teachers will need to feel comfortable with student cheating issues before fully buying into the implementation of a one to one program.

The benefits and limitations of a one to one program are numerous and varied. There is a lack of consistent, peer reviewed research on the same aspect of one to one programs. When looking at various research available, most studies indicate there is an improvement in student achievement or factors such as attendance, motivation, and collaboration, or there is insufficient

evidence to indicate student achievement had been impacted (BuShell, 2012; Dawson et al., 2006; McNew, 2008; Muhammad, 2011; Weers, 2012). There is evidence indicating student achievement can decline but that evidence is not as abundant. Proper implementation is a key to one to one implementations and an increase in student achievement and a change in instructional practices of teachers is a necessity.

Instructional Strategies in a One to One Environment

Changing instructional practices is a necessity if student achievement will be improved in the 21st Century. Educators must focus on training and teaching students using pedagogically different strategies and methods because "we live in a world that is mass customizing nearly all products and services" (Schwahn & McGarvey, 2011, p. 34). The mere use of technology in instruction does not, alone, ensure increased student achievement. Research indicates without 21st Century instructional strategies in place, students can and are taught in a traditional manner (Sullivan, 2011).

Instruction by teachers using traditional methods will not increase student achievement and could likely decrease student achievement. In two different studies of the use of interactive whiteboards, researchers found instruction was traditional in nature with the teachers disseminating much of the knowledge. Results indicated "high levels of teacher technology use were associated with lower levels of student engagement" (Bielefeldt, 2012, p. 219). Other research on the use of interactive whiteboards indicated students were not actively engaged in the process of learning when teachers utilized the board. Students should utilize the interactive white board in order for their learning to be active (Turel & Johnson, 2012).

Among concerns of implementing a one to one environment, keeping the attention of students when they use electronic devices is paramount. The device itself could easily be used to

disengage learners. Instruction in one to one classrooms must be such that distractions are not caused by the technology and use of computers. Students can easily be distracted by having "the world at their fingertips" so teachers will have to use strategies to keep distractions at bay. Research shows strategies for diminishing distractions include incorporating projects students enjoy as well as giving relevant, challenging assignments (Tagsold, 2012). It is difficult to incorporate these types of projects in a traditional classroom setting.

Teachers usually instruct as they were taught and as they learned throughout their pre-service education. The type of instruction used for many years and before technology was introduced is known as Transmission pedagogy. Transmission pedagogy was derived from the Industrial Revolution where teachers were the deliverers of all knowledge while students received the knowledge and repeated it to show their understanding (Stephens, 2012). Transmission theory states knowledge is being transferred from the teacher to the student, leaving the student as the passive learner, doing nothing more than memorizing the facts given. 21st Century learners must do much more than memorize facts as the Framework for 21st Century Skills articulates (*Framework*, 2009). Students must take ownership of their learning and be doing the work, rather than the teacher doing all the work for the passive student (Carpenter & Pease, 2012). Classrooms of the 21st Century must move from being centered on the teacher to being student-led and directed (Mehta & Fine, 2012).

Instructional strategies for the 21st Century focus on shifting the classroom from teacher-centered to student-centered. Technology is making the school a learning environment rather than a teaching environment by allowing students to learn in their own relevant and personal way, not just through the instructor (Kollie, 2011). The era of personal computing has allowed learning to take a personal approach, or become student-centered, and each student can learn

through multiple means and may sometimes become the teacher to the classroom instructor. Teachers must become the facilitator in the classroom and allow students to be the "teachers" to themselves and others.

Student needs of the 21st Century such as critical thinking, problem-solving, collaboration, and technology skills will not only change instruction but the school building as well. Traditional classrooms use transmission pedagogy and are traditionally configured in rows of chairs, all facing the front, to view the teacher. To meet the needs of the 21st Century learner, even school classroom configurations will change. Classroom organization is moving away from traditional rows and adding tables, to facilitate grouping and collaboration as well as adding electrical outlets to facilitate the use of technology (Kollie, 2011). Changes in classroom configuration will make it easier and enable teachers to create student-centered classrooms rather than teacher-centered classrooms. The reconfiguration of classrooms will make the shift to student-centered classrooms possible and necessary.

Relevance, communication skills and problem-solving are key pieces to the 21st Century classroom. Twenty-first Century Skills require teachers make the content relevant throughout all content areas, develop thinking skills, encourage learning transfer, teach students how to learn, address misunderstandings, promote teamwork, utilize technology, and foster creativity (Saavedra & Opfer, 2012). For students to be successful in the 21st Century, they must be able to communicate effectively through personal means as well as through technology (Alber, 2013).

> Our present assembly line organizational structure doesn't encourage, nor allow, teachers to act on individual learning needs, respond to individual learning styles, or to teach a concept or a skill using content of interest to the learner. Until we are able to meet learners at their personal need level in these three basic

categories, it will be difficult to think of our work as a profession (Schwahn & McGarvey, 2011, p. 31).

Students learn best when presented with information in a way containing meaning. Teachers must assess background knowledge of the students and student backgrounds including what they believe and understand to be true in order to facilitate the greatest amount of learning (Churchill, 2010). Learning must be personal and have meaning and relevance to students in order for achievement to be realized at its full potential (Richardson, 2012). With the shift in instruction and different classroom designs, students will be able to enter the world prepared (Ejiwale, 2012).

Research is available indicating effective learning in the 21st Century classroom requires the classroom to be student-centered through the use of relevance, cooperation, problem-solving and personal ownership (Carpenter & Pease, 2012; Culatta, 2012; Goldstein, 2010). The constructivist theory is the means teachers can implement these requirements. Teachers can shift from using transmission pedagogy to 21st Century instructional strategies through the theory of constructivism. Constructivist strategies for an effective one to one implementation include using gaming techniques, collaboration and cooperative learning, Problem-Based Learning, Project-Based Learning and Inquiry.

Constructivism is being used today in technology-rich classrooms, which allows students to achieve at their highest potential. The constructivist theory of learning is an active process in which learners construct new ideas or concepts based upon their current or past knowledge (Bruner, 2012). The constructivist theory fosters relevance for students and this relevance is an important reason the constructivist theory is effective in improving student achievement (Bas, 2012). The constructivist theory of instruction makes students active learners rather than passive

observers. Students are not given answers but are asked to ascertain answers to problems on their own.

Research shows students learn best as active learners in the process of learning (Culatta, 2012; Goldstein, 2010;). Teachers in a one to one environment are increasingly using a constructive approach to instruction for the technology use to be effective in improving interest, motivation and relevance to students so student achievement improves (Pogany, 2009). In studies of effective one to one initiatives, teachers were found to have constructivist methods more often than traditional transmission methods (Brodzik, 2012; Stephens, 2012). Stephens (2012) indicated in "full one to one implementations," teachers reported that constructivist methods such as "student grouping for instruction, instructional strategies, instructional content/subject matter" were used more often than traditional transmission pedagogy (pg. 28).

Teachers become facilitators of learning, rather than the deliverer of all knowledge in a constructivist classroom. In a constructivist learning environment, both students and teachers participate in instruction. Teachers should enhance the learning environment by creating active learning situations in a variety of methods while holding students accountable for their work. Teachers should use and evaluate data to improve instruction and foster creativity and individuality in their students. Students must also be independent learners who take ownership of their own learning. Students should give the teacher feedback on instruction, rubrics and assignments, work collaboratively with their peers and assume leadership roles in the classroom (Carpenter & Pease, 2012). When using the constructivist approach in an online, cloud-based format, instructors and students can work together to solve problems nearly simultaneously through group projects, peer assessment, student constructed presentations and simultaneous

collaborative classroom discussions. Constructivism in an online, cloud-based approach opens various opportunities for instruction to be student centered and relevant (Denton, 2012).

There are several different strategies for teaching in a 21st Century constructivist classroom. Gaming, problem-based learning, project-based learning, collaboration, cooperative learning, and inquiry are effective strategies for instruction. Gaming is seen as an effective tool for motivating students, making content relevant, and for helping students continue working at a task until their goal is met. Games can also be used as assessments for teaching, alleviating teachers from the pressure of creating additional tests and allowing students the freedom to show their knowledge in a manner relevant for them (Phillips & Popovic, 2012). Constructivist theory fosters relevance for students and this relevance is an important reason the constructivist theory is effective in improving student achievement (Bas, 2012; Sultan, Woods, & Koo, 2011).

Problem-Based Learning and Project-Based Learning are similar instructional methods but differ in specific ways. Both Problem-Based Learning and Project-Based Learning use collaboration with peers to solve issues or problems but they differ. Problem-Based Learning focuses on solving a particular problem and does not take an extended period of time. Problems in Problem-Based Learning are generally chosen by the teacher and given to students to answer. Students will write a problem statement, create a solution and present their findings (Education World, n.d.).

Project-Based Learning focuses on the real world and is usually specific to the interest of students. Project-Based Learning focuses on an interest of the students they wish to solve and lasts for an extended period of time. Students will create a project or presentation to show others (Education World, n.d.; McLeod, 2012). Problem-Based Learning has been used when integrating technology in instruction by increasing relevance through real-world examples and

problems without one specific answer. Students can create their own problems and then must solve the problem through collaboration and a sense of ownership for the problem itself (DeGallow, n.d.; "Instructional," n.d.) In many cases, teachers successfully use project-based learning using technology tools (Malcolm-Bell, 2010; Mehta & Fine, 2012). Problem-Based Learning and Project-Based Learning are both excellent instructional techniques for making learning relevant.

Collaboration among staff, such as Professional Learning Communities, and collaboration of students, such as cooperative learning strategies, has been promoted for many years as effective strategies for student achievement. The effectiveness of collaboration and cooperative learning is also seen in effective one to one programs (Sell et al., 2012). Merriam-Webster's Dictionary defines collaboration as "to work jointly with others or together especially in an intellectual endeavor" ("Collaborate," n.d.). Cooperative learning is a method of collaborative learning where students work together on a specific project or topic. Students utilize peers or other students to act as leaders or facilitators in the project. Cooperative learning helps improve interpersonal and communication skills of students ("Cooperative," 2004). Teachers should have a varied repertoire of cooperative learning strategies to gain the most benefit from collaboration.

Inquiry-Based instruction is another instructional strategy teachers can use to bring relevance into the classroom to meet the needs of the 21st Century learner. Inquiry-based instruction focuses on having students investigate real-world problems thus improving student thinking skills, problem-solving and analysis. Teachers who use inquiry-based instruction promote a student-centered classroom and give up their own role as the leader of the class.

Using inquiry-based instructional methods increases student ownership of his or her own learning and facilitates student problem-solving, thinking and reasoning skills ("Inquiry," n.d.).

There are multiple instructional strategies teachers use to help students learn but not one strategy is guaranteed to work for all students (Carpenter & Pease, 2012). "Even strategies that have a solid research base supporting their effectiveness are likely to be found ineffective by a substantial number of other studies assessing the impact of those same strategies" (Dufour & Marzano, 2011, p. 141). Strategies have been identified that are more effective for teaching students 21st Century skills in a one to one environment. It is the teachers' job to find and use the instructional strategies most useful for each student (Carpenter & Pease, 2012). Teachers who use a multiple number of instructional strategies and have high self-efficacy have higher student achievement. No one strategy of instruction works for all students (Jeck, 2010). The use of a combination of 21st Century instructional strategies can be used to make the classroom student-centered and relevant.

Teachers can attend training on technology and instructional strategies but may have trouble implementing a one to one program because their pedagogical belief systems hold them back from utilizing the strategies in a one to one environment. Daggett says, "many teachers do not perceive themselves as facilitators of learning. They have been conditioned to see their roles as disseminators of knowledge, usually in only one discipline" (Daggett, 2012, p. 244). Teachers must have their basic belief systems about instruction challenged to facilitate 21st Century instructional methods. This change will require substantial professional development for teachers still using the transmission, or traditional, method of instruction. The use of constructivism in the one to one classroom will provide students with the 21st Century skills needed to improve student achievement.

Change Theory for Professional Development

The implementation of a one to one program requires change in all aspects of the school setting. Change will happen from the infrastructure of the school system to the way classrooms are arranged, to the way students learn and do homework, to the way teachers instruct. Parents will also experience change in the way their child is taught and learns and this is unusual and unnerving for parents who learned in a different manner. Teachers, students and parents will all experience change with the implementation of a one to one program and change is difficult for most (Bolman & Deal, 2008; Reeves, 2009). Niles (2006), discovered six teacher and classroom changes within a one to one implementation.

> (1) Students functioned in the capacity of teacher, (2) technology changed the way teachers and students communicated, (3) the culture of the classroom dynamics between teacher and student changed, (4) technology made learning enjoyable for students, (5) teachers and students believed immersion in a technology-rich learning environment created advantages for student success after high school graduation, and (6) teachers believed access to ubiquitous technology created new challenges for maintaining student engagement in the learning process (p. viii).

Leaders should have a good understanding and use of research-based change strategies to gain the buy-in of teachers to the one to one implementation. Teachers must be committed to the one to one initiative before true change can happen and student achievement is realized.

Attempts at change fail for many reasons. Implementing change without first understanding the beliefs and structure of the organization and human capital is a primary reason change fails. Doug Reeves says quality teachers in every classroom is unrivaled and therefore,

human capital is the number one entity that will either make or break a change movement. Without addressing human needs, wants and desires, change initiatives will fail (Reeves, 2009). Humans have their own way of seeing reality and this "mental model" must be determined for each employee. Mental models must be recognized, understood and addressed by both the leadership and each employee when implementing change. Mental models are the beliefs and structures people hold and without facing this reality, change will fail (Bolman & Deal, 2008; Dweck, 2006; Senge, 1990).

Change causes people to lose their past and delve into the unknown. "The past shapes our aspirations for and orientations to change in the present and the future" (Hargreaves & Shirley, 2009, Pg. 3). Change is intimidating and fear of the unknown encourages resistance to the change. Change is loss and leaders must not only understand this fact but also allow the grief cycle to happen in order for the change to become effective and move teachers from compliance to an initiative to commitment to the change (Bolman & Deal, 2008; Reeves, 2009). Change agents should start the change process by focusing on the core belief systems of those they are asking to change because core beliefs can stifle change if not addressed (Jeck, 2010).

