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The Impact of Professional Development on Early Implementation of a 1:1 Laptop Initiative

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by

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Declaration of Originality

I do hereby declare and attest to the fact that this is an original study based solely upon my own scholarly work at Lindenwood University and that I have not submitted it for any other college or university course or degree.

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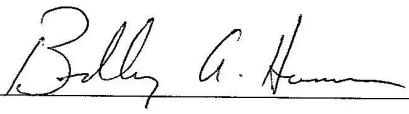
Signature:  Date: 6-11-2014

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Abstract

As school leaders continue to attempt to integrate technology into today's classrooms, 1:1 laptop initiatives are becoming increasingly more prevalent and certainly more affordable than ever before. School leaders must be able to justify the expenditure by the direct impact the integration of the laptops make on classroom instruction and learning. Preparing and supporting teachers to teach and facilitate learning with these new technological tools is a necessity that cannot be overlooked in ensuring the success of 1:1 laptop initiatives. This study examined the impact of various professional development preparatory factors on the instructional change that occurred immediately after implementation of a 1:1 laptop initiative within three high schools. Significant differences were observed between the teachers' perceived value of different types of professional development activities, including learning to use hardware, software, content management and instructional delivery platforms, as well as learning to integrate technology into instruction. Significant changes were also observed in each of 11 different instructional activities when comparing teacher practice pre-1:1 laptop initiative implementation and during implementation. Correlations between the amount of time teachers had access to their own laptops prior to the 1:1 implementation and the change in frequency of use of the instructional activities indicated limited significant results, as did the correlations between the length of professional development preparation designed to prepare teachers for the 1:1 laptop initiative and the change in frequency of use of the 11 instructional activities. The final correlations between the teachers' perceived value of the four professional development activities and the change in frequency of use of the 11 instructional activities also yielded limited significant results.

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Chapter One: Introduction of the Study

Technology in education is not a new concept. Educators have experimented utilizing computers with students for the past half century. What is relatively new, however, is the ubiquitous availability of lower cost computer technology that makes it more possible for schools to consider investing in computer technology and dispensing the technology into students' hands daily (U.S. Department of Education [USDOE], 2013).

In fact, current technology has the potential to transform teaching and learning like no other tool in the 21st century (Center for Digital Education, 2011). Today's educational stakeholders are placing the integration of technology into classrooms as one of the highest priorities in an effort to prepare students for success in the 21st century global economy (Blackboard, 2012). Nowhere is this more evident than at the high school level. In addition, with the recent advent of consumer-driven technology domination in the marketplace, educational publishers and software application developers are rapidly creating educational resources that can be utilized for educating students of all levels and any content area (USDOE, 2013).

The federal government has also made recent recommendations in support of the addition of instructional technology in the classroom. Beginning with the No Child Left Behind legislation in 2002, the USDOE has promoted as a primary goal "the improvement of student achievement through the use of technology in elementary and secondary schools" (Section 2402, b, 1). Additional goals listed within this legislation encouraged schools to "ensure that every student is technologically literate" and to "integrate technology resources and systems with teacher training and curriculum

development, in an effort to establish research-based instructional methods that can widely be implemented as best practices" (No Child Left Behind Act, 2002, Section 2402, b, 2). More recently, the American Recovery and Reinvestment Act (2009) and the 2012 Race to the Top initiative required schools to invest in computer technology within classrooms as a prerequisite for receiving certain federal funds. With this legislation and initiative, President Obama and the USDOE have set the stage for the future transformation of elementary and secondary education in the United States through the integration of technology (USDOE, 2010).

Today's students live in a world outside the classroom that has enabled most to have "anytime, anywhere" access to digital technology (Ontario Public School Boards' Association [OPSBA], n.d., p. 3). According to a national survey, most students' ages 8-18 devote more than seven and one-half hours per day using some facet of entertainment media (Rideout, Foehr, & Roberts, 2010). Even 15 years ago, Cuban (2001) reported students spent their entire lives with digital technology, including computers, cell phones, and video games. More recently, Apple Computer, Inc. (2008) cited:

> In a remarkably short period of time, the world and its people, economies, and cultures have become inextricably connected, driven largely by the Internet, innovations in mobile computers and devices, and low-cost telecommunication technology. (p. 6)

With these increases in technology access, students now have the opportunity to utilize resources from around the world and to express their learning in a variety of digital formats (OPSBA, 2013, p. 3). The challenge for teachers is to discover ways that technology can assist in creating "learning opportunities for students that stimulate them

to become independent, reflective, and collaborative learners" as well as to "challenge their thinking and assumptions and engage them on many levels" (OPSBA, 2013, p. 3). The National Education Technology Plan offered that technology is "at the core of virtually every aspect of our daily lives" (USDOE, 2010, p. ix). This plan suggested educators must find every opportunity to leverage the technology in order to create powerful learning experiences for all students (USDOE, 2010).

Background of the Study

As educators have recognized this change from an "analog" to "digital" world, many high schools have turned to 1:1 computing initiatives to bring classrooms into the 21st century (Center for the Advanced Study of Technology Leadership in Education [CASTLE], 2012, p. 2). Once considered too expensive an option for public high schools, laptop computers have become considerably more affordable, thus deserving strong consideration when identifying means of integrating technology into classroom instruction (Ferguson, 2012). Educators are now seeking technology tools that engage students and have a definitive impact on school success. Now, 1:1 laptop programs have quickly become a prevalent option for educators wishing to meet this objective (Constant, 2011).

In 2004, it was estimated that 4% of the nation's schools were involved in some form of 1:1 initiative ("One Computing Device," 2006). Just two years later it was estimated that number had grown closer to 25% and there seems to be little doubt this trend continues to rise today ("One Computing Device," 2006). Bebell and O'Dwyer (2010) forecasted, "It seems highly likely that some form of 1:1 computing will be the norm for the majority of American classrooms at some point in the future" (p. 5).

Penuel (2006) concluded when students and teachers have ready access to laptop computers, they have unlimited access to information as well as the ability to communicate and collaborate with anyone across the globe. Storz and Hoffman (2013) asserted, "Introducing 1:1 computing in a school places new demands on and affords new opportunities for teachers. Although the content may not change, the technology enables the use of innovative and engaging instructional approaches" (p. 3).

Costa (2012) added, "Without 1:1 access to the tools that form the foundation of 21st century learning and work, students cannot be properly prepared for life in this environment" (p. 15). Costa (2012) continued, "One would think that public schools, the institution with the greatest burden of preparing students for this reality, would aggressively shift resources to get every learner a digital device" (p. xv). Bebell and Kay (2010) concluded 1:1 laptop initiatives have great potential to "radically change teaching and learning practices" (p. 48).

Oftentimes this message is best coming from those who would be affected the most by the successful implementation of a 1:1 initiative. An eighth grade student interviewed within the Berkshire Wireless Technology Initiative stated:

> In school, it is important to keep kids informed and ready for the real world and the work force, and computers are becoming a very important part of our world. It is important that we know how to use a computer so that when we reach the workforce and higher levels of education, we are not struggling to keep up. Also, using computers in school is a great way to keep kids focused and ready to learn, and keep people interested in the education they are receiving. Computers, especially laptops, are our links to an ever-expanding world of technology, and it

> is important to know how to connect to this world easily which having laptops allows us to do. (as cited in Bebell & Kay, 2010, p. 46)

To investigate 1:1 initiatives, pertinent components of this research study must be presented. The main topics of this chapter include the conceptual framework for this study, statement of the problem, and the purpose of the study with accompanying research questions and hypotheses. Other main topics further explaining this study are the definition of key terms, limitations, and assumptions.

Conceptual Framework

Student access to high quality technological tools and resources, along with assurance of teachers' high quality training in technology integration, were listed as integral components of the Ten Elements of High Quality Digital Learning released by the Digital Learning Council in 2010. The U.S. Secretary of Education, Arne Duncan (2010), remarked, "Providing students with a laptop can have a far-reaching impact on how teachers teach and how students learn" (p. 1). The National Education Technology Plan suggested that technology would soon be essential in assisting teachers to create collaborative learning strategies and to, ultimately, improve student learning (USDOE, 2010).

The change in instructional practice that occurs as a result of the implementation of a 1:1 laptop initiative, along with the preparatory professional development practices designed to prepare teachers for such an implementation, provided the conceptual framework for this research. Understanding the types of instructional change that will most likely occur during the initial implementation of a 1:1 laptop initiative can provide school leaders with an example of what to expect as they commit resources towards the

development of their own initiative. Understanding how various professional development preparatory factors relate to the initial instructional change can also be of assistance to school leaders as they strategically plan for future initiatives.

Teachers ultimately control the amount of technology integration that occurs within their classrooms in a 1:1 laptop initiative (Bebell & Kay, 2010). In addition, teachers must be prepared to invest considerable amounts of time to learn how to effectively integrate laptop technology into their classrooms and to adapt current instructional practices (Bebell & Kay, 2010). Fulton, Glenn, and Valdez (2004) added that while technology provides a powerful tool that can be utilized for student learning, the technology is only as powerful as the teacher allows. Bebell and O'Dwyer (2010) concluded that 1:1 laptop initiatives have the possibility to improve teaching and student learning, including the creation of more efficient content delivery.