Effective change requires leaders to look at their organization through different perspectives or lenses to determine how to most appropriately instigate change. There are four separate lenses that can be viewed called frames. These frames give the leader a view of the organization through multiple vantage points to develop a holistic picture of the organization. The frames are known as the Structural frame, Human Resource frame, Political frame and the Symbolic frame. Each frame has its own meaning and can speak volumes for an organization. Frames can be addressed separately but it is best to address all of them when implementing change. Effective leaders look through each frame to accurately define a situation, constantly

reframe when new information is added and consciously break their own personal mental model, and use strategies from all four frames to develop strategies to address the situation and make organizational change (Bolman & Deal, 2008).

The Structural frame focuses on analysis and design of the organization including the organization's environment and adaptations. The Human Resource frame focuses on the people within the organization along with their beliefs and actions. The Political frame looks at political reality of the organization and its interest groups and major constituencies. The Symbolic frame views the long-held belief systems and "feelings" of the organization. This frame deals with the belief there is no need to change if the item being changed has been in place for many years and there are no perceived problems. In order to initiate change in teachers and an institution, each of these frames must be dealt with effectively (Bolman & Deal, 2008).

Michael Fullan (2010) says to make change simple by finding the smallest number of high leverage, easy-to-understand actions giving the most powerful consequences. Fullan (2010) says there are nine methods for change. These methods include building and using relationships first and being aware of the implementation dip. After every change, there is a dip in success and morale due to the stress of taking the organization and staff out of their comfort zones. This dip should subside in about six months. Leaders should be aware of over-planning and should strategically focus on specific priorities while not expecting commitment before compliance. Teachers need to see what the change will look like before they will believe it will be effective.

Leaders must communicate with their staff on a regular and timely basis. Announcing the change, expecting others to adopt the change, and walking away is easy but effective leaders must stay in communication throughout the change. Use the success and failures of others in the implementation process to make changes or strengthen methods during implementation. Look

for small, early successes to keep motivation high. Leaders should take risks and encourage staff to take risks and learn from the mistakes along the way. Finally, effective leaders find important initiatives and are assertive in ensuring the change takes place (Fullan, 2010). Reeves (2009) concurs with Fullan and states leadership creating effective change will create short-term wins, recognize effective practices throughout the year, emphasize effectiveness rather than popularity and make the case for change based upon a moral imperative rather than compliance (Reeves, 2009).

In order for change to be effective, the institution should first have strong leadership with knowledge of change strategies, a vision and be able to promote the vision to the staff (Hargreaves & Shirley, 2009; "Leadership," n.d.; Lessel, 2011; Sarkissian, n.d.). A plan should be in place for the future and leadership should determine what will stay the same as well as what can be removed from the plates of the stakeholders. Removing current initiatives makes the incoming change more palatable but also releases time for the new change initiative (Reeves, 2009).

Effective leaders will look at the context and capacity of the change and have commitment and follow-through with the change initiative. The context of change takes stock of the current surroundings of the institution while the capacity of change takes stock of the ability for the institution to change (Rutherford, 2009). Stakeholders should be a part of the decision-making before and during the change process (Lessel, 2011). Stakeholders involved should be those having high influence with the remaining staff. Leaders should initially show a need for the change before stakeholders will accept the change and should then work to ensure the change affects the culture of the district (Kotter, 2007). Finally, in all change initiatives, professional development should be provided (Lessel, 2011; Reeves, 2009).

Change is challenging in a one to one implementation due to the many aspects of the education system that will be different. Learning to use technology hardware and software alone will be an endeavor in and of itself, but educators will also need to be willing to be open-minded and change instructional methods and possibly long-held belief about instruction. Administrators responsible for implementing a one to one program must use the change literature available to provide for the smoothest transition possible. Changing the core beliefs of teachers and gaining buy-in to the one to one implementation must be addressed when planning for professional development (Sell et al., 2012).

Professional Development and Professional Learning

Effective professional development for teachers is imperative in school districts today for the sustainability and success of the organization and its students and especially in one to one initiatives. Professional development practices and strategies have evolved over time based upon research. Effective Professional Development today is known as Professional Learning and is collaborative in nature, uses data to make decisions, focused on student achievement, job-embedded, sustained, and has high-quality leadership. The LearningForward organization published national standards for professional development and multiple publications about professional development (Learning Forward website, 2014). Both the national standards and research concur with each other on the most effective professional development for today's schools.

The need for professional development and the definition of professional development has been a focus for many years. The Missouri Excellence in Education Act of 1985, the Outstanding Schools Act of 1993 and the 2005 Missouri Senate Bill 287 each state the importance of professional development in Missouri schools and require funds be designated to

professional development in school systems (*MO PD Guidelines*, 2006). Missouri state teacher certification requirements include consistent professional development as criteria for state certification. Missouri teacher certification requires teachers participate in a minimum number of professional development hours each year to maintain teaching certification (*Required PD*, 2012).

Professional development was originally focused on short-term, one-time workshops. Teachers attended the workshops and returned to teaching without ever sharing the new knowledge with others. Professional development was either given out by administration or teachers attended training based upon their own needs and interests. Professional development was random and scattered with no evaluation of results of the professional development on student achievement. Professional development has evolved so collaboration with others, the use of data to make decisions, and evaluation of the professional development based upon student achievement are believed to be some of the most effective methods of providing professional development for teachers (Crow, 2011; *MO PD Guidelines*, 2006).

There have been several definitions of professional development throughout history and along with the changes in the definition of professional development, the name for Professional Development has been changed. Professional Development is now known as Professional Learning by the Learning Forward organization, formerly known as the National Staff Development Council. The Professional Development term was changed to Professional Learning to change the focus of professional development from top-down approaches to a collaborative and personal approach to professional development (Crow, 2011).

The Learning Forward organization is in its third revision of writing national professional development standards. The first version was published in 1995. The second revision was

published in 2001 and the third revision was published in 2011. The third revision makes a pointed effort to change the focus of professional development from being district-centered with a top-down administrative approach to an individual, personal approach to professional development. It places the teacher in a collaborative relationship with the administration where both, together, determine the most effective learning strategies the teacher needs to make the biggest impact on student achievement in the classroom. The newly defined emphasis in professional development places the importance on the learning of the educator rather than on training. The term for professional learning was changed because of this focus (Crow, 2011).

The third version of the Learning Forward standards is known as the Standards for Professional Learning (Crow, 2011). The standards are focused around seven key areas. These include the necessity for learning communities, effective leadership, sufficient resources, the use of data in decision-making, the design of the professional learning, the implementation of the professional learning and the necessity of aligning outcomes with educator performance and curriculum standards (Crow, 2011, p. 62-63). Each one of the Learning Forward Standards has a specific purpose and combined, makes up high-quality professional learning.

The meaning of each standard is described as follows. The focus on learning communities revolves around the teacher taking the initiative for ongoing professional development in a collaborative environment through Professional Learning Communities with an emphasis on student needs. The effective leadership strand of the Learning Forward Standards emphasizes teachers taking a leadership role through professional learning by committing to their own professional learning, understanding the seven standards and helping others understand and desire to commit to them as well. Within the resource standard, the teacher articulates and defines necessary resources for learning, implements the resources and monitors their use. The

standard surrounding the use of data in decision-making requires teachers to use and analyze multiple pieces of data to determine the needs of the students and define the professional learning needed to meet those needs (Crow, 2011).

The Learning Designs Standard requires teachers to understand multiple learning designs and determine which learning design is best for professional needs. Teachers then work collaboratively with others to explain and help implement the learning design. The Implementation Standard looks at the level in which teachers participate in professional learning and support other teachers in the implementation by accepting and giving constructive feedback. The Outcomes Strand focuses teachers on using multiple sources of data to determine the effectiveness of the professional learning on the teacher and the student. This is done both individually and in collaboration with others (LearningForward, 2012). These seven standards are each different yet built tightly around the philosophy of continually learning teachers in a collaborative environment.

Professional development is needed for teachers to become successful in improving student achievement. Besides the focus on professional development and the evolution of professional development over the last 20 years, there are numerous other studies indicating professional development is key to improved student achievement. Quality professional learning has also been defined by other researchers and the concepts can be found built into the LearningForward standards. Brodzik (2012) defines professional learning as "job-embedded, student-centered, collegial, ongoing, and meta-cognitive" (pg. 54). Effective professional learning happens when teachers intrinsically have a need for professional development. Professional learning is the duty of administrators to facilitate that decision on the part of teachers as seen in Strand 2 of the Learning Forward Standards. The teacher should then choose

the professional learning they need with guidance from administrators. Effective professional development must push the comfort level of teachers so care should be taken when allowing teachers to choose their own professional development.

Teachers are the most important factor in the classroom so time and finances should be spent on effective professional development in order to improve student achievement (Devaney, 2012). Teachers should be the first priority when implementing change. Professional development funds expended on teachers will reap more benefits than ignoring staff and focusing on the change itself (Neudecker, 2012). Professional development using a long-term approach, fared better than professional development where the implementation was rushed and inadequate. Research by ISTE indicates the most effective professional development is job-embedded, "…technology-rich, delivered through a coaching model and enhanced by the power of community and social learning" (Beglau et al., 2011, p. 2).

Numerous studies indicate high quality professional development is required to have an effective one to one implementation improving student achievement (Brown-Joseph, 2010; Fahser-Herro, 2010; Hertzler, 2010; Naffziger, 2012; Pogany, 2009). Teachers must have a high knowledge of technical practices and effective instructional methods. Research states professional development must be ongoing and comprehensive, with technical support, for teachers to improve their teaching practices in a one to one setting (Danielsen, 2009; Goldstein, 2010; "Research," n.d.; Stephens, 2012). In a one to one environment, teachers must be willing to address and change their deeply held belief systems, learn new technologies and change the way of instruction in the classroom (Gardner, 2011; Mehta & Fine, 2012; Ozer Kendig, 2010). Teachers must be given time to focus on the requirements of a one to one classroom and the role reversal of teacher and student and learn to become the facilitator in the room (Drayton et al.,

2010). Professional development that addresses the core belief systems of teachers and is relevant, collaborative, job-embedded and includes the support of technical staff will be more effective than professional development that does not address these issues (Sell et al., 2012, p. 22). Professional development for one to one initiatives must also be ongoing, collaborative in nature and project-based and data should be generated and evaluated (Sockman, 2007).

Without professional development in the implementation of a one to one program, the initiative will languish or fail. The implementation of professional development for both teachers and students is an integral and pivotal part of the one to one technology initiative (Brodzik, 2012; Sockman, 2007; Stephens, 2012). The lack of professional development given, time allotted for professional development, logistics and lack of emphasis on professional development are major obstacles to successful one to one implementations (Silvernail & Lane, 2004). In the Maine Learning Technology Initiative, professional development was determined as the necessary piece to a successful implementation of the one to one program (Silvernail, 2009). It was noted teachers with more professional development on implementing a one to one program utilized technology in the classroom more often than those with less professional development (Brodzik, 2012; Silvernail & Lane, 2004). Without effective professional development, teacher efficacy in the implementation of one to one technologies is low, rendering the initiative unsuccessful (Wooldridge, 2009).

In the One Laptop Per Child program in Birmingham, Alabama, students and teachers were given laptops for use but without professional development or guidance for either group. The computers ended up not being used as expected (Keim, 2012). When comparing teachers who received professional development with teachers who did not receive professional development when implementing a one to one program, the teachers who received professional

development improved their knowledge of technology and teaching strategies and felt confident they could implement the program successfully. Teachers in the same study who did not receive professional development felt confident they would be successful in using the technology but indicated they would use technology in a manner they were accustomed, not changing their basic instructional strategies or practices in the classroom (Weaver, 2012).

Teachers and students need strategies to effectively utilize the electronic tool to ensure it is used for educational means rather than as the latest "toy" or educational distraction ("School CIO," 2010). Research indicates the need for effective professional development is non-negotiable in a one to one implementation.

Nearly each definition of professional learning includes the need for collaboration. Collaboration is so important to student success leaders should allocate time in the day for collaboration (Reeves, 2009). This is because "teachers learn best from other teachers" (Erickson, 2012, p. 2). Research indicates collaboration is effective in improving the overall culture of a district and its student achievement. Professional development or professional learning definitions agree professional learning must be ongoing and collaborative, intrinsically motivating and focused on student achievement (Besser et al., 2010; Locke, 2012; Reeves, 2010). Collaboration is defined by the Leadership and Learning Center as "the pairing of at least two brains, hearts, and sets of eyes and ears that translate data into decisions" (Besser et al., 2008, p. 2).

Professional collaboration can be a challenge for teachers who are used to working in isolation. Research on one to one implementations indicates collaboration is vital for the successful implementation of the one to one program (Chandrasekhar, 2009; Sockman, 2007). Research indicates in one to one implementations where teachers did not participate in

collaborative groups or did not understand the process or the philosophy, implementation of the program was not high (Leech, 2010; Ryan Ball, 2010). The philosophy of professional learning through PLCs and collaboration is vital for the success of America's schools. Instead of looking for new teachers, high quality professional learning can be used to train current teachers to meet the needs of the 21st Century students (Allison et al., 2011).

Professional Learning Communities (PLC) are being implemented in educational settings across the country and are based around teacher collaboration. A PLC is defined in various ways but each definition is in keeping with the definitions of professional development. A PLC is professional development in a group setting or "community of practice" and is effective for teacher growth (Stephens, 2012). Marzano and Dufour (2011) say the most effective strategy for improving schools is building the capacity of teachers through the PLC philosophy and define it as "a concept based on the premise that if students are to learn at higher levels, processes must be in place to ensure the ongoing, job-embedded learning of the adults who serve them (p. 20).