Ultimately, the increased access to laptops directly impacts the quality of instruction and student achievement. Annable (2013) suggested that the "most important factor in the implementation of laptop technology is the teacher" (p. 167). Annable (2013) added, "The use of laptop computers by teachers in the classroom requires teachers to make some significant changes in their teaching practices" (p. 51). Teachers, therefore, must discover means of embracing the technology and must become competent in technology use.

As 1:1 laptop initiatives become more prevalent, the "quality and depth" of professional development teachers receive in preparation for the implementation of the laptops will become a primary predictor of future program success (Bebell & O'Dwyer, 2010, p. 10). The authors of the Project Revolutionizing Education (Project RED) study

concluded that professional development is “essential for teacher growth in terms of effectively integrating education technology” (Greaves, Hayes, Wilson, Gielniak, & Peterson, 2010, p. 48). Sinay and Yashkina (2012) suggested that the majority of teachers are not prepared to teach and facilitate student learning in a 1:1 laptop environment; therefore, high quality professional development becomes paramount for successful implementation. Professional development programs that are well planned and ongoing become a significant investment in time and money, both of which schools should consider when considering a 1:1 laptop initiative (Rodriguez & Knuth, 2000). For these reasons, the process of preparing teachers for the effective implementation of 1:1 laptop initiatives was chosen for examination in this study.

Statement of the Problem

The integration of a 1:1 computing initiative was once thought too expensive for public school systems. The purchase of these laptop devices is now more affordable, thus making the consideration for 1:1 computing initiatives far more worthy of consideration (Greaves et al., 2010). Boardman (2012) warned that 1:1 computing initiatives could easily translate to fiscal waste if not utilized to transform instruction and student learning to meet the needs of the 21st century. Annable (2013) suggested that without the examination of the successes and failures within 1:1 computing initiatives, the technology investment could possibly be wasted by school districts. Annable (2013) continued, “We must look at what teachers are doing in their classrooms and how the laptops have had an influence on the teaching and learning that takes place” (p. 71).

The National Education Technology Plan explained, “Effective teaching is an outcome of preparing and continually training teachers and leaders to guide the type of

learning we want in schools" (USDOE, 2010, p. 5). This is especially true in the preparation and support for 1:1 laptop initiatives. Professional development is also needed to support the "creative and innovative use of technology" by teachers as a result of the wide variety and ever-changing assortment of technological resources available (Nadelson, Bennett, Gwilliam, Howlett, Oswalt, & Sand, 2013, p. 3). Rodriguez and Knuth (2000) proposed that effective technology professional development should include a variety of hands-on learning experiences that connect students to their own learning. These experiences should also be ongoing and provided with sufficient time and support to ensure learning transfers to the classroom.

Penuel (2006) concluded that despite increased implementation of 1:1 computing initiatives, there is certainly a lack of research that focuses upon the impact these initiatives have upon teaching and learning. Bebell and O'Dwyer (2010) concurred that there is not enough empirical evidence in the research to understand the true impact of 1:1 computing on teaching and learning. Bebell and O'Dwyer (2010) explained, "Scholarly reflection and sharing were deemed as essential components for creating further understanding of the impact of 1:1 computing initiatives for educators" (p. 13).

Annable (2013) recommended that future research involving 1:1 computing initiatives should include the examination of teacher practices before laptop implementation along with any change that occurred after laptop implementation. This type of research would, in a sense, provide an explanation for what educators could expect with such an implementation and the role the laptops might have made in transforming instructional practices. Tweed (2013) echoed this need for conducting research on the pre- and post-laptop implementation effects on classroom instruction.

Tweed (2013) also cited the need for further research on technology-based professional development and the subsequent impact made upon classroom instruction.

In a recent meta-synthesis of research involving 1:1 laptop initiatives conducted by the Institute for School Improvement at Missouri State University, a specific gap was identified in the area of teacher professional development:

> There were an insufficient number of studies to reach conclusions about the following issues related to professional development: teachers' computer literacy and usage prior to initiating 1:1 initiatives; whether professional development is more effective if it focuses on the personal concerns of teachers regarding using computers and/or teaching strategies to be employed; how and when to provide the instructional design and development help teachers might need in approaching a given curriculum with 1:1 technology; and under which conditions it is more effective to use local or contracted personnel for extended training or mentoring groups to continue professional development after 1:1 implementation. (Sell et al., 2012, p. 31)

Jenkins (2012) concluded that teacher professional development in instructional technology could lead to instructional changes that adapt to the ever-changing needs of 21st century learners. Jenkins (2012) recommended further quantitative studies involving teachers' professional development experiences. Majeski (2013) indicated that it would be interesting to investigate the specific types of technology integration professional development experiences offered to teachers. Raulston (2009) cited that, ultimately, research should emphasize how teachers best integrate technology within instruction. Raulston (2009) explained that the "examination of professional development training

sessions should be explored to investigate effective strategies to educate educators" (p. 77).

Purpose of the Study

This study was conducted to identify the impact of various factors of professional development preparation on teacher instructional practices during the early implementation of a 1:1 laptop initiative at the high school level. Once educational leaders have invested in a 1:1 computing initiative, they most assuredly want to ensure their investment begins to pay immediate dividends. This study provides educators a glimpse of the types of instructional changes that can likely be expected upon initial implementation of a 1:1 laptop initiative at the high school level and the relationship of various factors of professional development to those instructional changes.

The factors of professional development preparation investigated within this study included the actual amount of time teachers had access to their own laptops prior to implementation with students, the actual length of professional development preparation (in semesters), and the perceived value of various types of professional development in which teachers have participated to prepare for the 1:1 laptop implementation. The examination of these factors provides educators with specific quantifiable data to consider when planning for a future 1:1 laptop initiative.

The impact on teacher instructional practices was measured by the amount of change identified in technology-related instructional practices prior to 1:1 laptop implementation and during the first semester of implementation with students. The instructional practices identified for study within this research included the following: instructional planning, delivery, assessment of student learning, collection of student

work, supplementing the existing curriculum, creation of presentations, differentiating/personalizing instruction, critical thinking, use of a content management platform or webpage, student collaboration, and posting of work to a global audience. This study outlined the immediate change that can be expected from teachers within each of these respective teacher instructional practices as well as the relationship of these changes to teacher professional development experiences.

Research Questions

The following research questions guided this study:

RQ1. What is the statistical difference in the teachers' perceived value of various types of professional development activities for the purpose of preparing to implement a 1:1 laptop initiative?

RQ2. What is the relationship between the length of time teachers have had access to the same device students have been provided in 1:1 laptop initiative and the change in teacher instructional behaviors involving technology use within the classroom?

RQ3. What is the relationship between the time spent on professional development preparation prior to the implementation of a 1:1 laptop initiative and the change in teacher instructional behaviors involving technology use in the classroom?

RQ4. What is the relationship between the level of perceived value of various types of professional development activities and the change in teacher instructional behaviors involving technology use in the classroom?

Null Hypotheses

The following hypotheses were posed within this study:

$H1_0$. There is no statistical difference in the teachers' perceived value of various types of professional development activities for the purpose of preparing to implement a 1:1 laptop initiative.

$H2_0$. There is no statistical relationship between the length of time teachers have had access to the same device students have been provided in 1:1 laptop initiative and the change in teacher instructional behaviors involving technology use within the classroom.

$H3_0$. There is no statistical relationship between the time spent on professional development preparation prior to the implementation of a 1:1 laptop initiative and the change in teacher instructional behaviors involving technology use in the classroom.

$H4_0$. There is no statistical relationship between the level of perceived value of various types of professional development activities and the change in teacher instructional behaviors involving technology use in the classroom.

Definition of Key Terms

The following key terms are defined:

1:1 laptop initiative. A learning initiative by which students are given a laptop computer for learning use, both during school hours and outside of the regular school setting (Bebell & O'Dwyer, 2010; CASTLE, 2012).

Content management and instructional delivery platforms. Software and/or web-based applications/programs that allow teachers to organize instructional material for student use, deliver classroom instruction, gather student work, facilitate digital communication within a class, as well as assess student learning. Examples of content

management and instructional delivery platforms include, but are not limited to, Blackboard and Moodle (Glahn, 2014).

Differentiated (Personalized) instruction. Targeting instruction to each student's ability level and curricular needs (USDOE, 2013).

Global audience. Allowing students to communicate with others outside their own school for learning purposes. This term can also refer to the posting of student work to educationally related Internet websites to expand the range of viewers and feedback opportunities of student work (USDOE, 2010).

Hardware. A term used to refer to the actual physical technological products utilized in today's classrooms, including laptop computers, LCD projectors, SmartBoards and Promethean Boards, document cameras, and student response systems (Chatterji & Jones, 2012).

Professional development. Any learning activity for teachers designed to prepare the teacher to utilize instructional technology in the classroom for the benefit of student learning ("Definition of Professional Learning," 2008).