Research indicates the highest performing schools have processes where PLCs are in place and they follow a cycle of inquiry using data in order to ensure student success (Hattie & Reeves, 2011, location 1299). An effective PLC focuses on learning through a collaborative culture while being results oriented (Dufour & Marzano, 2011). A PLC is more than teachers collaborating together. In a complete implementation of PLC, collaborative groups can consistently articulate the vision, using it to guide decisions. Professional Learning Community groups believe all students can learn, there is shared decision-making, collaboration is seen daily with teachers working with each other to determine how to best help students and multiple data is used to make decisions with a focus on results. Full implementation of a PLC should take place in order to see student achievement improve (*"Missouri"*, n.d., p. 2).

Literature about the one to one initiative is abundant and there is information that suggests with professional development and proper usage of one to one technology, student achievement is improved (Silvernail, 2009). Professional development is an integral part of effective one to one programs and must be in place for effective implementation.

Summary

Chapter II outlined the research available on the implementation of one to one technology. The chapter was divided into five sections with topics from the history of technology integration and one to one implementations, the pros and cons of one to one implementations, learning strategies in a one to one implementation, strategies for implementing change and literature on professional learning strategies. Literature was reviewed in each section articulating the explosion in technology use and implementations of one to one programs, the necessity to change instructional methods to meet the needs of the 21st century student and specific strategies for implementing change. Finally, the discussion of professional development centered around the LearningForward Standards and collaboration.

Chapter Three

Research Design and Methodology

Introduction

The chapter on methodology discusses the overall procedures used to conduct this study. Research design including participants, questionnaire, teacher survey, consent, and selection and sampling are discussed. The pilot survey and the final survey are analyzed and reviewed for validity and reliability. An extensive review of validity and reliability results is discussed.

Professional development is an integral part of the successful implementation of a one to one technology program in school districts (Stephens, 2012). This study focused on professional development practices in school districts relating to a one to one implementation and the overarching research question was what are the perceptions of teachers about effective professional development practices for a one to one technology implementation? There were three supporting research questions. Supporting research questions included:

1. What do teachers perceive is effective training for software, hardware, and instructional practices?
2. Is professional development on using hardware, software, *or* professional development on implementing new instructional methods the most critical to teachers?
3. What methods of professional development are preferred by teachers?

Research Design

A survey instrument was created to assess the perceptions of teachers concerning their beliefs about professional development practices in relation to their one to one technology

implementation. The survey was sent to Missouri teachers working in an identified one to one technology program.

Prior to dissemination of the teacher survey, Missouri school districts with one to one technology programs were identified. The Missouri Department of Elementary and Secondary Education did not have documented the number of school districts in Missouri which had implemented a one to one program so a questionnaire was created to make the determination. All 563 Missouri school districts with a state county/district code were emailed an explanatory letter and questionnaire asking if the district met the one to one definition defined by this study (see Appendix A.) A one to one technology program was defined for this study as a school in which each student and teacher has an internet-connected wireless computing device for use both in the classroom and at home, 24 hours a day, seven days a week, in any district building or grade level. Missouri school districts qualifying as a one to one school district for use in this study were required to have a one to one program meeting the study definition.

Participants. Teachers in school districts meeting the study criteria for a one to one technology program were asked to participate in the study. Participants were teachers at any grade level or content area who were employed by a Missouri school district and working in a one to one technology program.

Questionnaire. Approval for this research was given by the Research Review Board. After receiving approval, a questionnaire was sent to superintendents of all 563 Missouri school districts with a state county-district code to determine if the school district had implemented a one to one technology program as defined by the study. The questionnaire gave superintendents the study definition and asked them to determine if the district met the criteria of a one to one technology program (see Appendix A). If the district did not meet the definition for a one to one

technology school district, superintendents were asked to respond to the email by replying the district did not meet the criteria as defined by the study. If the district did not meet the criteria as defined by the study, the questionnaire ended and superintendents were thanked for their participation.

Superintendents in school districts meeting the one to one study definition were also asked to list the school buildings with one to one technology programs, grade levels of the one to one technology program, and number of teachers working in the one to one technology program. Superintendents were then asked if they would forward the survey link to teachers in their district working in the one to one program. Superintendents were asked to return the email when completed with the survey. Superintendents agreeing to forward the survey were then emailed the survey link. Superintendents not agreeing to forward the survey were thanked for their participation.

Responses to the questionnaire to Missouri superintendents allowed the researcher to determine how many school districts in Missouri had a one to one technology program as defined by the study. The study noted the number of districts in Missouri with a one to one technology program but did not disaggregate the individual grade levels or building configurations. The number of school districts in Missouri meeting the one to one program definition was presented in the study.

Teacher Survey. Only teachers within the identified school district working in the one to one technology program were asked to complete the teacher survey. The teacher survey was electronic and a link to the survey was emailed to superintendents in districts meeting the one to one technology definition. Superintendents agreed to forward the survey to teachers. An introductory message for teachers was included in the email forwarded by superintendents. The

message introduced the survey, explained the purpose, and asked teachers to take the survey. Teachers agreeing to complete the survey did so online and submitted electronically. The email with survey link sent to teachers is located in Appendix B. The final survey sent to teachers is located in Appendix C.

Consent. Consent to be questioned was given with receipt of the returned email questionnaire from the superintendents indicating whether the district met the criteria for a one to one technology implementation. A completed survey was recorded as the teacher's agreement to participate in the study. The email questionnaire contained identifiable information and superintendents were informed responses were not anonymous. The teacher survey contained no identifiable information and teachers were informed their responses were anonymous. Survey results were grouped as a whole and it was not possible to identify individual school districts, grade levels, content areas, or respondents. Only a list of school districts meeting the one to one program definition was available. Participants were informed that by completing the survey, they were giving consent. Teachers were also notified their completed survey was consent to be surveyed and they could withdraw from the survey at any time.

Selection/Sampling. Missouri school districts which had the identifying criteria for a one to one technology program were asked to participate in the survey. Once the school was identified as meeting the one to one technology definition, the superintendent, or designee, was asked to participate in the study by forwarding an electronic survey link to teachers working in the district's one to one technology program. Once the superintendent agreed to participate in the study, all teachers working in the school district identified as being a one to one technology school district, regardless of grade level or building configuration, were asked to complete the

survey. The number of teachers working within identified one to one technology programs was calculated and the sample size was based upon the overall rate of return.

A four week time-line was set up to complete all aspects of questionnaire and survey distribution and acquisition. Missouri superintendents were sent the initial questionnaire and given two weeks to respond. A follow-up email was sent and phone calls were made directly to districts not responding to email requests. Teachers in districts agreeing to participate in the survey were given two weeks to complete the survey. A follow-up survey request was sent after one week to all districts participating in the survey.

Instrumentation

Preliminary Survey. A survey was used to determine teacher perceptions about effective professional development practices for a one to one technology implementation. The preliminary survey contained 42 questions and was divided into five categories: Demographics, Software, Hardware, Instructional Strategies, and Methods. Three subscales were created and placed on the survey. Scales placed on the survey were software, hardware, and instructional strategies. Questions were placed on the survey based upon alignment with the scales. The preliminary survey is located in Appendix D.

Questions in the Software, Hardware, and Instructional Strategies subscales were written so respondents completed the question stem, "For the implementation of a one to one technology program, I believe". Responses to all statements were in the form of a likert scale where respondents answered strongly agree, agree, disagree, or strongly disagree to the statement. Each subscale contained 10 questions relating specifically to the construct. All questions were written based upon research and researcher expertise. Results for each question in the three subscales were ranked and the top one-half of survey items were reported. Fullan (2010) states

effective change strategies have the fewest, high leverage number of changes so the top one-half of the items were reported in each scale to give districts the most leverage when implementing a one to one program.

Survey Questions 1-30 were written to address the overarching research question, supporting research Q1 and supporting research Question 2. Survey Questions 1-10 focused on subscale 1 and asked the respondent about their perception of training for software. Questions 2-5 and 7-9 were specific to various software applications and directly answered supporting research Question 1. Questions 1, 6 and 10 addressed teacher beliefs about the importance of software training in general and directly answered supporting research Question 2. Questions 11 through 20 on the survey instrument were written to focus on subscale 2, professional development on technology hardware. Questions 12-15 and 17-19 addressed professional development on various hardware tools and directly answered supporting research Question 1. Questions 11, 16, and 20 addressed teacher beliefs about the importance of professional development on hardware in general and directly answered supporting research Question 2. Survey Questions 21-30 were written to focus on sub-scale 3, teacher perceptions of the value of professional development for instructional strategies. Questions 22-26, 28 and 29 were written to address professional development on various instructional strategies and directly answered supporting research Question 1. Questions 21, 27, and 30 all addressed teacher beliefs about the importance of professional development for instructional strategies in general and answered supporting research Question 2. Questions 6, 9, 13, 19, 21, 22, 23, 28, and 30 were reverse coded to reduce response patterning.

Questions 31 through 40 on the survey instrument addressed the perceptions of teachers regarding the most effective methods of professional development and answered the overarching

research question and supporting research Question 3. The Methods section differed from the sections on software, hardware and instructional strategies as the focus was on the process of implementing professional development rather than the content of the professional development. The Methods section of questions was an important piece of the answer to the overarching research question. The method of professional development used by school districts could make a difference in the results of the implementation of the topics for which training will be provided.

There were three specific categories embedded within the questions on methods. The categories embedded in the Methods section related to collaboration, in-district or out-of-district training, and the hiring of outside sources to provide training. Questions 31, 35, 36, and 39 were all related to collaboration as a form of professional development. Questions 34 and 38 addressed out-of-district workshops and Questions 37 and 40 addressed professional development through hiring outside sources. Question 32 addressed learning in isolation and Question 33 addressed length of training.

Demographic questions were related to age of the teacher and years of service of the teacher. The two demographic areas evaluated were age and length of service teaching. The two areas are independent of each other but can also function together to validate results. Age and years of service could have an effect on perceptions of professional development for a one to one technology program because technology may be foreign to older teachers who did not grow up with it but is part of everyday life to younger teachers who grew up with technology (McTighe, 2012). The implementation of technology into schools may have differing effects on teachers with various years of experience. Teachers with many years of experience could have different professional development needs than teachers just coming in to the field. The two groups work together when comparing number of years of service and age. The more experience a teacher

has in education, the older the teacher will be. Results for these two groups can be compared. Conversely, older teachers could have few years of experience. Results for age alone must not be compared to years of service in education.

Validity and Reliability

The survey instrument was tested for validity and reliability prior to actual survey administration. Face validity, content validity, construct validity, and reliability were part of the piloting process prior to disseminating the final survey. Institutional Review Board approval of the study and survey tools was received in November, 2013. Validity and Reliability testing commenced at that time.

Face Validity. Face validity was conducted when crafting the research questions to help determine if the questions measured what was intended by the overarching research question and the supporting research questions. The questions on the survey were determined to answer the survey questions based upon face validity. Table 1 displays the Table of Specifications for the preliminary survey.

Table 1

Table of Specifications

Survey Item	Software	Hardware	Instructional Strategies
1. Training on software applications is effective professional development.	X		
2. Word processing software training is effective professional development.	X		
3. Presentation software training is effective professional development.	X		
4. Training on internet-based search engines is effective professional development.	X		
5. Training on Learning Management Systems used by my school district is effective professional development.	X		
6. Software training is not more important than training on hardware.	X		
7. Social media tools training (i.e. Facebook, Twitter, Blogging, Glogster, Skype, etc.) is effective professional development.	X		
8. Training on video creation and use (i.e. Animoto, MovieMaker, VINE, You Tube, etc.) is effective professional development.	X		
9. Gaming software training is not effective professional development.	X		
10. Software training is more important than training on Instructional Practices for use in the 21st Century classroom.	X		
11. Technology hardware training is effective professional development.		X	
12. Training on the electronic tool students use daily is effective professional development.		X	
13. Professional development on using a printer is not effective professional development.		X	
14. Web camera training is effective professional development.		X	
15. SmartBoard training is effective professional development.		X	
16. Technology hardware training is more important than training on Instructional Practices for use in the 21st Century classroom.		X	
17. Training on using a video camera is effective professional development.		X	
18. Projector usage training is effective professional development.		X	
19. Professional development on using a scanner is not effective professional development.		X	
20. Technology hardware training is more important than training on software.		X	
21. Training on effective instructional strategies for use in the 21st Century classroom is not effective professional development.			X
22. Training for using Inquiry-Based Instruction strategies in the classroom is not effective professional development.			X
23. Professional development on addressing teacher beliefs and attitudes about instruction and pedagogy is not effective professional development.			X
24. Training on Constructivist pedagogy practices is effective professional development.			X
25. Using cooperative learning strategies in the classroom training is effective professional development.			X
26. Training on Problem-Based Learning strategies is effective professional development.			X
27. Effective instructional strategies for use in the 21st Century classrooms training is more important than training on software use.			X
28. Training on integrating technology into the core curriculum is not effective professional development.			X
29. Professional development on Project-Based Learning strategies is effective professional development.			X
30. Training on effective instructional strategies for use in the 21st Century classrooms is not more important than training on hardware use.			X

Content Validity. The survey was reviewed for content validity by experts in the field of technology in education. Six experts reviewed the survey items. Four of the six experts were

employed by Missouri and Kansas public school districts. Each expert worked a minimum of two years in a school district which had implemented a one to one technology initiative for a minimum of two years. Positions held by the four experts included three technology directors and one high school principal. Two expert reviewers were college professors working for post-secondary institutions in Missouri. Both experts' primary field of instruction was technology or technology in education and both had taught in the field of technology for a minimum of two years. One expert held a doctorate degree and was the Associate Provost for Extended Learning and Technology Services at a mid-western Missouri university and the other expert was an Assistant Professor in the Department of Education at a southwestern Missouri university.

Experts were asked to review each survey question to determine content validity and an Index of Item Objective Congruence was conducted. The survey was divided into five categories: Demographics, Software, Hardware, Instructional Strategies, and Methods of Professional Development. The Demographic section included two questions and the remaining categories of the survey contained ten questions each. Demographic questions were not numbered in the preliminary survey.

Respondents were asked to review each question and rate them on a three-point scale, Good Match (1), Neutral (0), Does Not Match (-1). Thirty-four (81%) of the 42 questions rated a perfect score of 1. Eight (19%) survey questions received a rating of less than 1. Questions 1, 12, 13, 19, and 23 (12%) had one rating of Neutral each which translated to a score of .83. Questions 15, 17, and 18 (7%) had one rating each of Does Not Match which translates to a score of .67. There was one question (2%) within the Software category scoring lower than a 1 and one question (2%) within the Instructional Strategies category scoring lower than a 1. All six (14%) of the remaining questions scoring lower than a 1 were found in the Hardware category.

The cut score for determining questions to be revised or removed was .67. No survey items scored below a .67 index. No changes were made to any survey question and all questions were retained for the survey pilot. Table 2 displays how each question was rated by the expert reviewers.

Table 2

Index of Item Objective Congruence

Item	Expert Rating
1. Training on software applications is effective professional development.	0.83
2. Word processing software training is effective professional development.	1.00
3. Presentation software training is effective professional development.	1.00
4. Training on internet-based search engines is effective professional development.	1.00
5. Training on Learning Management Systems used by my school district is effective professional development.	1.00
6. Software training is not more important than training on hardware.	1.00
7. Social media tools training (i.e. Facebook, Twitter, Blogging, Glogster, Skype, etc.) is effective professional development.	1.00
8. Training on video creation and use (i.e. Animoto, MovieMaker, VINE, You Tube, etc.) is effective professional development.	1.00
9. Gaming software training is not effective professional development.	1.00
10. Software training is more important than training on Instructional Practices for use in the 21st Century classroom.	1.00
11. Technology hardware training is effective professional development.	1.00
12. Training on the electronic tool students use daily is effective professional development.	0.83
13. Professional development on using a printer is not effective professional development.	0.83
14. Web camera training is effective professional development.	1.00
15. SmartBoard training is effective professional development.	0.67
16. Technology hardware training is more important than training on Instructional Practices for use in the 21st Century classroom.	1.00
17. Training on using a video camera is effective professional development.	0.67
18. Projector usage training is effective professional development.	0.67
19. Professional development on using a scanner is not effective professional development.	0.83
20. Technology hardware training is more important than training on software.	1.00
21. Training on effective instructional strategies for use in the 21st Century classroom is not effective professional development.	1.00
22. Training for using Inquiry-Based Instruction strategies in the classroom is not effective professional development.	1.00
23. Professional development on addressing teacher beliefs and attitudes about instruction and pedagogy is not effective professional development.	0.83
24. Training on Constructivist pedagogy practices is effective professional development.	1.00
25. Using cooperative learning strategies in the classroom training is effective professional development.	1.00
26. Training on Problem-Based Learning strategies is effective professional development.	1.00
27. Effective instructional strategies for use in the 21st Century classrooms training is more important than training on software use.	1.00
28. Training on integrating technology into the core curriculum is not effective professional development.	1.00
29. Professional development on Project-Based Learning strategies is effective professional development.	1.00
30. Training on effective instructional strategies for use in the 21st Century classrooms is not more important than training on hardware use.	1.00

Note: Each group is one survey scale. Group 1 (Q1-10) is the Software scale, Group 2 (Q11-20) is hardware and the Group 3 (Q21-30) is the instructional strategies scale.

Two comments were received from the expert reviewers. One expert noted survey results could be different depending upon the number of years the school district had maintained a one to one technology program. The expert suggested adding a demographic question asking respondents for the number of years the district had maintained a one to one technology program. The researcher did not add this question to the survey due to the variability of human memory. The researcher believed multiple, various answers could be received by teachers working for the same district. Survey results would be inaccurate if teachers from the same building answered the number of years the district had maintained a one to one technology program differently.

Another expert suggested the survey be completely reformatted from its original version. The expert believed the survey would function better if questions were asked in a different format. The researcher organized the questions on the survey deliberately to answer the overarching research question and the three supporting research questions. The researcher did not revise the survey question format.

Pilot

Validity. Survey questions were piloted to determine validity and reliability of the survey instrument. The survey was disseminated to four school districts in southeast Kansas which met the definition of a one to one technology program as defined by this study. The four school superintendents were contacted by phone to verify schools meeting the one to one technology definition defined by this study. This study defined a one to one technology program as any school in which each student has an internet-connected, wireless computing device for use in the classroom 24 hours a day, seven days a week, in any district building or grade level. One to one technology programs in the four Kansas school districts was confirmed when the district superintendent stated the district had given each student an internet-connected, wireless

computing device for use in the classroom, 24 hours a day, seven days a week, to at least one grade level or building.

Teachers working in the one to one technology environment were the targeted audience of the pilot survey. Superintendents were asked to forward the pilot survey instrument to teachers working in the one to one technology program. All four superintendents agreed to forward the survey to teachers in the one to one technology setting. Superintendents of the four school districts were sent an email link to the pilot survey and the superintendents then forwarded the link to the teachers in the one to one technology program. The preliminary survey used for the pilot is included in Appendix D.

All pilot survey items were completed by 48 respondents. Questions 1 and 2 were completed by 57 respondents, Questions 3-12 were completed by 54 respondents, Questions 13-22 were completed by 52 respondents, and Questions 23-42 were completed by 48 respondents. Due to the small sample size returned for the pilot survey, decisions made about each survey item were based upon expert survey analysis, validity and reliability analysis and the expertise of the researcher.

The software, hardware and instructional strategies scales were evaluated for validity. The Methods section of the survey was treated as demographic and was not evaluated for validity. Validity was determined by exploratory factor analysis of the three survey scales: Scale 1 - Software, Scale 2 - Hardware, and Scale 3 - Instructional Strategies. The three scales were analyzed with SPSS software using the extraction method of Principal Component Analysis and three components were extracted. Factor analysis was conducted to determine if the survey items measured what they were intended to measure and functioned as a group. A loading of greater than .30 indicated the survey item showed alignment to the scale intended. Eighteen

(60%) survey items had two results indicating alignment to more than one scale. Items were considered aligned to the scale if at least one of the results was in the scale component for which it was intended. Exploratory factor analysis indicated the Software and Instructional Strategies scales loaded as intended and showed consistent alignment. The Hardware scale showed inconsistent alignment. Results from exploratory factor analysis are in Table 3. Boldface numbers show factors loading greater than .30.

Table 3

Factor Loadings with Exploratory Factor Analysis with Principal Component Analysis

	Subscale		
Item	**Software**	**Instructional Strategies**	**Hardware**
Q1	**.63**	.05	.10
Q2	**.79**	.13	.18
Q3	**.73**	.01	.00
Q4	**.64**	.09	.01
Q5	**.55**	**.32**	.00
Q6	.20	.24	.06
Q7	**.45**	.08	**.55**
Q8	**.65**	.06	**.44**
Q9	.17	.08	**.65**
Q10	.25	**.30**	.19
Q11	**.57**	.06	**.40**
Q12	**.64**	.11	.07
Q13	.17	.21	.01
Q14	**.57**	.07	**.40**
Q15	**.32**	.14	**.33**
Q16	**.37**	**.57**	.27
Q17	**.67**	.08	.02
Q18	**.71**	.02	.07
Q19	.15	.04	.12
Q20	.24	**.46**	**.50**
Q21	.04	**.84**	.06
Q22	.00	**.81**	.20
Q23	.22	**.61**	.05
Q24	.07	**.50**	.28
Q25	.24	**.55**	**.53**
Q26	.13	**.54**	**.42**
Q27	**.45**	**.48**	.10
Q28	.12	**.58**	.05
Q29	**.40**	**.41**	.10
Q30	.18	**.62**	**.38**

Note. Three groups of items are presented and are separated by a bold line. Each group of statements represents the statements theorized to form a scale. The first group (Q1-10) represents the Software scale, the second group (Q11-20) represents hardware and the third group (Q21-29) represents instructional strategies. Factor loadings greater than .30 are shown in boldface.

Questions written for the Software scale showed alignment in seven of the ten questions. Question 6 did not show alignment to any of the scales and Questions 9 and 10 showed alignment to hardware and instructional strategies, respectively. All ten questions for the Instructional Practices scale showed solid alignment with the weakest alignment at .41.

Questions written for the Hardware scale indicated alignment in three of the ten survey items. A review of items in the Hardware scale indicated confusion when responding to the question. Seven hardware items loaded as components of the Software scale. Items 11, 12, 14, 15, 16, 17, and 18 each had scores above .30 with Items 11, 12, 14, 17, and 18 loading greater than .55.

Reliability. Survey scales evaluated for reliability were software, hardware, and instructional strategies. The Methods section of the survey was treated as demographic and was not evaluated for reliability. Chronbach's Alpha was used to determine reliability of the survey scales to evaluate the consistency with which each survey item performed within the designated scale. A Chronbach's Alpha score of one indicated the same results would be seen regardless of the number of times the survey item was given. Chronbach's Alpha scores close to one indicated strong reliability of the survey items. Results of the reliability test indicated a Chronbach's Alpha of .75 in the Software scale, .68 in the Hardware scale, and .82 in the Instructional Strategies scale. All three scales indicated reliability with the Hardware scale seeing the least reliability at .68 and the Instructional Strategies scale seeing the greatest reliability at .82. Reliability results were consistent with expert survey analysis and validity results from the exploratory factor analysis.

Analysis of Reliability and Validity. The preliminary Table of Specifications (see Table 1) indicated alignment in all three scales. Expert analysis indicated content validity in all

three scales. Chronbach's Alpha indicated reliability in all three scales. Exploratory factor analysis indicated validity in the Software and Instructional Practices scales and weak validity in the Hardware scale. All tests for reliability and validity consistently indicated the strongest alignment of questions to the scale for which it was intended was in Instructional Strategies scale. The Software scale showed the next strongest relationship. The Hardware scale showed the least strong relationship.

Survey Disseminated to Teachers. The Table of Specifications, exploratory factor analysis, Chronbach's Alpha reliability, and the survey creator were the basis for revisions of the pilot survey. Revisions were made to the survey, specifically in the Hardware scale. Six questions, Questions 6, 16, 27, 34, 37, and 39, were removed from the survey due to inconsistent alignment to the intended construct or duplication of questions. Seven questions, Questions 12, 13, 14, 15, 17, 18, and 19, from the Hardware construct were revised to include the word device. Exploratory factor analysis indicated the Hardware scale was problematic. Each item was revised to include the word device. Question 36 was revised to combine content from a previously removed item. Demographic questions were moved to the end of the survey so respondent fatigue would be minimized and response options were decreased. Headings were removed from the survey and survey items 1-30 were reordered. All other survey items remained the same. Questions 9, 13, 19, 21, 22, 23, 28, and 30 were reverse coded to reduce response patterning.

The survey instrument disseminated to teachers contained 36 questions including 9 items for the Software scale, 9 items for the Hardware scale, 9 items for the Instructional Strategies scale, 7 demographic items related to Methodology, and 2 demographic items related to age and years of service in education. The survey disseminated to teachers is in Appendix C.

Final Survey

The final survey (see Appendix C) was disseminated to teachers in Missouri school districts identified as having a one to one technology program meeting the definition of a one to one program set forth by this study. The criteria of a one to one technology program was a school in which each student and teacher had an internet-connected wireless computing device for use both in the classroom and at home, 24 hours a day, seven days a week, in any district building or grade level. Only teachers working in the one to one technology program were asked to complete the survey.

A questionnaire was sent electronically to all 563 Missouri superintendents or school leaders as defined by the Missouri Department of Education 2013-2014 School Directory. Missouri school districts with Missouri Department of Elementary and Secondary Education county/district codes were surveyed. Superintendents or school leaders not returning the initial email questionnaire were emailed a follow-up questionnaire. Phone calls were made to superintendents or school leaders not returning the follow-up questionnaire. Fifty-nine Missouri school districts (10 %) were identified as meeting the criteria. There were 371 (66 %) Missouri school districts not meeting the survey criteria and the status of 133 (24 %) Missouri school districts remained unknown. The questionnaire return rate was 76 percent.

Superintendents or school leaders of the identified school districts who agreed to forward the teacher survey link to teachers working in the one to one program within the district were sent the survey link. Nine (2%) school superintendents declined to send the survey on to staff. There were 2,349 possible respondents and 665 completed surveys were returned for a return rate of 28 percent.

Validity. The survey was multi-dimensional and contained three constructs. A confirmatory factor analysis was conducted on the completed survey items. Factor analysis was initiated to determine if the survey items measured what they were intended to measure. A result greater than .60 indicated the survey items aligned to the appropriate scale. Results from the confirmatory factor analysis are in Table 4. A boldface number indicates a factor loading of greater than .60.

Table 4

Factor Loadings for Confirmatory Factor Analysis with Rotated Component Matrix

	Subscale		
Item	Hardware	Software	Instructional Strategies
Q3 (X)	.02	.20	**.69**
Q7	.29	.40	.04
Q9 (X)	.30	.11	.28
Q11 (X)	**.73**	.17	.13
Q15	.42	.49	.05
Q18	.28	**.60**	.12
Q20	.20	**.65**	.06
Q22	.21	.41	.23
Q24	.55	.30	.02
Q1	.54	.25	.11
Q5	.54	.28	.01
Q8	.33	.49	.19
Q12	**.75**	.03	.01
Q14	**.78**	.09	.03
Q17	.45	.42	.11
Q19 (X)	.10	**.69**	.06
Q23	**.60**	.34	.04
Q26 (X)	.07	.07	.23
Q2	.09	.02	**.62**
Q4	.15	.34	.35
Q6	.05	.20	**.63**
Q10	.09	.51	.44
Q13	.05	.53	.50
Q16	.06	.18	.49
Q21	.01	.40	.41
Q25	.06	.31	.46
Q27	.13	.30	**.68**

Note. Each group of statements represents the statements theorized to form a scale. The first group represents the Software scale, the second group represents hardware and the third group represents instructional strategies. Factor loadings greater than .60 are shown in boldface. Items with (X) were removed from survey.