Software applications and programs. The actual applications/programs that are typically downloaded to computers to give users the ability to accomplish various tasks as prescribed by the software (Lee, Waxman, Wu, Michko, & Lin, 2013).

Limitations and Assumptions

The purpose of this study was to investigate the relationship of various professional development factors on the instructional changes that may occur during the first semester of 1:1 laptop initiative implementation at the high school level. Various

limitations and assumptions were considered within this study as a result of the chosen study population:

- The results of this study were limited to the responses by teachers at the high school level.
- The three high schools participating in this study were all located in one southwest Missouri region.
- The superintendents of the three school districts involved within this study were participants in the same research-based professional development experience that focused upon best practices in technology integration during the time of their 1:1 laptop initiative implementation.
- The survey used in this study was a self-reflection completed by each teacher concerning his/her professional development experiences and instructional practices in relation to the 1:1 laptop initiative implementation.
- A baseline survey to determine teacher instructional practices prior to 1:1 laptop initiative implementation was not conducted; instead, teachers were asked to reflect upon their teaching practices prior to laptop implementation.
- This study was limited to those teachers willing to participate by completing the survey instrument. There is no guarantee that the responses provided by those responding were representative of the entire population. Only 47% of participants invited to participate in this study chose to complete the survey instrument.
- It was assumed that the survey instrument utilized in this study could demonstrate, as required, statistical significance and reliability.

- It was assumed that all respondents answered accurately and honestly concerning their professional development experiences and the frequency of various instructional practices both before and during 1:1 laptop initiative implementation.

Summary

The infusion of instructional technology into K-12 classrooms is certainly becoming more prevalent in education today (Blackboard, 2012; USDOE, 2013). Many high schools are now exploring the possibilities of providing technology for their students that can be utilized both inside and outside the classroom to enhance the learning process (CASTLE, 2012; USDOE, 2010). These types of programs are most often referred to as 1:1 technology initiatives. Once thought too expensive, many schools are now considering providing laptop computers for their students as a 21st century technological tool designed to compliment the learning process (Ferguson, 2012).

1:1 laptop initiatives are certainly changing the manner in which students are instructed in the classroom (Penuel, 2006; Storz & Hoffman, 2013). When students have instant access within the classroom to the unlimited information provided via the Internet, as well as a device that allows all students to create products designed to display learning, this certainly challenges the traditional view of classroom instruction (Bebell & Kay, 2010). In many cases, effective 1:1 laptop initiatives require a more student-centered approach to classroom instruction as opposed to the more traditional teacher-directed approach (Bebell & Kay, 2010). This shift in approach requires teachers to be willing and able to make very significant changes in their own instruction.

Professional development preparation is a key ingredient for success in implementing any change initiative (Bebell & O'Dwyer, 2010; Greaves et al., 2010). This is certainly no different in the implementation of 1:1 laptop initiatives. As school leaders begin the planning process for a future 1:1 laptop initiative, a primary concern must be the development of an effective plan for teacher preparation for the obvious changes that will be expected within the classroom.

In Chapter Two, a review of the current literature surrounding various aspects of successful 1:1 laptop initiative implementations is provided. Professional development factors, such as the length of time teachers are provided access to their own laptops prior to implementation with students, as well as the amount of professional development preparation specifically designed to prepare teachers for the 1:1 laptop initiative implementations, are explored. Teacher ratings concerning the value various types of professional development activities provided in the preparation for the 1:1 laptop initiative implementation are also examined. In addition, the literature review also includes current research involving the impact of 1:1 laptop initiatives on various teaching and learning behaviors.

Chapter Two: Review of the Literature

Leaders in the drive for increased utilization of technology in the classroom, including 1:1 laptop initiatives, have expressed their belief that the integration of this type of technology has the potential to transform current teaching and learning practices in similar ways that the nation's culture has changed (Bebell & Kay, 2010). Over the past decade, educational leaders have indicated that increased access, as well as use of computers in the classroom, would lead to improved instruction and student learning. One-to-one computing initiatives have emerged as one of the most common educational reform efforts supporting these beliefs (Bebell & O'Dwyer, 2010). Bebell and O'Dwyer (2010) explained, "It seems highly likely that some form of 1:1 computing will be the norm for the majority of American classrooms at some point in the future" (p. 5).

The introduction of 1:1 computing in the classroom expands the possibilities for innovation within instructional practice (Storz & Hoffman, 2013). The "ubiquitous" nature of 1:1 computing presents a "strong departure from the status quo and existing educational practices" in today's schools (Bebell & Kay, 2010, p. 48). Students surveyed in the 2009 Speak Up national survey indicated a vision for their learning in the future that included three distinct elements:

- Social based learning – students want to leverage emerging communications and collaboration tools to create and personalize networks of experts to inform their educational process.
- Untethered learning – students envision technology-enabled learning experiences that transcend the classroom walls and are not limited by resource

constraints, traditional funding streams, geography, community assets, or even teacher knowledge or skills.

- Digitally-rich learning – students see the use of relevancy-based digital tools, content and resources, as a key to driving learning productivity, not just about engaging students in learning. (Project Tomorrow, 2010, p. 1)

Dunleavy, Dexter, and Heinecke (2007) summarized that "it is not really about the laptops. It is about what the laptops enable in terms of new ways of teaching and learning" (p. 451). One-to-one computing enables classroom instruction to become more "learner-, assessment-, community-, and knowledge-centered" (Dunleavy et al., 2007, p. 451).

Teachers maintain ultimate control concerning the amount of technology integrated into daily instruction, and to initiate instructional changes, teachers must invest a tremendous amount of time and effort (Bebell & Kay, 2010). Annable (2013) offered, "Technology is just a tool; unless a teacher is shown how to use it effectively, then it will not lead to changes in teaching and learning" (p. 167). Kellen (2013) cited the use of technology in the classroom has required teachers to make significant changes in their own instructional practices. Ultimately, it is the teacher who determines the "if, when, and how" concerning technology use in the classroom (Kellen, 2013, p. 26).

Over half of the administrators surveyed in the 2009 Speak Up national survey indicated that the use of technology is one of their most significant challenges (Project Tomorrow, 2010). In fact, over 90% agreed that the effective implementation of technology into the classroom is important to their overall mission (Project Tomorrow, 2010). In another study, Higgins and Russell (2003) cited that well over 80% of teachers

surveyed responded that their districts' commitment to provide computers in their classrooms greatly influenced their use of the technology in the classroom.

Raulston (2012) found that teachers indicated tremendous increases in the daily use of computers for instruction when provided with a laptop along with ample professional development. In just two years, teachers increased their daily usage of computer technology by nearly 34% (Raulston, 2012). Raulston (2012) concluded that a 1:1 laptop initiative, in conjunction with effective professional development, could help prepare students to learn in the 21st century.

Need for Technology Professional Development

In 2007, the International Society for Technology in Education (ISTE) released the National Education Technology Standards for Teachers (NETS-T). Engagement in professional growth and leadership is one of the five outcomes identified by ISTE (2007) as essential for 21st century student learning:

> Teachers continuously improve their professional practice, model lifelong learning, and exhibit leadership in their school and professional community by promoting and demonstrating the effective use of digital tools and resources.
>
> a. Participate in local and global learning communities to explore creative applications of technology to improve student learning.
>
> b. Exhibit leadership by demonstrating a vision of technology infusion, participating in shared decision making and community building, and developing the leadership and technology skills of others.

> c. Evaluate and reflect on current research and professional practice on a regular basis to make effective use of existing and emerging digital tools and resources in support of student learning.
>
> d. Contribute to the effectiveness, vitality, and self-renewal of the teaching profession and of their school and community. (pp. 1-2).

The authors of the Project RED study added that "professional learning is essential for teacher growth in terms of effectively integrating education technology" (Greaves et al., 2010, p. 48). Teachers must continually sharpen their use of technology in instruction to enhance 21st century learning (Greaves et al., 2010). Integration of technology in classroom instruction is predicted to be "short-lived" without ample opportunities for targeted professional development (Center for Digital Education, 2012, p. 22). Stephanie Hirsch, the Executive Director of Learning Forward, offered the following:

> Professional development is the single most important strategy school systems have to ensure all educators have the knowledge and skills to enable all students to meet state standards…. Technology enhances professional learning by supporting improvements in classroom instruction and spreading best practices from classroom to classroom, school to school, and system to system. (as cited in Center for Digital Education, 2012, p. 17)

Effective teaching is the result of continual professional development designed to inspire teachers to transform teaching practices (Center for Digital Education, 2012). Simply stated, the best form of technology professional development allows teachers to experience technology firsthand (USDOE, 2010).

How can districts provide the type of technology professional development that will result in effective technology integration within the classroom? Rodriguez and Knuth (2000) suggested that the professional development must first be linked to the district's improvement plan and should also contain all of the necessary components research has determined vital, including connection to student learning, hands-on technology use, a variety of learning experiences, and curriculum-specific applications. Penuel (2006) cited continuing support for learning to utilize technology, along with instructional integration as the two most essential aspects of technology professional development. The goal is to identify each teacher's "sweet spot" that aligns professional development opportunities with teachers' unique needs (Center for Digital Education, 2012, p. 21).