A rotated component matrix indicated two of nine items on the Software scale loaded greater than .60. Items written for the Software scale loaded as expected during the exploratory factor analysis but did not load as expected for the confirmatory factor analysis. Software items remained the same after exploratory factor analysis but items for the Hardware scale were revised before the final survey was disseminated. All scale items were also mixed and headings were removed for the final survey. It is theorized the change in hardware items, mixing of scale items, and number of respondents kept the software items from loading as intended. Software Items 7, 15, 18, 20, 22, and 24 loaded greater than .30 so the items were kept for analysis. Items 3, 9, and 11 did not load greater than .30 so were discarded for use in data analysis.

During the exploratory factor analysis, four of ten hardware items loaded as expected. Hardware items were revised to increase the likelihood the items would load correctly after the final survey. Confirmatory factor analysis found three of nine items on the Hardware scale loaded greater than .60. An additional four of nine Hardware scale items loaded greater than .30 so were kept for final analysis. Items 19 and 26 did not load to the intended scale and were discarded. Revisions made to hardware items after exploratory factor analysis increased the number of items loading to the Hardware scale and Hardware Items 1, 5, 8, 12, 14, 17, 23 were kept for data analysis.

Three of nine items on the instructional strategies scale loaded as intended during confirmatory factor analysis with greater than .60. The additional six instructional strategies items loaded greater than .30 so were kept for final analysis. All instructional strategies items loaded as intended for the exploratory factor analysis. Revisions were made to hardware items, all survey items were mixed and headings were removed, and number of respondents increased.

Changes in the survey after pilot testing may have affected how each item loaded. All nine items in the Instructional Strategies scale were kept for final analysis.

Questions not aligning to the intended scale were removed from the survey prior to data analysis. Questions 3, 9, 11, 19, and 26 were removed from the survey and are not recommended when using the survey for future studies. The final survey used for data analysis is located in Appendix E.

Reliability. Chronbach's Alpha was used to evaluate reliability of the three survey scales, software, hardware and instructional strategies. Chronbach's Alpha analysis confirmed reliability of all three constructs. A Chronbach's Alpha of 1.00 indicated strong reliability of survey items. The Software scale indicated a Chronbach's Alpha of .69, the Hardware scale indicated a Chronbach's Alpha of .77, and the Instructional Strategies scale indicated a Chronbach's Alpha of .75. The Hardware scale indicated the greatest reliability, the Instructional Strategies scale indicated the second strongest reliability, and the Software scale indicated the least reliability of the three constructs.

Summary

A questionnaire and survey were used to ascertain results for this study. The questionnaire was used to determine the Missouri school districts implementing a one to one technology program. Teachers in the one to one programs in the identified school districts were sent the survey.

The survey instrument for this study was a multi-dimensional scale survey containing constructs for software, hardware, and instructional strategies. All measures of validity and reliability were used to ensure survey results were usable. Face validity, content validity, factor analysis and Chronbach's Alpha tests were conducted on the pilot survey. All tests indicated the

three constructs were holding with the intended construct. Tests for validity and reliability on the pilot survey indicated the Instructional Strategies scales showed the strongest alignment, the Software scale had the second strongest alignment and the Hardware scale showed the least alignment of the three scales. Survey items not aligning to the intended scale were removed or revised before the final survey was sent to teachers. The final survey disseminated to teachers working in the identified one to one technology districts contained 36 questions.

Confirmatory factor analysis and Chronbach's Alpha tests were conducted on the final survey. Tests for validity and reliability on the final survey indicate alignment in all three constructs. The Instructional Strategies scale was the strongest aligned, the Hardware scale had the second strongest alignment, and the Software scale had the least alignment of the three scales. Survey items not aligning to the intended scale were removed from the survey prior to additional data analysis. Results from 31 questions were used for final analysis.

Chapter Four

Analysis of the Data

Introduction

This quantitative study was implemented to answer the research question, what are the perceptions of teachers about effective professional development practices for a one to one technology implementation? There were three supporting research questions.

1. What do teachers perceive is effective training for software, hardware, and instructional practices?
2. Is professional development on using hardware, software, *or* professional development on implementing new instructional methods the most critical to teachers?
3. What method of professional development is preferred by teachers?

A 36 item survey was completed and used to identify responses to each survey question. After confirmatory factor analysis and reliability testing was completed, 31 items were used for data analysis. The survey contained subscales of software, hardware, and instructional strategies. Inferential statistical analysis was used to analyze survey constructs and individual questions to apply the results to the larger population. Mean, standard deviation and confidence interval were calculated. A one-way ANOVA test was completed to test for statistical significance and Tukey's HSD was used to find significance among groups.

Results of each question in the Software scale were analyzed and the mean was calculated. The mean for each software survey item was ranked to determine the most effective software topics. The mean and standard deviation of all questions on software functioning as a construct was calculated. Resulting means were compared to the mean of the Hardware and

Instructional Strategies scales to rank the most effective construct. A one-way ANOVA test was completed to test for statistical significance and Tukey's HSD was used to find significance among groups.

Responses to Hardware scale questions were analyzed and the mean was calculated. The mean for each hardware survey item was ranked to determine the most effective hardware topics. The mean and standard deviation of all questions on hardware functioning as a construct were calculated. Resulting means were compared to the mean of the Software and Instructional Strategies scales to rank the most effective construct. A one-way ANOVA test was completed to test for statistical significance and Tukey's HSD was run to test for significance among groups.

Results for each item on instructional strategies were analyzed and the mean calculated. The mean for each instructional strategies item was ranked to determine the most effective instructional strategies topics. The mean and standard deviation of all questions on instructional strategies functioning as a construct were calculated. Resulting means were compared to the mean of the Software and Hardware scales to rank the most effective construct. A one-way ANOVA test was completed to test for statistical significance and Tukey's HSD was used to test for significance among groups.

The final section of the survey was methods of professional development. The results of each question in the Methods section were analyzed and the percentage of teachers choosing each option was calculated. A one-tailed ANOVA test was calculated to test for statistical significance and Tukey's HSD was used to test for significance among groups.

Supporting Research Question 1

Descriptive Statistics. Individual items within each scale were used to answer what do teachers perceive is effective training for software, hardware, and instructional practices? Mean

results of each scale item were ranked to determine areas of professional development teachers perceive to be the most effective for software, hardware and instruction. The mean range possible for any item in any scale is 1-4 with Strongly Agree (1), Agree (2), Disagree (3), and Strongly Disagree (4). Means for items written as a negative response were reversed before results were calculated. Results indicate all items in each scale are important professional development. The top 50% of the items are reported in each scale as the most effective professional development topics. Table 5 reports how each item ranked within the assigned scale by the mean score and the standard deviation for each item. Boldfaced items denote the top one-half questions with mean results closest to Strongly Agree.

Table 5

Mean, Standard Deviation and Range for Software, Hardware, Instructional Strategies Items

Software: Range: 1.86-2.25	M	SD
Training on video creation	**1.86**	.61
Training on software applications	**1.93**	.53
Training on learning management systems used by my school	**1.97**	.63
Presentation software training is effective	1.98	.58
Training on internet-based search engines	2.18	.71
Social media tools training	2.25	.77
Hardware Scale: Range: 2.02-2.66		
Training on how to use a projecting device	**2.02**	.84
Technology hardware training	**2.03**	.65
Training for using a SmartBoard device	**2.06**	.70
Web camera device training	**2.29**	.65
Training on a video camera device	2.44	.70
Training on a scanning device	2.47	.67
Training on using a printing device	2.66	.72
Instructional Strategies: Range: 1.69-2.22		
Training on problem-based learning strategies	**1.69**	.52
Professional development on project-based learning strategies	**1.70**	.55
Training on integrating technology into the core curriculum	**1.71**	.71
Training on effective instructional strategies for use in the 21st century	**1.78**	.72
Training for using inquiry-based instruction strategies	**1.80**	.58
Using cooperative learning strategies in the classroom	1.83	.62
Professional development on addressing teacher beliefs and attitudes about instruction and pedagogy	2.04	.78
Training on Constructivist pedagogy practices	2.10	.64
Training on effective instructional strategies for use in the 21st century classrooms is not more important than training on hardware use.	2.22	.82

Note. Means in boldface are the top 50% in each scale. n=665. Potential Range=1-4.

The mean range for each scale was small and skewed toward Strongly Agree indicating all respondents perceive professional development in each area as important. Teachers perceive the most effective software professional development is video creation, overall software applications, and learning management software. The mean difference between Software scale items was .39. The perception of teachers concerning hardware professional development indicates professional development on a projecting device, overall hardware training, SmartBoard, and a web camera were most important. The mean difference in results was .64. Instructional strategies perceived as most effective professional development topics include problem-based learning, project-based learning, integrating technology into the core curriculum, overall instructional strategies for use in the 21st Century, and inquiry-based instruction. The mean range for instructional strategies was .53.

Supporting Research Question 2

Descriptive Statistics. The survey contained three scales with items working as a group to determine the answer to supporting research Question 2, is professional development on using hardware, software *or* professional development on implementing new instructional methods the most critical to teachers? Scales used in the survey were software, hardware, and instructional strategies. Respondents were asked to answer survey items relating to the constructs based upon a four point likert scale. Possible responses were Strongly Agree (1), Agree (2), Disagree (3), and Strongly Disagree (4). The mean and standard deviation was calculated for each survey scale. A normal distribution of data was not found in any of the scales. All resulting data was skewed toward a favorable response. Table 6 presents results of data analysis of each survey scale. Summative results of all items loading into aligned scales are presented.

Table 6

Mean, Standard Deviation, and Range for Scale Groupings

Scale	n	M	SD	Range
Software	6	12.16	2.4	6-24
Hardware	7	15.96	3.2	7-28
Instructional Strategies	9	16.87	3.4	9-36

Note. n=number of survey items for each scale.

The Software scale contained 6 items and the mean score range was 6 to 24. The mean in the middle of the range was 15. The Software scale mean score was 12.16 with a standard deviation of 2.4. The actual mean indicated a difference of 2.84 below the average mean. Results indicate teachers believe professional development on software is necessary and the standard deviation is lower than the standard deviation for the hardware and Instructional Strategies scales.

The hardware scale contained 7 items and the mean range was 7 to 28. The mean in the middle of the range was 17.5. The mean result was 15.96 with a standard deviation of 3.2. The actual mean was 1.54 below the average mean. Teachers believe professional development on hardware is necessary but feel less strongly about hardware than about software professional development.

The Instructional Strategies construct contained 9 items and the mean range was 9 to 36. The mean possible in the middle of the range was 22.5. The mean result for the Instructional Strategies scale was 16.87 with a standard deviation of 3.4. The actual mean was 5.63 below the average mean. Although the standard deviation for the Instructional Strategies scale is higher than both the Hardware and Software scales, results indicate teachers believe professional development on instructional strategies is more important than professional development on software and hardware.

Overall, the Instructional Strategies scale displayed the mean closest to Strongly Agree, the Software scale was second, and the Hardware scale was third. The Software scale had the lowest standard deviation followed by the Hardware scale. The Instructional Strategies scale had the highest standard deviation.

Survey responses were evaluated based upon teacher age and years of service teaching to determine if there was a difference in responses based upon age or years of service. Demographic questions asked respondents to indicate age and years of service in teaching. Age of the respondent was categorized into four levels. Possible responses were 20-30, 31-40, 41-50, and 50 & above. Respondents also indicated the number of years working as a teacher. Respondents chose from four categorical options. Possible responses were 0-5, 6-16, 17-30, and 31 & above. The number of respondents and means for each group are in Tables 7 and 8, respectively.

Table 7

Age Mean and Number of Respondents and the Three Scales

		20-30 (n = 128)	31-40 (n = 198)	41-50 (n = 187)	51 & Above (n = 144)
	Range	M	M	M	M
Software	6-24	12.31	12.15	12.05	12.11
Hardware	7-28	16.63	16.55	15.47	15.26
Instructional Strategies	9-36	16.27	16.35	17.41	17.33

Note. n = number of respondents. M = mean.

Table 8

Years of Service Teaching Mean and Number of Respondents and the Three Scales

		0-5 (n = 119)	6-16 (n = 308)	17-30 (n = 208)	31 or More (n = 22)
	Range	M	M	M	M
Software	6-24	11.98	12.44	11.83	11.95
Hardware	7-28	15.97	16.72	15.07	14.18
Instructional Strategies	9-36	16.35	16.79	17.20	17.05

Note. n = number of respondents. M = mean.

Inferential Statistics. Responses for each demographic area were analyzed for statistical significance. A one-way ANOVA statistical analysis was conducted to determine statistical significance. The Tukey HSD test was conducted for multiple comparisons. Both Age and Years of Service indicated statistical significance between group responses. Age of respondents indicated more areas with statistical differences than Years of Service. Respondent age indicated four areas of statistical significance on the Hardware scale and three areas of statistical significance on the Instructional Strategies scale. Two areas of statistical significance on the Hardware scale and one area of statistical significance on the Software scale were found for years of service teaching.

Age. Age of respondents indicated significance for the Hardware scale, $F(3, 653) = 8.05$, $p = .000$. The Instructional Strategies scale also indicated significant differences based upon age, $F(3, 653) = 5.26$, $p = .001$. Statistical significance was not found in the Software scale $F(3, 653) = .306$, $p = .821$. Table 9 displays the summary from the ANOVA for hardware and age, and Table 10 displays the summary from the ANOVA for instructional strategies and age.

Table 9

Analysis of Variance for Hardware and Age

	df	SS	MS	F	p-value
Between Groups	3	241.48	80.50	8.05	.000*
Within Groups	653	6531.08	10.00		
Total	656	6772.56			

Note. n = 657.
*p ≤ .05

Table 10

Analysis of Variance for Instructional Strategies and Age

	df	SS	MS	F	p-value
Between Groups	3	184.05	61.35	5.26	.001*
Within Groups	653	7623.33	11.67		
Total	656	7807.38			

Note. n = 657.
*p ≤ .05.

The Tukey HSD test found age of respondents and results for the Hardware scale indicated extensive variability when comparing significant responses. Four of the six possible comparisons were statistically significant. Responses from teachers in the 20-30 age range were significantly different than responses from teachers in the 41-50 age range, $F(3, 653) = 8.05$, $p \leq .008$. Significance was also found between the 20-30 age range and 50 and above, $F(3, 653) = 8.05$, $p \leq .002$, 31-40 age range and 41-50 age range, $F(3, 653) = 8.05$, $p \leq .005$, and 31-40 age range and 50 and above age range, $F(3, 653) = 8.05$, $p \leq .001$.

Age of the respondent also made a difference in responses to instructional strategies. Significance was found in three of the six possible comparisons. Teachers in the 20-30 age range felt significantly different about professional development on instructional strategies than 41-50 year old respondents, $F(3, 653) = 5.26$, $p \leq .019$. Teachers in the 31-40 age range felt significantly different than teachers in the 41-50 age range, $F(3, 653) = 5.26$, $p \leq .014$, and teachers in the 50 and above age range, $F(3, 653) = 5.26$, $p \leq .045$.

Tukey's HSD test for statistical significance indicated older teachers believe professional development on hardware is more important than do younger teachers. Teachers 41 years of age and older believe professional development over hardware has more importance than do teachers in the 20 to 40 year-old range. Conversely, younger teachers believe professional development on instructional strategies is more important than do older teachers. Teachers ranging from 20 to 40 years old believe professional development on instructional strategies is important where teachers 41 years of age and older find instructional strategies professional development less important.

Years of service. Significance was found when comparing responses to survey items with years of service teaching. Years of service teaching indicated high statistical significance in

the Hardware scale F(3, 653) = 14.10, p = .000. Statistical significance was also found in the Software scale, F(3, 653) = 2.96, p = .032. Statistical significance was not found in the Instructional Strategies scale, F(3, 653) = 1.60, p = .188. Table 11 and Table 12 display ANOVA results for years of service teaching on software and hardware, respectively.

Table 11

Analysis of Variance for Software and Years of Service

	df	SS	MS	F	p-value
Between Groups	3	50.87	16.96	2.96	.032*
Within Groups	653	3746.39	5.74		
Total	656	3797.26			

Note. n=657.
*p ≤ .05.

Table 12

Analysis of Variance for Hardware and Years of Service

	df	SS	MS	F	p-value
Between Groups	3	411.94	137.31	14.10	.000*
Within Groups	653	6360.62	9.74		
Total	656	6772.56			

Note. n=657.
*p ≤ .05.

Based upon years of service teaching and the Hardware scale, significance was found in responses between two of the six possible comparisons. Teachers with 6-16 years of experience felt significantly different than teachers with 17-30 years of experience, F(3, 653) = 14.10, p ≤ .000. Teachers with 6-16 years of experience also felt differently about professional development for hardware than teachers with 31 or more years of experience teaching, F(3, 653) = 14.10, p ≤ .001. Teachers with 17 to 30 years of experience and teachers with 31 or more years of experience felt that professional development on hardware was more important than teachers with 6-16 years of experience.

There was also a significant difference found in responses based upon years of teaching and professional development on software. Significance was found in one of the six possible

comparisons. Teachers with 6-16 years of experience and teachers with 17-30 years of experience showed significant differences, $F(3, 653) = 2.96$, $p \leq .025$. Teachers with 17-30 years of experience believe professional development on software is more important than teachers with 6-16 years of experience.

Overall, there were seven significant comparisons between groups in the age category compared to three significant comparisons between groups in the years of service category. Findings indicate age is a greater factor in how teachers perceive professional development than is years of service.

Supporting Research Question 3

Descriptive Statistics. Items in the survey section on Methods asked respondents to choose the preferred method of professional development. Respondents were given seven questions with two choices each and asked to choose the preferred method. Each question was analyzed separately. Table 13 shows the mean score and standard deviation for each item. All questions were answered by 659 respondents and the range was 1-2. The first item listed had a mean of 1 and the second item listed had a mean of 2.

Table 13

Means and Standard Deviations for Methods Items

Item	M(SD)
28. Learning in collaborative teams vs. learning individually	1.30 (.46)
29. Learning with online resources vs. learning face to face	1.75 (.44)
30. Short, one-time workshops vs. ongoing workshops	1.65 (.48)
31. Learning from grade level teachers vs. learning from instructional coach	1.22 (.41)
32. Observing at other schools vs. learning from expert in field	1.20 (.40)
33. Training inside district vs. training outside district	1.31 (.46)
34. Learning from instructional coach vs. outside PD company	1.17 (.38)

Note. M = mean. SD = standard deviation.

All respondents reported teachers prefer to participate in ongoing professional development provided within the district with grade level collaborative teams. Teachers prefer

to learn face to face rather than through electronic or print resources. Teachers find value in observing at school districts which have already implemented a one to one program and teachers preferred most strongly being trained by an in-district instructional coach rather than by an outside agency hired by the district. Table 14 displays the percentage of teachers choosing the preferred method. Numbers in boldface indicate the method preferred by respondents.

Table 14

Number and Percentage Results for Methods Items

Item	Question Text	n	%
Q28	Learning new material/strategies in collaborative teams	462	**70.1**
	Learning new material/strategies individually	197	29.9
Q29	Using online resources (training manuals, videos, professional development websites, etc.) to learn new material/strategies	167	25.3
	Learning new material from an individual face to face	492	**74.7**
Q30	Short, one-time workshops	233	35.4
	Ongoing learning on a topic	426	**64.6**
Q31	Learning from other teachers in my grade level/content area	517	**78.5**
	Learning from a district-paid instructional coach	142	21.5
Q32	Observing at other school districts which have already implemented the strategy	526	**79.8**
	Learning from an expert in the field	133	20.2
Q33	Attending training inside my district	455	**69**
	Attending training outside my district	204	31
Q34	Learning from in-district instructional coaches	548	**83.2**
	Learning from a professional development company hired by my school district	111	16.8

Note. Boldface items indicate the preferred method. n = number of respondents.

Responses for each question were evaluated based upon teacher age and years of service in teaching to determine if a difference in belief systems existed concerning methods of professional development. Teacher age was separated into four categories. Category choices

were 20-30, 31-40, 41-50, 51 & above. Years of service teaching was separated into four categories. Categories available were 0-5, 6-16, 17-30, and 31 & above.

Inferential Statistics. A one-way ANOVA test was conducted to determine the existence of statistical differences in responses between age groups and between years of service groups. A Tukey HSD test was also conducted to find means significantly different from each other. Statistically significant responses were calculated at alpha = .05. Two questions in the age category indicated statistical significance and three questions in the years of service teaching category contained statistical significance.

Age. Items 30 and 33 in the age category contained statistically significant responses. Statistically significant differences based on age were found in Item 30, $F(3, 653) = 5.01$, $p = .002$, and Item 33, $F(3, 653) = 5.50$, $p = .001$. Statistically significant responses were not found for any of the remaining items. All remaining items showed a $p \geq .068$. Table 15 and Table 16 display the ANOVA tables for results with significance.

Table 15

Analysis of Variance for Short One-Time Workshops vs. Ongoing Learning and Age

Item		df	SS	MS	F	p-value
Q30	Between Groups	3	3.38	1.13	5.01	.002*
	Within Groups	653	146.99	0.23		
	Total	656	150.37			

Note. n = 657.
*p ≤ .05.

Table 16

Analysis of Variance for Training Inside District vs. Training Outside District and Age

Item		df	SS	MS	F	p-value
Q33	Between Groups	3	3.46	1.15	5.50	.001*
	Within Groups	653	136.82	0.21		
	Total	656	140.28			

Note. n = 657.
*p ≤ .05.

The Tukey HSD post hoc test found Item 30 was significant in responses between 20 – 30 age range and the 50 and above age range, $F(3, 653) = 5.01$, $p \leq .001$. Significance was also found in responses from 31-40 age range and 50 and above age range, $F(3, 653) = 5.01$, $p \leq .045$. Mean results indicate all three groups in relation to Item 30 prefer ongoing learning but younger groups of teachers are more likely to prefer short, one-time workshops than older teachers. Item 33 showed significant responses between the 20-30 age range and 50 and above age range, $F(3, 653) = 5.50$, $p \leq .009$, and the 31-40 age range and the 50 and above age range, $F(3, 653) = 5.50$, $p \leq .009$. An evaluation of mean scores for each grouping related to Item 33 indicates all groups prefer to attend training inside the district but younger teachers are much more likely to prefer training outside the district than are older teachers.

Years of service. Three items in the category for years of service teaching showed significant findings. Items 30, 33 and 34 contained statistically significant responses in relation to years of service teaching. Item 30 was statistically significant, $F(3, 653) = 4.31$, $p = .005$, Item 33 showed statistical significance, $F(3, 653) = 3.87$, $p = .009$, and Item 34 was statistically significant, $F(3, 653) = 2.93$, $p = .033$. Table 17, Table 18, and Table 19 display analysis of variance results for each item with statistical significance based upon years of service.

Table 17

Analysis of Variance for Short One-Time Workshops vs. Ongoing Learning and Years of Service

Item		df	SS	MS	F	p-value
Q30	Between Groups	3	2.92	.97	4.31	.005*
	Within Groups	653	147.45	.23		
	Total	656	150.37			

Note. n = 657.
*$p \leq .05$.

Table 18

Analysis of Variance for Training Inside District vs. Outside District and Years of Service

Q33	Between Groups	3	2.45	.82	3.87	.009*
	Within Groups	653	137.83	.21		
	Total	656	140.28			

Note. n = 657.
*p ≤ .05.

Table 19

Analysis of Variance for Instructional Coaches vs. Outside Agency and Years of Service

Q34	Between Groups	3	1.23	.41	2.93	.033*
	Within Groups	653	91.02	.14		
	Total	656	92.25			

Note. n = 657.
*p ≤ .05.

A Tukey HSD post hoc test was conducted to determine groupings with statistical significance. Item 30 had two comparisons with statistical significance, Item 33 had one comparison with statistical significance, and Item 34 had one comparison showing statistical significance. Significance for Item 30 was found between responses from teachers with 0-5 years of experience and 6-16 years of experience, $F(3, 653) = 4.31$, $p \leq .028$, and teachers with 0-5 years of experience and 17-30 years of experience, $F(3, 653) = 4.31$, $p \leq .002$. Mean responses indicate all groupings prefer ongoing workshops but groups with fewer years of experience are more likely to prefer short, one-time workshops.

Significance for Item 33 was found in the comparison of teachers with 6-16 years of experience and 17-30 years of experience, $F(3, 653) = 3.87$, $p \leq .006$. Both groups prefer to have training provided inside the district but teachers with fewer years of experience are more likely to prefer training outside the district. Item 34 contained significant results when comparing teachers with 6-16 years of experience to teachers with 17-30 years of experience, $F(3, 653) = 2.93$, $p \leq .023$. Mean results indicate both groups prefer training from in-district instructional

coaches but teachers with fewer years of experience are more likely to prefer professional development provided by a professional development company.

Age of teachers and years of service teaching are important factors to take into consideration when implementing a one to one technology program. When determining methods of professional development, the two areas teachers felt the most differently are between short, one-time workshops or ongoing workshops and whether to conduct training in-district or send staff out-of-the-district. There are also notable differences in the perceptions of teachers based upon experience in education concerning learning from instructional coaches or outside agencies.

When reviewing data to determine teacher preferences concerning one-time workshops or ongoing workshops, based upon teacher age, all teachers, regardless of age, prefer ongoing workshops as evidenced by a mean greater than 1.5. Teachers 50 years old or older are more likely to prefer ongoing learning than teachers less than 50 years old. Teachers 20 to 30 years old are most likely to prefer one-time workshops. There is similar discrepancy between teachers with differences in teaching experience on this same topic. All teachers, based upon years of service teaching prefer ongoing workshops as evidenced by group means larger than 1.5. Teachers with more years of experience are more likely to prefer ongoing learning than teachers with 0-5 years of experience.

When analyzing data to determine perceptions of teachers regarding professional development provided inside the district or outside the district, all teachers, regardless of age or years of service, prefer professional development conducted inside the district. This is evidenced by group means of less than 1.5. Teachers 50 years old or older are much more likely to prefer training held inside the district as opposed to younger teachers. Teachers with 17-30 years of

experience are more likely to prefer professional development inside the district than teachers with 6-16 years of service.

There was no significant difference between age of teachers on perceptions of using instructional coaches for professional development versus hiring an outside agency, but there was a significant difference of perceptions of teachers based upon years of service teaching. Teachers with any level of teaching experience prefer using instructional coaches to provide professional development, based upon mean scores below 1.5. Teachers with 17-30 years of experience are more likely to prefer using instructional coaches for professional development than are teachers with 6-16 years of experience.

Summary

This chapter presented results of the survey analysis relating to the overarching survey question and the three supporting research questions. Mean results for each scale item were ranked and displayed. The top one-half items in each scale were identified as the most effective professional development. The mean score from the Software scale, Hardware scale, and Instructional Strategies scale were calculated and discussed. Each survey scale was analyzed for statistically significant responses and results were presented and discussed. Table 20 displays each survey scale and significance factors.

Table 20

Significance Findings for all Three Scales

	Age	Years of Service
Software		X
Hardware	X	X
Instructional Strategies	X	

Results for preferred methods of providing professional development were presented separately. Overall results were presented and discussed. Preferred methods were analyzed for statistical significance. Items with statistical significance were presented and discussed.