A study by Higgins and Russell (2003) provided considerable insight into the types of professional development that teachers deemed beneficial in integrating technology within the classroom. Teachers involved in this study indicated that learning to integrate technology into instruction was most beneficial, while professional development designed to assist teachers in managing the programs accessible to them was rated as the least beneficial topic for professional development (Higgins & Russell, 2003). More specifically, teacher respondents were split in describing the type of professional development that was provided to them (Higgins & Russell, 2003).

Less than one-third of teachers indicated that the majority of the technology professional development provided to them emphasized the mechanics of technology use compared to one-third of teacher respondents who indicated that the majority of their technology professional development emphasized classroom application (Higgins &

Russell, 2003). Over 90% of teacher respondents in this survey indicated professional development opportunities designed to enhance classroom applications were beneficial, whereas only 35% of teacher respondents indicated professional development opportunities designed to enhance learning the mechanics of technology were beneficial (Higgins & Russell, 2003).

In a nationwide survey, Spaulding (2013) cited that 67% of educators believed that professional development was the greatest technology need for schools. Colandrea (2012) suggested that teachers' knowledge of computers was one of the strongest predictors for future use of technology in the classroom. Silvernail and Lane (2004) found that on average, teachers who rated themselves as *advanced* or *expert* in terms of their comfort level with technology utilized the technology in classrooms 20% - 30% more often than other teachers, thus further displaying the need for professional development in this area. Raulston (2009) offered that when teachers were given appropriate resources and training involving the integration of technology into the classroom, classroom practice would change along with teacher confidence in using the technology. Teachers within this study increased their technology utilization over 30% from one year to the next when provided with sufficient professional development experiences (Raulston, 2009).

Amount of Time Devoted to Technology Professional Development

A certain length of time must be provided to teachers when confronted with new technology to process the information learned and to identify means of technology adaptation to the classroom (Brown, Benson, & Uhde, 2004). Lawless and Pellegrino (2007) added that successful professional development programs are extended over a

lengthy period of time and provide ample opportunity for "follow-up learning and feedback" (p. 594). Strother (2013) indicated that many technology professional development programs occur "infrequently" and "sporadically" (p. 24). Strother (2013) added that effective technology professional development must occur over a long period. The research of Dawson, Cavanaugh, and Ritzhaupt (2008) found that technology professional development is most effective when it has been provided over an extended period. While it is certainly apparent the research has indicated that sufficient time is critical for successful technology professional development, Jenkins (2012) offered that both principals and teachers indicated time was the most "difficult hurdle to combat in professional development" (p. 95).

In their school district vision plan for successful technology integration, Sinay and Yashkina (2012) compared effective technology professional development to the business community:

> Like business leaders, teachers need the opportunity for brainstorming and collaborating with peers and goal setting with superiors. Ongoing professional development that supports the growth of a teacher helps to maximize the potential of each teacher and ultimately each student. (p. 60)

In the National Education Technology Plan (2010), the USDOE indicated that "episodic and ineffective" professional development must be replaced by learning opportunities that are "collaborative, coherent, and continuous" (p. xii).

The Project RED authors suggested that teachers should receive technology training well before the technology is rolled out to students (Greaves et al., 2010). Not only do teachers need to become familiar with hardware and software, but they also need

time to review available resources that would be relevant to their classrooms (Greaves et al., 2010). Annable (2013) echoed these thoughts, concluding that technology professional development sessions should begin as early as possible prior to students' laptop implementation: "Teachers will be more likely to use technology in their classrooms if they feel comfortable and confident with it and if they see a purpose to its use" (p. 174).

The Project RED study also illustrated an effective professional development plan that provided all teachers with significant time to learn about using their new laptops prior to implementation with students (Greaves et al., 2010). Shapley, Sheehan, Maloney, and Caranikas-Walker (2010) described a school district's failure to provide time for teacher professional development prior to 1:1 implementation; therefore the teachers listed their own lack of preparation as a "major barrier to effective implementation of the laptop technology" (p. 45).

In their study involving Maine teachers, Silvernail and Lane (2004) found that teacher technology use within instruction increased as the amount of exposure to professional development and exposure to laptops increased. O'Connor, Goldberg, Russell, Bebell, and O'Dwyer (2004) found that nearly three-fourths of all teacher respondents indicated that "not providing enough time" to learn to utilize software and applications was a major obstacle to effective technology use in their classrooms (p. 145). Tweed (2013) examined the correlation between the amount of hours spent in technology professional development and actual technology use in the classroom. The results of this study indicated a weak, positive relationship between the hours spent in technology

professional development and technology use in the classroom; however, this relationship was not statistically significant (Tweed, 2013).

Teacher Access to Laptops

Providing teachers access to laptops prior to students' access is the first step in professional development for teachers (Kellen, 2013; Silvernail & Buffington, 2009). In fact, teacher experience with technology has been listed as one of the strongest predictors for technology use in the classroom (Miranda & Russell, 2011). Annable (2013) explained that this process enables teachers to become more confident with the technology, and, subsequently, with students' accessibility to the laptops in the classroom. Providing laptops to teachers "allows teachers time to learn how to use the laptops, to play with what laptops can do, and to discover resources they can use in the classroom" (Annable, 2013, p. 174). Rutledge, Duran, and Carroll-Miranda (2007) cited that experience with laptops encouraged teachers to learn more about utilizing the laptops for classroom instruction.

In their research study, Higgins and Russell (2003) found that nearly 90% of teacher respondents indicated they felt having access to a laptop computer for their own use would be valuable to their own teaching. Silvernail and Lane (2004) found that teachers' use of laptops in the classroom was directly affected by the amount of exposure teachers had to the laptop technology. Bonifaz and Zucker (2004) cited evidence that teachers became more comfortable with computers when given their laptops prior to utilization within the classroom. Although research has indicated that teachers become more confident with laptop technology with extended exposure to the technology, it should be noted that this access alone is not enough to lead to improvements in student

learning (Annable, 2013). Raulston (2009) suggested that providing teachers with a laptop, combined with professional development, enables teachers to apply the technology to their own classroom needs.

Teachers simply need sufficient time to practice with the laptops in order to develop confidence in their own use of the laptops (Rodriguez & Knuth, 2000). Shapley et al. (2010) cited a 1:1 implementation program that did not provide teachers with adequate time to prepare for integration of the technology in the classroom, thus creating a "major barrier to effective implementation" (p. 45). Teachers indicated they would have preferred to have the opportunity to strengthen their own technology skills and to practice lessons with their laptops (Shapley et al., 2010).

Annable (2013) suggested that laptops be provided to teachers at least a year prior to 1:1 implementation with students. Educational leaders must recognize that the provision of laptop technology to teachers is essential (Center for Digital Education, 2012; Colandrea, 2012). The authors of the Project RED study described the timetable for teacher accessibility to laptops in two case studies of 1:1 schools (Greaves et al., 2010).

Teachers at the Klein Independent School District, in Texas, were provided their laptops one year before students were issued their computers (Greaves et al., 2010). Teachers in the Mooresville School District, in North Carolina, were given their laptops nearly eight months before the laptops were rolled out to students (Greaves et al., 2010). The authors of the Project RED study listed "giving devices to teachers, and later to students, ensures they [the teachers] maintain control of their own learning and can

develop integrative practices for teaching on a developmental basis" as a best practice for 1:1 laptop implementation (Greaves et al., 2010, p. 43).

Learning to Use Hardware

Teachers must find a comfort level when exposed to new technology hardware (Center for Digital Education, 2011). These authors suggested that teachers not only need to learn the basics of technology hardware usage, but they must also develop the confidence to feel comfortable in using the technology with their students in the classroom (Center for Digital Education, 2011). Balanskat, Bannister, Hertz, Sigillo, and Vuorikari (2013) explained that effective technology training must begin with early "familiarization with the equipment" (p. 54). Kellen (2013) offered that technology training must begin first with developing teachers' skills with the technology provided them. Typically, this type of training gives teachers hands-on experience with experimentation with the new technology tools (Baylor & Ritchie, 2002).

In many cases, professional development in the area of technology focuses primarily on the development of skills with hardware rather than focusing on the use of the technology within the classroom (Hogue, 2013). Harris, Mishra, and Koehler (2007) offered that teachers need training with utilization of hardware and suggested teachers only need to be exposed to the tools' implementation within the classroom. Raulston (2009) suggested that once teachers learn to use the equipment they can begin to implement the technology into classroom instruction. Teachers in Penuel's (2006) study indicated that while these teacher workshops often focus on technology skill development, their ultimate goal was learning to effectively utilize the technology within daily instruction.

In their study with Maine teachers involved with a 1:1 initiative, Silvernail and Lane (2004) found that teachers perceived very little difference in the effectiveness of technology professional development designed to learn how to use the laptops compared to professional development designed to learn how to integrate the laptops into daily instruction. Higgins and Russell (2003) reported that the majority (69%) of the high school teachers surveyed within their study indicated that basic professional development designed to teach teachers to manage their computers was not necessary. Finally, over two-thirds of the teachers surveyed in another study indicated that insufficient support concerning operational use of the technology was an obstacle for their effective use of the technology in the classroom (O'Conner et al., 2004).