Chapter Five

Conclusions and Recommendations

Introduction

Technology in education is increasing and one to one technology programs are being implemented in school districts at a rapid pace. Financing one to one technology programs is an extensive investment for school districts and without proper implementation, the program is ineffective. Professional development is an integral part of any effective one to one technology implementation. School districts have the fiduciary responsibility to be effective users of district funds and are accountable to the communities in which they reside. This research study was conducted to determine what teachers perceive to be effective professional development strategies for a one to one technology implementation. There were three supporting research questions and responses to the supporting research questions answered the overarching research question. Supporting research questions included:

1. What do teachers perceive is effective training for software, hardware, and instructional practices?
2. Is professional development on using hardware, software, *or* professional development on implementing new instructional methods the most critical to teachers?
3. What *method* of professional development is preferred by teachers?

This study substantiated prior research that professional development is an important part of any one to one technology implementation (Beaudry, 2011; Haight, 2011; Lewis, 2010; Skoretz, 2011). Teacher results from all three study scales indicated a skewed mean toward a favorable response. Analysis of the mean for each overall construct and mean results of each

individual question showed teachers perceive all three areas are important professional development. All mean scores fell into the strongly agree and agree categories for combined scale items. All mean scores for individual scale items also fell into the strongly agree and agree categories.

One individual item within each scale asked respondents about the perception of need for professional development for the area overall. The question in the Software construct and the question in the Instructional Strategies construct fell into the strongly agree category. The question in the Hardware construct fell into the agree category.

Conclusions

Professional development topics within software, hardware and instructional strategies scales teachers perceived as most important were identified to answer the overarching research question and supporting research Question 1. All items within each scale registered as important. The top one-half of the items in each subscale were identified as most important professional development topics. To determine specific items in each scale for which to focus, each item was ranked according to the mean responses from teachers and the top ½ of the items were reported. Research indicates teachers realize the implementation of a one to one program is very different from the way they learned, were taught, and were trained to teach and acknowledge the need for professional development.

Within each scale, teachers' perception determined the greatest need for professional development. The greatest perceived needs for professional development on software were video creation and learning management software. The greatest perceived needs in the Hardware construct were for professional development over a projecting device, SmartBoard device, and web camera device. Finally, the greatest perceived needs for professional development on

instructional strategies were problem-based learning, project-based learning, incorporating technology into the curriculum, and inquiry-based education. The mean difference among scores in each scale was small and averaged .52 indicating all were important topics for professional development.

When determining the most important topic for professional development to answer the overarching question and supporting research Question 2, a mean score was calculated for each scale item as a whole. The resulting mean scores indicated teachers believed each scale item was important professional development as indicated by each mean score in the strongly agree or agree categories. Mean results show teachers perceive professional development on instructional strategies as the most important area, professional development on software was the second most important area, and professional development on hardware was the least important area. Results corroborate previous research indicating teachers must shift instructional practices to focus on using instructional strategies where students are doing their own work rather than being passive observers and the classroom must become student-led rather than teacher-centered (Carpenter & Pease, 2012; Mehta & Fine, 2012).

Age of teachers and years of service teaching are important factors to take into consideration when implementing a one to one technology program. Students and younger teachers have been born into technology and are considered digital natives. Adults born before the age of technology and technology in education are considered digital immigrants (McTighe, 2012). Teachers with technology backgrounds may have different professional development needs than teachers learning to use technology at a later age.

Survey results were analyzed based upon teacher age and years of service teaching. Statistical differences were found in age groups and years of service concerning professional

development on hardware. There were no statistically significant responses between teachers with 0-5 years of experience and other groups. Older teachers and teachers with more experience perceived professional development on hardware was more important than did younger teachers and teachers with less experience. The older the teacher, there is a greater preference for professional development on hardware. This perception remains consistent with teachers having 6-16 years of service and 17-30 years of service. Teachers with 17-30 years of experience prefer hardware professional development more than teachers with 6-16 years of experience. Teachers with 31 or more years of teaching perceive professional development on hardware is more important than do the teachers with 6-16 years of teaching experience. The older teachers and teachers with more experience believe professional development on hardware is more important than younger teachers and teachers with less experience. Hardware is the initial piece of technology requiring learning and younger teachers have generally had more experience with the technology and are less fearful of damaging the equipment.

Statistically significant responses were also found among age and the perception of professional development on instructional strategies. Older teachers perceive professional development on instructional strategies is less important than younger teachers. This coincides with the finding that older teachers prefer professional development on hardware more than younger teachers. Statistically significant responses were found among years of service in teaching and the perception on professional development for software. Teachers with 6-16 years of service perceive professional development on software is less important than teachers with 17-30 years of experience.

Technology in schools has only been around since the 1980s and some teachers working then may still be working now (Sapers, 2012). Older teachers and teachers in the profession

longer have had less experience with technology than younger teachers or teachers working in the profession for shorter periods of time. Students and teachers today are digital natives while older teachers are digital immigrants. Younger teachers have grown up on technology and were trained in pre-service education classes using technology and different instructional strategies. Older teachers and those with more experience did not have that training. It is apparent older teachers and teachers with more experience have different needs than do younger teachers and teachers with fewer years of experience.

Overall, teachers perceive professional development on software, hardware, and instructional strategies necessary for an effective one to one technology implementation. Tests of statistical significance indicate older teachers and teachers with more experience believe professional development on hardware is more important than professional development on instructional strategies. Older teachers may believe their knowledge on instructional strategies is greater and need less help than younger teachers. Older teachers may also view themselves as needing hardware training more than younger teachers because they have had less experience on hardware but more experience with teaching. Likewise, younger teachers have had more experience using technology hardware but have had less experience with instruction.

The Methods section of the survey was used to determine how teachers prefer to be provided professional development. This section was different than the previous sections because it did not address what was being taught, but only addressed how topics were being taught. It was used to answer the overarching research question and supporting research Question 3. Overall, teachers preferred to be provided professional development within the district, face to face, in collaborative teams over an extended period of time. The use of in-district instructional coaches providing training was preferred over hiring an expert or agency

from outside the district but teachers preferred learning from grade level peers. Teachers believed observing at other school districts having already implemented a one to one technology program was beneficial and teachers perceived most strongly hiring an outside agency to provide professional development was not effective. The results agree with professional development theory stating on-going learning in collaborative teams is most effective. Providing professional development to all staff within the district, focused on district goals, makes learning new strategies most effective (Crow, 2011).

Testing for statistically significant differences in age or years of service in education was completed on responses to the Methods section of the survey. Statistical analysis indicated there was a difference between perceptions of effective professional development for a one to one implementation based upon age and years of service teaching. Younger teachers felt differently than did older teachers concerning aspects of effective professional development and teachers with more experience in education felt differently than those with less teaching experience.

A difference in opinion was found in the age and in the years of service categories in preference for short, one-time workshops or ongoing learning and training inside the district or training outside the district. Both the age and years of service groups preferred ongoing learning on a topic to short, one-time workshops but older teachers preferred on-going workshops more than younger teachers. Likewise, teachers with more experience preferred ongoing learning more than teachers with fewer years of experience.

All teachers preferred attending training inside the district to attending training outside the district. Older teachers and teachers with more experience preferred training inside the district more than younger teachers and teachers with fewer years of experience. A statistically significant difference was found in perceptions concerning learning from in-district instructional

coaches or learning from a professional development company hired by the school district. All teachers preferred to learn from an in-district instructional coach but teachers with greater years of experience preferred the method more than teachers with fewer years of experience. No statistical differences for this method based upon age were found.

Perceptions of older teachers and teachers with more years of experience may be explained by experiences or lack of experiences. Older teachers and teachers with more years of experience have had more opportunities to participate in professional development than their counterparts who are younger or have less teaching experience. Older teachers have learned through time how they most effectively learn. Younger teachers and those with less experience may not have experienced both ways of professional development so do not have an extensive understanding of what each is like. This lack of understanding may explain why teachers who are younger or had less experience did not as strongly support the methods of their older and more experienced peers.

Recommendations

Districts planning to implement a one to one program should provide teachers with professional development. Districts should spend the most time working with teachers on instructional strategies to be used in a one to one setting and in the 21st Century classroom. Professional development on software and hardware are important but should not be provided at the expense of providing professional development on instructional strategies. Districts should take note of the fact older teachers and teachers with more experience in education need more instruction on hardware and software than do younger teachers and teachers with less experience in teaching. Districts should focus professional development on instructional strategies for the younger teachers and teachers with less experience.

It is important to provide professional development to teachers in a way most effective. Districts should plan to provide professional development within the district through professional learning teams. Districts should consider hiring an instructional coach for technology and find lead teachers within each professional learning community to provide face to face instruction. Although online resources are abundant, districts should avoid the exclusive use of online resources to provide professional development. Districts should seek out other school districts which have already implemented a one to one program and plan to send teachers for observation and future collaboration. It would be beneficial for school districts implementing a one to one program to work together to support each other to provide insight on effective practices. Districts implementing a one to one program should be aware younger teachers and teachers with fewer years of experience may benefit from attending outside training and one-time workshops. Younger teachers or those with fewer years of experience may be used to learn new strategies outside of the district and return to provide ongoing professional development to teachers within the school district.

Future Research Topics

Further research should be conducted to learn additional information about professional practices in a one to one technology initiative. Future topics for further research include understanding if differences occur in responses based upon school size, wealth, or length of a district's one to one program. The study could be replicated and demographic information could be added. This survey looked only at districts meeting the study definition of a one to one program. Additional research could be done to determine Missouri school districts having different types of one to one programs and to determine the grade levels at which districts have implemented the one to one programs and any future plans for one to one technology

implementations. School size, wealth, length of implementation, and differing one to one implementation types could be studied and perceptions of teachers toward effective professional development analyzed for differences.

The researcher suggests additional review of survey items before use of the final survey form due to minimal alignment of survey items with the software, hardware, and instructional strategies constructs. Current survey items should be reviewed and items related to each construct should be added. Additional testing for validity and reliability should be conducted before use.

Summary

This chapter summarized the data and made conclusions and recommendations for future professional development practices in one to one technology implementations. Differences in perceptions based upon age and years of service were noted and significant differences were discussed. Recommendations were made for professional development for future one to one technology initiatives.

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Appendix A

Survey Email and Survey Instrument for Superintendents

Dear

I am completing the doctoral program in Educational Leadership at Southwest Baptist University in Bolivar, Missouri. I am writing to request your help with my dissertation. Your participation will take less than two minutes. *To participate, click Reply, scroll to the bottom of this email, and respond to the short questionnaire.*

The focus of my dissertation is on professional development practices for an effective one to one technology implementation in a public Missouri school district. Results will be used for two purposes: 1) to help educators across the country determine how best to use their limited professional development funds in order to have the most successful one to one implementation; 2) to have concrete data on the number of *districts*/*buildings* in Missouri which have implemented a one to one technology implementation. Currently, Missouri DESE does not know how many, or which, districts in Missouri have implemented a one to one technology program so survey results will provide the information.

First, I need to determine if your district has implemented a one to one technology program at any grade level as defined in the questionnaire below. *Second*, if you confirm that your district (or building) meets the criteria of a one to one technology program as set forth by the study, I am asking if you would forward a survey to your teachers working in your one to one technology program. If you agree to forward the survey to your teachers, I will email you a link to the teacher survey within the next two weeks.

The teacher survey is electronic and will take less than 10 minutes to complete. The teacher survey is anonymous and only the respondents' age and years of service in education will

be gathered. The teacher survey contains 42 questions and is separated into five categories. The categories include Demographics, Software, Hardware, Instructional Strategies, and Methods. Survey questions are statements for which the respondent shows their level of agreement and is scored using a four-category likert scale (Strongly Disagree, Disagree, Agree, Strongly Agree.)

Your response to this email questionnaire will not be anonymous but the results will only be used to determine the sample population for the study as well as determine what districts in Missouri meet the criteria. Your participation is voluntary and you may withdraw at any time. This research study survey has been approved by the SBU Research Review Board.

Thank you, in advance, for your help in this study. Please feel free to contact me if you have further questions. I will be happy to provide you with the results of the survey if requested.

Superintendent Questionnaire

DEFINITION OF A ONE TO ONE PROGRAM

The definition of a one to one technology program as defined by this study is "*any school in which each student has an internet-connected, wireless computing device for use in the classroom 24 hours a day, seven days a week, in any district building or grade level."*

Using this definition, click "Reply" to this email and type your answers in the boxes provided below.

1) What is the name of your school district?

2) Does your district meet the definition of a one to one technology program as stated above? Place an X in the appropriate box.

Yes	
No	

If your answer is No, thank you for participating in this questionnaire. Please click "Send" to return the questionnaire.

3) **If your answer to Question 2 is Yes**, please type, in the table below, the building names, grade levels and number of teachers in each building currently meeting the definition.

Building Name	**Grade Configuration**	**Number of Teachers**

4) Will you please forward the teacher survey to your teachers currently working in a one to one technology setting? Place an X in the appropriate box.

Yes	
No	

Note: If you agree to forward the survey, you will receive a follow-up email within two weeks. The email will contain the survey link to forward to teachers within your identified buildings.

Thank you for your participation in this Questionnaire! You are appreciated.

Appendix B

Email Sent to Teachers via Superintendent

Dear Teacher

I am writing to ask if you would take just a few minutes to complete the survey at the link below. I am a Doctoral student attending Southwest Baptist University in Bolivar, Missouri. As a final part of the doctoral program, I am completing my doctoral dissertation on professional development practices in a One to One Technology implementation. I am surveying teachers in Missouri school districts with a One to One Technology program. Completing the survey should take less than 8 minutes and I would really appreciate your input.

This research study focuses on teacher perceptions of the most effective professional development practices for a One to One Technology implementation and has been reviewed by the SBU Research Review Board. Results will help educators across the country determine how best to use their limited professional development funds in order to have the most successful One to One implementation.

The survey is anonymous and only the respondents' age and years of service in education will be gathered. No identifying criteria are collected. Your completed survey is your implied consent to be surveyed. Your participation is voluntary and you may withdraw at any time.