Learning to Use Software

Educational leaders must ensure that teachers are provided adequate support for learning to use digital resources (Colandrea, 2012). Baylor and Ritchie (2002) found that effective technology professional development, especially that which incorporated hands-on experiences, had a strong influence on the amount of future technology use with classroom instruction. One teacher interviewed in the Rutledge et al. (2007) study explained that learning to use particular software applications enhanced the classroom experience for students. Learning to use the software application was the first step. Harris et al. (2007) offered that teachers need training with the utilization of software resources available to them. Penuel (2006) added that, similar to hardware, teachers reported their technology professional development sessions typically focused on the procedural use of software. However, learning to use the software applications

effectively within classroom instruction was cited as being much more critical as compared to learning to use the hardware (Penuel, 2006).

Nadelson et al. (2013) surveyed pre-service teachers concerning their confidence levels with various technology-related teaching activities. They found that word processing along with presentation and spreadsheet software were rated higher by these future teachers compared to more subject-specific software and Web 2.0 applications (Nadelson et al., 2013). Similarly, these pre-service teachers' responses to their likelihood to utilize the various teacher activities in their own classroom in the future indicated that they were much more likely to utilize word processing, presentation, and spreadsheet software than subject-specific software and Web 2.0 applications (Nadelson et al., 2013). Higgins and Russell (2003) found that nearly three-fourths of teacher respondents in this study indicated that technology professional development focused on learning to use software and applications was beneficial. In fact, nearly one-third rated this type of professional development as very beneficial (Higgins & Russell, 2003).

Learning to Use Content Management and Instructional Delivery Platforms

Online and blended learning experiences are becoming more commonplace in today's classrooms. This mode of delivery is new to teachers; therefore, it is imperative that teacher professional development is designed to assist teachers in the development of skills that will enable them to teach within this mode (USDOE, 2010). The National Education Technology Plan also suggested that states consider appropriate standards and possible certification for online and blended teaching (USDOE, 2010).

Nearly half of the aspiring teachers surveyed in the 2009 Speak Up national survey indicated they believed learning management systems, which allow teachers to

deliver content in an online format, were a viable option for enhancing student achievement (Project Tomorrow, 2010). This compares to less than one-quarter of the aspiring teachers' responses concerning the viability of completely online courses in enhancing student achievement (Project Tomorrow, 2010). Another survey statistic from this same study suggested this relatively new mode of instructional delivery has certainly not gained as much ground in terms of rank order importance as other instructional strategies (Project Tomorrow, 2010). Less than one-quarter of administrators surveyed indicated they felt a need for teachers to be trained in content delivery through an online mode (Project Tomorrow, 2010). In another study involving teachers in the state of Massachusetts, nearly two-thirds of teacher respondents indicated they believed professional development focusing on learning to use online modes to interact and mentor with students would be valuable for their classroom instruction (Higgins & Russell, 2003).

Conversely, nearly three-quarters of students indicated they knew of someone, family or friend, who had completed an online course, and over one-third expressed a desire to participate in this type of learning environment (Project Tomorrow, 2010). However, less than 15% of middle and secondary-level students surveyed indicated they had participated in an online class with a teacher, and fewer (8%) expressed that they had experienced a blended learning environment, combining traditional face-to-face instruction with an online component (Project Tomorrow, 2010). Although students have indicated their preference for online interactions and instructional delivery methods, it certainly appears this educational delivery system, both in teacher preparation and in actual practice, has not progressed very far. The authors of the Project Tomorrow study

(2010) explained, “Unless educators invest in developing both the existing and aspiring teacher’s interest and capacity to facilitate online classes, demand will continue to outpace supply in the traditional K-12 setting” (p. 12).

Learning to Integrate the Technology Within Instruction

It is not enough to simply focus on learning to use technology proficiently; professional development must extend beyond the simple knowledge of technology to its effective integration into classroom instruction (Annable, 2013). Professional training of teachers should include assisting teachers in integrating technology into their classrooms (Balanskat et al., 2013; Greaves et al., 2010). Franklin (2007) offered that “learning to integrate technology into the curriculum should be an integral part of learning how to teach” (p. 284). Harris et al. (2007) developed their own Technology Pedagogical Content Knowledge approach (TPACK) that illustrated the essential connection between technology content knowledge, technology pedagogical knowledge, and pedagogical content knowledge. Chism (2004) offered that teachers who received professional development focused on the integration of technology, especially in their own curricular areas utilizing technology more effectively than their peers.

Teacher professional development workshop sessions generally focus on assisting teachers in gaining the skills necessary to use the technology effectively; however, many have reported that preparing teachers to effectively integrate technology into classroom instruction was more critical for success (Penuel, 2006). Kellen (2013) cited that isolated training programs based solely upon teaching specific technology skills are insufficient compared to “learning what to do with it instructionally, [and] linking it to curriculum-based content standards, assessment and/or meeting individual needs” (p. 12). Russell,

Bebell, O'Dwyer, and O'Connor (2003) suggested that teacher training for technology should include opportunities for teachers to experience effective technology integration within the classroom. Drayton, Falk, Stroud, Hobbs, and Hammerman (2010) indicated that teachers learning from the technology integration experiences of other teachers, both good and bad, were essential for successful technology integration. Failure to provide the time necessary for this type of collaborative learning was noted as a definite barrier to effective integration of technology into the classroom (Drayton et al., 2010).

Several studies have also indicated that teachers prefer professional development experiences that better prepare them to integrate technology into their classrooms. Bennison and Goos (2010) found very few teachers were interested in learning more about how to use technology. These teachers indicated their main desire for professional learning was in the area of how to best integrate the technology into their classroom instruction (Bennison & Goos, 2010).

Rutledge (2007) cited teachers' interest in moving beyond technology fundamentals into more advanced topics involving collaboration with students. In fact, Higgins and Russell (2003) found that nearly 90% of teacher respondents remarked that professional development experiences focused upon the integration of technology into classroom instruction was beneficial for their continued growth in teaching and student learning. O'Connor et al. (2004) found that nearly two-thirds of secondary school teachers surveyed conveyed that their inability to make technology relevant in the classrooms created an obstacle for effective technology use.

Teacher and Student Use of Laptops in the Classroom

According to Cuban (2001), the goal of reforming schools and transforming teaching and learning through the increased access to and use of technology in schools and classrooms has been in place since the early 1980s. When technology tools are effectively implemented, learning can be transformed in powerful ways (Boss, 2011). The Internet can provide students with more resources than ever imagined, the ability to collaborate with peers is now easier than ever, and the tools that allow students to express their learning are now at their fingertips for use on a daily basis (Boss, 2011).

The USDOE (2010) further explained that technologies are being utilized to increase student engagement and to enhance the learning experience for all students. These learning experiences include, but are certainly not limited to, improved accessibility to productivity tools, interactive content, and instantaneous feedback (USDOE, 2010). The Internet also allows for student interaction in relevant ways that assist in improving student learning (USDOE, 2010).

Students' lives outside of the school setting are now filled with an abundance of technology (USDOE, 2010). Students access and share information from digital sources twenty-four hours per day, seven days per week (USDOE, 2010). Students also create multimedia content and share it with others on a frequent basis (USDOE, 2010). The advent of social media networks has students engaged in communicating, collaborating, sharing, and learning on their own, outside of school on a daily basis (USDOE, 2010). The USDOE (2010) added, "The opportunity to harness this interest and access in the service of learning for schools is huge" (p. 9). In 2010, the Digital Learning Council released the Ten Elements of High Quality Digital Learning:

1. Student Eligibility: All students are digital learners.
2. Student Access: All students have access to high quality digital content and online courses.
3. Personalized Learning: All students will have the opportunity to customize their learning through the use of digital content.
4. Advancement: Students progress based on demonstrated competency.
5. Content: Digital content, instructional materials, and online and blended learning are all high quality.
6. Instruction: Digital content and teachers have high quality.
7. Providers: All students have access to multiple high quality providers.
8. Assessment and Accountability: Student learning is the metric for evaluating the content and instruction.
9. Funding: To create incentives for performance, options, and innovation.
10. Delivery: Infrastructure supports digital learning. (p. 1)

In their study involving middle school teachers in Massachusetts, Bebell and Kay (2010) indicated that within just a few months of 1:1 laptop implementation, teacher and student use of the laptops within classroom instruction increased. Teachers indicated they had adopted "new and novel approaches" to deliver content within their curriculum (Bebell & Kay, 2010, p. 16). Students also reported altering their approach to learning as a result of the infusion of laptops into the classroom environment (Bebell & Kay, 2010).

Dunleavy et al. (2007) reported that drill and practice exercises were still the most commonly utilized classroom instructional activity with laptops. They reported that the laptops enabled these activities to become more "self-paced," with the ability to provide

more timely feedback (Dunleavy et al., 2007, p. 7). Students were also asked to conduct research and utilize productivity tools with their laptops on a frequent basis (Dunleavy et al., 2010). Annable (2013) added, "Laptop technology in the classroom made it much easier for teachers to play the role of facilitator and allowed them to be more student-centered in their approach" (p. 152).

Research has indicated that the common objectives for the integration of laptops into classroom instruction are to ensure equitable access to technology for all learners, increase student engagement in the learning process, improve student achievement, and to prepare students for their future in the 21st century (Sinay & Yashkina, 2012). Raulston (2009) offered that laptop technology allows school and teachers to "leverage resources, individualize instruction, and open the door to lifelong learning opportunities for students" to make the aforementioned goals a reality (p. 77). The superintendent of the Mooresville Graded School District, in North Carolina, Mark Edwards, summarized his school district's 1:1 experience:

> Technology has played a significant part in teaching and learning through increased student engagement in Mooresville classrooms. Laptop computers have significantly enhanced the level of student interest, motivation, and engagement to learn. The focus is to engage students with instructional tools, add value to their performance, and realize improved achievement in all aspects of their school experiences. (as cited in Greaves et al., 2010, p. 44)

Using Technology to Plan for Instruction

Raulston (2009) indicated that teachers often utilize mobile computers for lesson planning. Teachers listed the convenience that mobile technology provides as a primary

reason for this type of use (Raulston, 2009). Teachers stated that the ability to take laptops home with them, as well as to departmental or grade-level meetings, enabled them to "create more meaningful lessons in the classroom" (Raulston, 2009, p. 67). Bebell and Kay (2010) also confirmed that lesson preparation and researching materials for planning have often increased as a result of teachers' increased access to computers and the Internet. In addition, Bebell and Kay (2010) found that, in many cases, this type of teacher use of technology occurred well before students were exposed to the same technology in the classroom.

In a study involving the initial phase of the Maine Learning Technology Initiative (MLTI), teacher use of laptops for planning and researching materials for lessons rose from 50% during the first semester of exposure to the laptops to 60% after three semesters of exposure to the laptops (Silvernail & Lane, 2004). Teachers also indicated a similar increase in the use of their laptops to develop instructional materials within the lesson planning process (Silvernail & Lane, 2004). Fifty percent of teachers indicated they used their laptops for developing instructional materials during the first semester of exposure compared to 65% of teachers indicating the same after three semesters of use (Silvernail & Lane, 2004).

In the same research study, Silvernail and Lane (2004) indicated that teacher responses to their own self-rating of their individual skill level involving the use of laptop technology was a strong predictor of technology use in the area of lesson planning. Teachers who rated themselves as novice, beginners, or intermediate users utilized their laptops for planning only 45% of the time compared to 75% for those teachers who rated themselves as advanced or expert in the use of their laptops (Silvernail & Lane, 2004).

Similarly, 55% of teachers who rated themselves as a novice, beginner, or intermediate users utilized their laptops for the development of instructional materials compared to nearly 80% of the teachers who rated themselves as advanced or expert in the same category (Silvernail & Lane, 2004).

These researchers also found that teachers who indicated they had participated in four or fewer laptop-related professional development activities were less likely to plan and research for daily lessons as well as to develop classroom instructional materials with their laptops (Silvernail & Lane, 2004). Silvernail and Lane (2004) concluded with these results that the amount of professional development provided to teachers is certainly related to teacher use of laptops for instructional planning. In a study of teachers in the state of New York, Colandrea (2012) indicated that teachers' knowledge of their computers along with their attitudes related to technology use were the strongest predictors of laptop use for lesson planning. He added there was greater use of laptops for lesson planning in teachers who rated their own skill level as "high tech," as compared to those teachers who rated their own skill level as "low tech" (Colandrea, 2012).

Teacher use of technology in the area of research and planning for classroom instruction was also explored in the Use, Support, and Effect of Instructional Technology (USEIT) survey conducted in the state of Massachusetts, in 2001-2002 (O'Connor et al., 2004). This study indicated that 32.2% of respondents utilized technology for instructional research and planning several times a week (O'Connor et al., 2004). An additional 24.1% of respondents indicated using technology for the same purpose several times a month (O'Connor et al., 2004). The only teacher behaviors that received higher

frequencies of use by respondents were the creation of instructional materials and assessments with a computer (O'Connor et al., 2004).

Using Technology to Expand Students' Critical Thinking

In 2007, the International Society for Technology in Education (ISTE) released the National Education Technology Standards for Students (NETS-S). The ISTE listed "critical thinking, problem solving, and decision making" as one of the six essential outcomes identified for 21st century student learning:

> Students use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources.
>
> a. Identify and define authentic problems and significant questions for investigation.
>
> b. Plan and manage activities to develop a solution or complete a project.
>
> c. Collect and analyze data to identify solutions and/or make informed decisions.
>
> d. Use multiple processes and diverse perspectives to explore alternative solutions. (p. 1)

Warschauer (2005) indicated that "laptops facilitate the kinds of learning, thinking, and analysis that today's world demands" (p. 35). Other studies cited evidence the use of instructional technology in the classroom enabled students to attain 21st century skills that would enable them to succeed in the high technology, global society they will face in the future (Bebell & Kay, 2010; Penuel, 2006). Dawson et al. (2008) added when students are provided with laptops, classroom activities become more project-based, thus

allowing for more independent student inquiry and research. In a qualitative study involving the New Mexico Laptop Learning Initiative in 2007, teacher interviews provided evidence that student development of higher-order thinking skills were enhanced as a result of teachers' ability to make instructional activities more rigorous through the use of the laptops in the classroom (Rutledge et al., 2007). Penuel (2006) cited, however, that teachers must also believe students are capable of this level of critical thinking before they create and assign projects of this nature.

The Speak Up national survey in 2009, conducted by Project Tomorrow, explored teacher views concerning the use of emerging technologies in the classroom. Teachers nationwide indicated that students were developing their creativity skills (39%) and problem-solving/critical-thinking skills (27%) through the use of technology (Project Tomorrow, 2010). Ultimately, when technology is utilized to enhance students' critical thinking and problem-solving skills and when teachers become more proficient in leveraging the technology to provide these experiences, student learning is certainly enhanced (Sinay & Yashkina, 2012).

Use of Digital Resources to Supplement Instruction

The Internet has a vast repository of resources for teachers to utilize to supplement classroom instruction (Twyman, 2014). Many teachers are using digital resources to replace more traditional print-based materials in the classroom to expand learning (USDOE, 2013). These digital resources include digital media, interactive textbooks, and other supplemental materials. The USDOE (2013) also described the availability of "open education resources" as an integral repository for digital resources that can be shared and repurposed from one educator to another. Annable (2013)

explained that in an effort to enhance instruction, teachers often use virtual manipulatives and other web-based applications. With the nearly infinite array of available digital resources at teachers' disposal, teachers are now expanding their repertoire of instructional resources (Bebell & Kay, 2010).

In a 2010 study involving high school science teachers, Drayton et al. (2010) found that the Internet was listed as the source by which most teachers found additional content for use in classroom instruction. Digital software and applications as well as teacher websites were also mentioned as additional sources for resources (Drayton et al., 2010). These researchers also found that the most common supplemental resource found within classrooms in this study were texts, pictures, and video clips (Drayton et al., 2010).

Silvernail and Lane (2004) cited that teachers who indicated they had participated in four or fewer laptop-related professional development activities were less likely to develop classroom instructional materials with their laptops. When asked whether they agreed with the following statements, over 85% of the teacher respondents in this particular research study agreed that laptops had assisted them in accessing more timely information (Silvernail & Lane, 2004). Nearly 70% of the teacher respondents indicated that they agreed with the statement they were more able to access diverse teaching materials when using their laptops (Silvernail & Lane, 2004).

In the 2009 Speak Up national survey, teachers indicated that their primary use of digital resources was through teaching aids (66%) and software designed to assist in reading, writing, and math instruction (46%). Pre-service teachers were asked what type of learning experiences involved with technology use in the classroom would best prepare them to teach in a 21st century classroom (Project Tomorrow, 2010). Sixty-eight

percent of respondents indicated that incorporating digital resources in a lesson was important for their future preparation (Project Tomorrow, 2010). Finally, school and district-level administrators indicated they were more concerned with providing teachers appropriate professional development opportunities designed to assist teachers in effectively utilizing digital resources (43 %) compared to having teachers locate effective digital resources (7%).