To begin the brief survey, click on the link below. I thank you, in advance, for your valuable time and help with this research project. Your input is valuable to future and present One to One implementations.

http://pdforonetoone.questionpro.com

Thank you for your willingness to take this survey over the most effective professional development practices for a One to One Technology implementation.

Your participation in this study is completely voluntary. There are no foreseeable risks associated with this project. However, if you feel uncomfortable answering any questions, you can withdraw from the survey at any point. It is very important for me to learn your opinions.

Your survey responses will be strictly confidential and data from this research will be reported only in the aggregate. Thank you very much for your time and support.

Appendix C

Final Survey Disseminated to Teachers

Each statement below begins with the following stem: For the implementation of a One to One Technology program, I believe… Click on the answer which best indicates your perception of the statement.				
1. Training on how to use a Projecting device is effective professional development.	Strongly Agree	Agree	Disagree	Strongly Disagree
2. Professional development on addressing teacher beliefs and attitudes about instruction and pedagogy is not effective professional development.	Strongly Agree	Agree	Disagree	Strongly Disagree
3. Software training is more important than training on Instructional Practices for use in the 21st Century classroom.	Strongly Agree	Agree	Disagree	Strongly Disagree
4. Using cooperative learning strategies in the classroom training is effective professional development.	Strongly Agree	Agree	Disagree	Strongly Disagree
5. Training on a video camera device is effective professional development.	Strongly Agree	Agree	Disagree	Strongly Disagree
6. Training on effective Instructional Strategies for use in the 21st Century classroom is not effective professional development.	Strongly Agree	Agree	Disagree	Strongly Disagree
7. Social media tools training (i.e. Facebook, Twitter, Blogging, Glogster, Skype, etc.) is effective professional development.	Strongly Agree	Agree	Disagree	Strongly Disagree
8. Technology hardware training is effective professional development.	Strongly Agree	Agree	Disagree	Strongly Disagree
9. Gaming software training is not effective professional development.	Strongly Agree	Agree	Disagree	Strongly Disagree

10. Training on Problem-Based Learning strategies is effective professional development.	Strongly Agree	Agree	Disagree	Strongly Disagree
11. Word processing software training is effective professional development.	Strongly Agree	Agree	Disagree	Strongly Disagree
12. Training on a scanning device is not effective professional development.	Strongly Agree	Agree	Disagree	Strongly Disagree
13. Professional development on Project-Based Learning strategies is effective professional development.	Strongly Agree	Agree	Disagree	Strongly Disagree
14. Training on using a printing device is not effective professional development.	Strongly Agree	Agree	Disagree	Strongly Disagree
15. Presentation software training is effective professional development.	Strongly Agree	Agree	Disagree	Strongly Disagree
16. Training on effective Instructional Strategies for use in the 21st Century classrooms is not more important than training on Hardware use.	Strongly Agree	Agree	Disagree	Strongly Disagree
17. Training for using a SmartBoard device is effective professional development.	Strongly Agree	Agree	Disagree	Strongly Disagree
18. Training on software applications is effective professional development.	Strongly Agree	Agree	Disagree	Strongly Disagree
19. Training on the electronic device students use daily (iPad, Chromebook, etc.) is effective professional development.	Strongly Agree	Agree	Disagree	Strongly Disagree
20. Training on video creation and use (i.e. Animoto, MovieMaker, VINE, You Tube, etc.) is effective professional development.	Strongly Agree	Agree	Disagree	Strongly Disagree
21. Training on integrating technology into the core curriculum is not effective professional development.	Strongly Agree	Agree	Disagree	Strongly Disagree

22. Training on Learning Management Systems used by my school district is effective professional development.	Strongly Agree	Agree	Disagree	Strongly Disagree
23. Web camera device training is effective professional development.	Strongly Agree	Agree	Disagree	Strongly Disagree
24. Training on internet-based search engines is effective professional development.	Strongly Agree	Agree	Disagree	Strongly Disagree
25. Training on Constructivist pedagogy practices is effective professional development.	Strongly Agree	Agree	Disagree	Strongly Disagree
26. Technology hardware training is more important than training on software.	Strongly Agree	Agree	Disagree	Strongly Disagree
27. Training for using Inquiry-Based Instruction strategies in the classroom is not effective professional development.	Strongly Agree	Agree	Disagree	Strongly Disagree

Methods

For the statements below, place a checkmark beside the professional development method you prefer.

28. Learning new material/strategies in collaborative teams	OR	Learning new material/strategies individually
29. Using online resources (training manuals, videos, professional development websites, etc.) to learn new material/strategies	OR	Learning new material from an individual, face to face
30. Short, one-time workshops	OR	Ongoing learning on a topic
31. Learning from other teachers in my grade level/content area	OR	Learning from a district-paid instructional coach
32. Observing at other school districts which have already implemented the strategy	OR	Learning from an expert in the field
33. Attending training inside my district	OR	Attending training outside my district
34. Learning from in-district instructional coaches	OR	Learning from a professional development company hired by my school district

Demographics

35. What is your age? 20-30 31-40 41-50 50 & above

36. How many years have you taught? 0-5 6-16 17-30 31 & above

Appendix D

Preliminary Survey for Pilot Testing

Demographics				
What is your age? 20-25 26-30 31-35 36-40 41-50 51-55 56 & above				
How many years have you taught? 0-2 3-5 6-10 11-15 16-20 21-25 26-30 31 & above				
Each statement below begins with the following stem: For the implementation of a One to One Technology program, I believe…				
Software				
1. Training on software applications is effective professional development.	Strongly Agree	Agree	Disagree	Strongly Disagree
2. Word processing software training is effective professional development.	Strongly Agree	Agree	Disagree	Strongly Disagree
3. Presentation software training is effective professional development.	Strongly Agree	Agree	Disagree	Strongly Disagree
4. Training on internet-based search engines is effective professional development.	Strongly Agree	Agree	Disagree	Strongly Disagree
5. Training on Learning Management Systems used by my school district is effective professional development.	Strongly Agree	Agree	Disagree	Strongly Disagree
6. Software training is not more important than training on hardware.	Strongly Agree	Agree	Disagree	Strongly Disagree
7. Social media tools training (i.e. Facebook, Twitter, Blogging, Glogster, Skype, etc.) is effective professional development.	Strongly Agree	Agree	Disagree	Strongly Disagree
8. Training on video creation and use (i.e. Animoto, MovieMaker, VINE, You Tube, etc.) is effective professional development.	Strongly Agree	Agree	Disagree	Strongly Disagree
9. Gaming software training is not effective professional development.	Strongly Agree	Agree	Disagree	Strongly Disagree
10. Software training is more important than training on Instructional Practices for use in the 21st Century classroom.	Strongly Agree	Agree	Disagree	Strongly Disagree

Hardware				
11. Technology hardware training is effective professional development.	Strongly Agree	Agree	Disagree	Strongly Disagree
12. Training on the electronic tool students use daily is effective professional development.	Strongly Agree	Agree	Disagree	Strongly Disagree
13. Professional development on using a printer is not effective professional development.	Strongly Agree	Agree	Disagree	Strongly Disagree
14. Web camera training is effective professional development.	Strongly Agree	Agree	Disagree	Strongly Disagree
15. SmartBoard training is effective professional development.	Strongly Agree	Agree	Disagree	Strongly Disagree
16. Technology hardware training is more important than training on Instructional Practices for use in the 21st Century classroom.	Strongly Agree	Agree	Disagree	Strongly Disagree
17. Training on using a video camera is effective professional development.	Strongly Agree	Agree	Disagree	Strongly Disagree
18. Projector usage training is effective professional development.	Strongly Agree	Agree	Disagree	Strongly Disagree
19. Professional development on using a scanner is not effective professional development.	Strongly Agree	Agree	Disagree	Strongly Disagree
20. Technology hardware training is more important than training on software.	Strongly Agree	Agree	Disagree	Strongly Disagree
Instructional Strategies				
21. Training on effective Instructional Strategies for use in the 21st Century classroom is not effective professional development.	Strongly Agree	Agree	Disagree	Strongly Disagree
22. Training for using Inquiry-Based Instruction strategies in the classroom is not effective professional development.	Strongly Agree	Agree	Disagree	Strongly Disagree
23. Professional development on addressing teacher beliefs and attitudes about instruction and pedagogy is not effective professional development.	Strongly Agree	Agree	Disagree	Strongly Disagree

24. Training on Constructivist pedagogy practices is effective professional development.	Strongly Agree	Agree	Disagree	Strongly Disagree
25. Using cooperative learning strategies in the classroom training is effective professional development.	Strongly Agree	Agree	Disagree	Strongly Disagree
26. Training on Problem-Based Learning strategies is effective professional development.	Strongly Agree	Agree	Disagree	Strongly Disagree
27. Effective Instructional Strategies for use in the 21st Century classrooms training is more important than training on Software use.	Strongly Agree	Agree	Disagree	Strongly Disagree
28. Training on integrating technology into the core curriculum is not effective professional development.	Strongly Agree	Agree	Disagree	Strongly Disagree
29. Professional development on Project-Based Learning strategies is effective professional development.	Strongly Agree	Agree	Disagree	Strongly Disagree
30. Training on effective Instructional Strategies for use in the 21st Century classrooms is not more important than training on Hardware use.	Strongly Agree	Agree	Disagree	Strongly Disagree

Methods

For the statements below, place a checkmark beside the professional development method you prefer.

31. Learning new material/strategies in collaborative teams	OR	Learning new material/strategies individually
32. Using online resources (training manuals, videos, professional development websites, etc.) to learn new material/strategies	OR	Learning new material from an individual, face to face
33. Short, one-time workshops	OR	Ongoing learning on a topic
34. Professional development provided in-district, during my work day	OR	Attending workshops outside of my school, during my work day
35. Learning from other teachers in my grade level/content area	OR	Learning from a district-paid instructional coach
36. Observing at other school districts which have already implemented the strategy	OR	Learning from a collaborative team within my school

37. My district to bring in an out-of-district expert	OR	Learning from a "lead" teacher in my district
38. Attending training inside my district	OR	Attending training outside my district
39. Participating in a collaborative book study to learn new material	OR	Learning from an expert in the field
40. Learning from in-district instructional coaches	OR	Learning from a professional development company hired by my school district

Appendix E

Final Survey Used for Data Analysis

Each statement below begins with the following stem: For the implementation of a One to One Technology program, I believe… Click on the answer which best indicates your perception of the statement.				
1. Training on how to use a Projecting device is effective professional development.	Strongly Agree	Agree	Disagree	Strongly Disagree
2. Professional development on addressing teacher beliefs and attitudes about instruction and pedagogy is not effective professional development.	Strongly Agree	Agree	Disagree	Strongly Disagree
4. Using cooperative learning strategies in the classroom training is effective professional development.	Strongly Agree	Agree	Disagree	Strongly Disagree
5. Training on a video camera device is effective professional development.	Strongly Agree	Agree	Disagree	Strongly Disagree
6. Training on effective Instructional Strategies for use in the 21st Century classroom is not effective professional development.	Strongly Agree	Agree	Disagree	Strongly Disagree
7. Social media tools training (i.e. Facebook, Twitter, Blogging, Glogster, Skype, etc.) is effective professional development.	Strongly Agree	Agree	Disagree	Strongly Disagree
8. Technology hardware training is effective professional development.	Strongly Agree	Agree	Disagree	Strongly Disagree
10. Training on Problem-Based Learning strategies is effective professional development.	Strongly Agree	Agree	Disagree	Strongly Disagree
12. Training on a scanning device is not effective professional development.	Strongly Agree	Agree	Disagree	Strongly Disagree
13. Professional development on Project-Based Learning strategies is effective professional development.	Strongly Agree	Agree	Disagree	Strongly Disagree

14. Training on using a printing device is not effective professional development.	Strongly Agree	Agree	Disagree	Strongly Disagree
15. Presentation software training is effective professional development.	Strongly Agree	Agree	Disagree	Strongly Disagree
16. Training on effective Instructional Strategies for use in the 21st Century classrooms is not more important than training on Hardware use.	Strongly Agree	Agree	Disagree	Strongly Disagree
17. Training for using a SmartBoard device is effective professional development.	Strongly Agree	Agree	Disagree	Strongly Disagree
18. Training on software applications is effective professional development.	Strongly Agree	Agree	Disagree	Strongly Disagree
20. Training on video creation and use (i.e. Animoto, MovieMaker, VINE, You Tube, etc.) is effective professional development.	Strongly Agree	Agree	Disagree	Strongly Disagree
21. Training on integrating technology into the core curriculum is not effective professional development.	Strongly Agree	Agree	Disagree	Strongly Disagree
22. Training on Learning Management Systems used by my school district is effective professional development.	Strongly Agree	Agree	Disagree	Strongly Disagree
23. Web camera device training is effective professional development.	Strongly Agree	Agree	Disagree	Strongly Disagree
24. Training on internet-based search engines is effective professional development.	Strongly Agree	Agree	Disagree	Strongly Disagree
25. Training on Constructivist pedagogy practices is effective professional development.	Strongly Agree	Agree	Disagree	Strongly Disagree
27. Training for using Inquiry-Based Instruction strategies in the classroom is not effective professional development.	Strongly Agree	Agree	Disagree	Strongly Disagree

Methods For the statements below, place a checkmark beside the professional development method you prefer**.**		
28. Learning new material/strategies in collaborative teams	OR	Learning new material/strategies individually
29. Using online resources (training manuals, videos, professional development websites, etc.) to learn new material/strategies	OR	Learning new material from an individual, face to face
30. Short, one-time workshops	OR	Ongoing learning on a topic
31. Learning from other teachers in my grade level/content area	OR	Learning from a district-paid instructional coach
32. Observing at other school districts which have already implemented the strategy	OR	Learning from an expert in the field
33. Attending training inside my district	OR	Attending training outside my district
34. Learning from in-district instructional coaches	OR	Learning from a professional development company hired by my school district
Demographics		
35. What is your age? 20-30 31-40 41-50 50 & above		
36. How many years have you taught? 0-5 6-16 17-30 31 & above		