Using Technology to Encourage Student Collaboration

In 2007, the International Society for Technology in Education (ISTE) released the National Education Technology Standards for Students (NETS-S). The ISTE listed "student communication and collaboration" as one of the six outcomes identified as essential for 21st century student learning:

> Students use digital media and environments to communicate and work collaboratively, including at a distance, to support individual learning and at a distance, to support individual learning and contribute to the learning of others.
>
> a. Interact, collaborate, and publish with peers, experts, or others employing a variety of digital environments and media.
>
> b. Communicate information and ideas effectively to multiple audiences using a variety of media and formats.
>
> c. Develop cultural understanding and global awareness by engaging with learners of other cultures.
>
> d. Contribute to project teams to produce original works or solve problems. (p. 1)

The Project RED study was designed to identify key implementation factors that lead to the successful implementation of 1:1 laptop initiatives (Greaves et al., 2010). In the key findings of this study, student online collaboration was listed as one of nine key implementation factors that must be present in a 1:1 environment to ensure success (Greaves et al., 2010). Greaves et al. (2010) conveyed that the Internet now enables student collaboration to expand beyond the traditional face-to-face interactions of the past. These authors also cited evidence that the use of online collaboration with students increases student engagement and has a significant impact in reducing disciplinary and student dropout rates (Greaves et al., 2010).

Fonkert (2010) clarified the significance of student collaboration with laptops by stating, "The use of laptops seemed to act as a magnet to draw students together. During my observations, students seemed to collaborate more frequently when they were using computers than when they were not" (p. 305). Additional studies have echoed this statement, reporting that the use of digital technology most often leads to increases in student collaboration (Cengiz Gulek & Demirtas, 2005; Dunleavy et al., 2007; Kellen, 2013; Strother, 2005).

In their research with the Berkshire Wireless Learning Initiative, Bebell and Kay (2010) found that 44% of teacher respondents reported increased student interaction (p. 25). Silvernail and Lane (2004) cited that some of the greatest increases in student academic behaviors were seen in "working in small groups" within a 1:1 environment (p. 13). Silvernail and Lane (2004) also cited that over 70% of teacher respondents reported that interaction of all students had increased in their classrooms, specifically at-risk and special education students, during the 1:1 implementation. Within the 2009 national

Speak Up survey, student respondents listed communication tools (61%) as the top pick for technology use in their ultimate school (Project Tomorrow, 2010). The authors of the Project Tomorrow (2010) research concluded, "Students continue to tell us using technology to communicate and collaborate with their classmates and teachers helps them learn and enhances their experience" (p. 6).

Using Technology to Differentiate or Personalize Instruction

In education, the terms differentiation, personalization, and individualization have become commonplace in recent years. In most cases, they all refer to similar end goals that refer to teachers breaking away from the traditional "one size fits all" mode of classroom instruction in an effort to meet the needs of each individual student. The USDOE (2010) defined each of these terms in their National Education Technology Plan: "Differentiation refers to instruction that is tailored to the way different learners learn. Individualization refers to instruction that is paced to the learning needs of different learners" (p. 38). The USDOE (2010) offered that the term personalization offers an explanation that fully captures the intent of both differentiation and individualization; whereby, "personalization refers to instruction that is paced to learning needs, tailored to learning preferences, and tailored to the specific interests of different learners" (p. 38).

The authors of the Project RED study referred to this type of student-centered instruction as "perhaps the most important use model of technology in education" (Greaves et al., 2010, p. 16). The availability of technology-based resources provides unlimited opportunities for teachers to tailor classroom instruction to meet the needs of all learners, including remedial and advanced learners (Sinay & Yashkina, 2012). Annable (2013) suggested that laptops provide teachers with the option of providing

different programs for delivering content. Laptops also provide students options of choosing content delivery options that are best suited to them (Annable, 2013).

Dunleavy et al. (2007) offered that the increased ability of teachers to provide self-paced instruction to individual students was critical in moving from a teacher-centered learning environment to a more learner-centered learning environment. Dunleavy et al. (2007) added, "Across sites, the 1:1 student to networked laptop ratio empowered teachers to cultivate these principles within their classrooms" (p. 10). Storz and Hoffman (2013) also echoed this trend of transitioning from teacher-centered instruction, indicating, "students and teachers reported less whole-class, lecture-format instruction and more small-group and individualized instruction" (p. 7).

Silvernail and Lane (2004) cited that over 70% of teacher respondents indicated that laptops helped them individualize their curriculum to meet individual student needs. One teacher remarked, "I like the individuality that the laptops provide. Lockstep is not required. Students can explore and create new and creative products to share their learning" (p. 15).

The 2009 Speak Up national survey provided additional evidence to support the idea that technology assists in differentiating or personalizing instruction (Project Tomorrow, 2010). Thirty-one percent of teacher respondents indicated that they found more time to differentiate instruction for students with the laptops (Project Tomorrow, 2010). Pre-service teachers also indicated that learning how to utilize technology to differentiate instruction for students (75%) was the most important learning experience they could have to prepare them to teach in a 21st century classroom (Project Tomorrow, 2010).

Using Technology to Assess Students

The Project RED study was designed to identify key implementation factors that lead to successful implementation of 1:1 laptop initiatives (Greaves et al., 2010). In the key findings of the study, the use of online formative assessments was listed as one of nine key implementation factors that must be present in a 1:1 environment to ensure success (Greaves et al., 2010). Greaves et al. (2010) suggested that these formative assessments, conducted with use of digital tools (including laptops), should be performed at least weekly in the classroom.

Most of the assessment performed in today's classrooms is summative in nature and only serves to determine whether students have learned (USDOE, 2010). The USDOE (2010) added, "Little is done to assess students' thinking during learning so we can help them learn better" (p. 2). In the National Technology Education Plan, the educational leaders at the federal government level suggested that educators are not leveraging the full abilities of technology to create new assessment materials and processes (USDOE, 2010). The USDOE (2010) explained, "Technology can support measuring performance that cannot be assessed with conventional testing formats" (p. 37).

In her study of mathematics teachers, Annable (2013) cited that assessment techniques were one of the aspects of classroom instruction that changed the most in a 1:1 environment. Teachers in this study indicated that laptops allowed them to be more creative in their assessment design (Annable, 2013). They mentioned experimenting with allowing students to create presentations and projects to display their learning in a much different format than the traditional paper-pencil tests (Annable, 2013).

Teachers indicated that this type of assessment often leads to a "much deeper understanding" of student learning than what could be provided from a typical test question (Annable, 2013, p. 162). Strother (2013) found similar feedback from teachers concerning the use of project-based assessment. One teacher commented, "one-to-one changes the way you think…I feel students can be better assessed with projects versus regular formal assessment" (Strother, 2013, p. 75).

Dunleavy et al. (2007) indicated that formative assessments were more commonplace with teachers in a 1:1 environment. These researchers cited that with the use of technology, higher quality assessments were created and utilized more frequently (Dunleavy et al., 2007). Teacher respondents also stated that this type of assessment offered them more opportunities for quality feedback that certainly helped them target interventions for individual students (Dunleavy et al., 2007). Strother (2013) added that this type of more "informal" assessment was much quicker and efficient, thus enabling teachers to provide students with more timely feedback (pp. 76, 85).

Digital technology allows teachers to transform traditional assessment procedures into more meaningful and targeted tools for assisting student learning (Sinay & Yashkina, 2012). Where traditional assessments have been "standardized, summative in nature, focused upon basic skills, involving the evaluation of literacy and numeracy skills, and conducted in class," technology allows assessments to become "customized to learner needs, more formative in nature, able to measure 21st century skills, and conducted anytime and anywhere" (Sinay & Yashkina, 2012, p. 50).

Silvernail and Lane (2004) found only slight increases in teachers' utilizing laptop technology to assist in assessing student work. They did, however, find that teachers who

rated their own technology skill level as advanced or expert were far more likely to utilize technology to assess student work, thus indicating a need for teacher technology literacy development for significant impact in this area (Silvernail & Lane, 2004, p. 10). Only minor increases in teacher use of technology to assess student work were cited within this same study when teachers indicated that they had participated in four or more technology-related professional development activities (Silvernail & Lane, 2004).

Use of Webpages or Content Management Platforms

Adamson and Darling-Hammond (2013) recommended that schools consider the creation of online platforms that serve as repositories of instructional material for student use as well as to provide links to websites that may be relevant to the curriculum. Sinay and Yashkina (2012) indicated these online platforms allow teachers to better connect with their students and allow for learning to extend beyond the walls of classrooms. These authors also noted that online platforms provide students with the ability to learn through a technology mode in which they are frequently very comfortable (Sinay & Yashkina, 2012).

Students who have access to instructional materials through an online platform have “anytime/anywhere” access to their learning (Greaves et al., 2010, p. 58). Students can review materials at their leisure and can keep up with assignments when they are absent from school (Greaves et al., 2010). These authors also offered that the communication line between students and their teachers are also strengthened with the addition of online platforms (Greaves et al., 2010). Strother (2013) cited one teacher, in particular, who commented that teacher website access for students provided students an added ability to contact the teacher when they did not understand a particular topic.

Student respondents in the Speak Up national survey shared an overall vision for their learning in the 21st century which includes "un-tethered learning," or "technology-enabled learning experiences that transcend the classroom walls and are not limited by resource constraints, geography, or teacher knowledge and skills" (Project Tomorrow, 2010, p. 1).

In a study involving three high schools that had experienced a 1:1 learning environment for multiple years, the majority of the teacher respondents indicated they had created their own websites to provide students with more accessibility to instructional resources (Drayton et al., 2010). These authors added that their ability to post relevant links to other Internet sites they wanted students to access enabled them to focus student attention directly on the desired outcome for learning (Drayton et al., 2010). Drayton et al. (2010) also suggested that the use of their websites by students to access instructional materials provided little or no excuse for those students who complained of forgetting an assignment. Overall, the teachers indicated that student responsibility and organizational skills increased as a result of the online platform (Drayton et al., 2010). Strother (2013) added that teachers believed the constant accessibility to information increased student accountability.

Strother (2013) referenced several teachers' use of online platforms such as Edmodo, Google Drive, and Google Docs, in addition to their own websites, to expedite the process of sharing and collecting learning materials and to facilitate communication and collaboration between teacher and student, as well as between students. Similarly, Sinay and Yashkina (2012) referred to the online platform Moodle as an excellent example of an online learning management platform for students. These authors

described this online platform as a tool to "help teachers extend the boundaries of their classroom" by "fostering collaboration and knowledge construction" (Sinay & Yashkina, 2012, p. 28).

O'Connor et al. (2004) cited very little evidence that this type of instructional tool was being used in a widespread manner within 1:1 schools. In fact, less than 3% of all teacher respondents reported using online learning platforms on a regular weekly basis (O'Connor et al., 2004). O'Connor et al. (2004) added that only 20% of high school teachers surveyed indicated they had created and maintained a webpage for themselves.

Creating/Downloading Presentations for Student Use

In addition to the Internet, teachers are becoming more proficient in creating their own digital learning resources (USDOE, 2013). Applications and software designed to assist teachers in creating and publishing work currently makes this type of work easier to accomplish (USDOE, 2013). Teachers utilize laptops in a variety of ways; however, creation of digital instructional resources continues to be one of the most highly observed teacher behaviors in a 1:1 learning environment (Silvernail & Lane, 2004). Aspiring teachers indicated in the 2009 Speak Up national survey that learning to create and utilize digital resources was important in preparing them to teach in a 21st century classroom (Project Tomorrow, 2010). In addition, over 65% of school principals surveyed in a recent Blackboard report indicated that the ability to create and utilize video, podcasts, and other media were the most essential skills for technology preparedness in today's classrooms (Blackboard, 2012).

Silvernail and Lane (2004) indicated that over two-thirds of their teacher respondents conveyed they created digital learning resources with their laptops at least a

few times per week after just three semesters of use. Along with communicating with colleagues with their laptops, creating instructional materials was the most often utilized teacher activity cited by teachers in this particular study (Silvernail & Lane, 2004). Eighty percent of teachers who self-rated their own technology skill level as advanced or expert utilized their laptops for the development of instructional materials at least a few times per week compared to less than 60% of teachers who self-rated their technology skill level as novice, beginner, and intermediate (Silvernail & Lane, 2004). Silvernail and Lane (2004) also cited a small increase (5%) in the percentage of teachers utilizing their laptops to develop instructional materials at least a few times per week when they participated in four or more sessions of technology-related professional development.

Using Technology to Expand Student Work to a Global Audience

Evidence suggests that students become highly motivated when they are provided with an audience outside their normal classroom (USDOE, 2010). When students are allowed to post their work to social networking websites or video-sharing websites, they are motivated to produce higher quality work, and receive more frequent critiques and constructive feedback (USDOE, 2010). The authors in the Project RED study also referred to the "collaborative" benefit of sharing with an audience outside the normal classroom (Greaves et al., 2010). This global network can quickly become "mentors, tutors and experts" that, when used safely and correctly, can lead to increases in student learning (Greaves, et al., 2010, p. 18).

Students in the 2009 Speak Up national survey placed this type of learning at the forefront of their shared vision for 21st century learning (Project Tomorrow, 2010). These students named "social-based learning," whereby "students leverage emerging

communications and collaboration tools to create and personalize networks of experts to inform their educational process" (Project Tomorrow, 2010, p. 1). These students explained that digital tools providing the most instant feedback and interaction are preferred, such as instant messaging, text messaging, discussion boards, online chats, and social networking (Project Tomorrow, 2010).

O'Connor et al. (2004) cited that there was very limited evidence that teachers in the 1:1 environments studied were utilizing technology to allow their students to communicate and collaborate outside of the classroom. In fact, less than 1% of teachers surveyed indicated that their students were communicating with students in other schools outside of their own classroom several times a week (O'Connor et al., 2004). Similarly, only 10% of teachers indicated that their students were communicating with students outside their classroom even once or twice a year (O'Connor et al., 2004).

Summary

The increased availability of technology resources available in today's world has provided schools with a multitude of options from which to select to provide teachers with tools that will increase student engagement and prepare students for the careers they will face in the 21st century (Bebell & Kay, 2010). One-to-one computing initiatives are quickly becoming an option that many school districts are considering when it comes to meeting the aforementioned goals (Bebell & O'Dwyer, 2010). By providing teachers and students access to a mobile computer at all times of the day, inside and outside of the classroom, school districts have invested in a tool that has the possibility to transform teaching and learning more than any other available tool (Bebell & Kay, 2010; Dunleavy et al., 2007).

Ultimately, however, this type of technology investment should only be considered a tool for instruction (Annable, 2013). The teacher still remains the most vital component in determining the level of student learning that occurs in the classroom (Bebell & Kay, 2010). Therefore, it remains critical that school leaders remain mindful of the investment of time necessary to prepare teachers to teach in this new technological world (Kellen, 2013).

Professional development in the area of instructional technology is essential if school leaders are to expect success in a 1:1 laptop initiative (Center for Digital Education, 2012; Greaves et al, 2010). The topics of professional development must be varied to meet the needs of each teacher. From the simple basics of learning to operate a computer, to navigating through the multitude of software resources and applications, there certainly are basic skills that must be addressed within professional development opportunities to ensure teachers attain the skills necessary to confidently integrate this technology into the classroom with students (Harris et al., 2007; Rutledge et al., 2007). After the basics have been addressed, professional development programs should shift focus to integrating and applying the technology within the classroom in an effort to enhance student learning (Annable, 2013; Penuel, 2006). This type of application includes learning to utilize online platforms to provide continuous student accessibility to classroom information (USDOE, 2010).

Effective professional development support systems should lead to transformation of classroom instruction. Teachers have often reported that 1:1 laptop initiatives have assisted in improving their own planning process for daily instruction, as well as in seeking resources to supplement the curriculum, differentiate and personalize instruction

for individual students, and to effectively assess student learning to better inform instruction (Drayton et al., 2010; Raulston, 2009; Sinay & Yashkina, 2012; Strother, 2013). Teachers have also reported that their skills in creating presentations for content delivery have increased as a result of 1:1 laptop initiatives, as well as their ability to utilize content management platforms and personal webpages to store and collect classroom documents (Adamson & Darling-Hammond, 2013; Silvernail & Lane, 2004). Transformation of classroom instruction through implementation of 1:1 laptop initiatives also gives students the opportunity to expand their own critical thinking skills and to communicate and collaborate with others within their own classrooms and with those worldwide (Fonkert, 2010; Greaves et al., 2010; Warschauer, 2005). Simply put, 1:1 laptop technology has provided unprecedented learning opportunities.

In Chapter Three, the methodology for this research is provided. Detailed descriptions of the survey instrument utilized within this study, including its creation and the link between each specific question and the four respective research questions are examined. A general overview of the overall population of study and the sampling methods for determining participation in the study are also provided. In addition, the methodology utilized for data collection and analysis are examined to provide the reader a view of the methods used to examine the research questions in this study.

Chapter Three: Methodology

Problem and Purpose Overview

The purpose of this quantitative study was to identify the impact of various factors of professional development preparation on teacher instructional practice during the early implementation of a 1:1 laptop initiative in a high school setting. The factors of professional development examined were those of actual time spent in preparation for the 1:1 laptop initiative, the actual amount of time the teachers had access to their own laptops prior to laptop implementation with their students, and the teachers' perceived value of their own professional development experiences. The types of professional development experiences explored included learning to use hardware, software, and content management platforms as well as how to best integrate the laptop technology into classroom instruction.

Changes in teacher instructional practices were also examined in the areas of teacher planning, instructional delivery, student assessment, digital resource use to supplement existing curriculum and creation of presentations, differentiation and/or personalization of instruction to meet individual student needs, and the utilization of webpages and/or content management platforms to improve student accessibility to classroom instructional materials. Student levels of critical thinking, collaboration, and posting of student work to a global audience were also examined in an effort to quantify instructional change that occurred as a result of 1:1 laptop implementation.

One-to-one computing initiatives have been touted within research as having the potential to radically transform existing classroom instruction (Bebell & Kay, 2010; Storz & Hoffman, 2013). Ubiquitous access to this type of mobile technology by both students

and teachers has been suggested to enable classroom instruction to become more student-centered (Dunleavy et al., 2007). The determining factor, however, in any type of instructional reform effort, including 1:1 laptop initiatives, is most often cited as the teacher (Annable, 2013; Bebell & Kay, 2010; Kellen, 2013).

To effectively leverage the laptop technology in classrooms provided within 1:1 laptop initiatives, professional development must become a primary consideration for school leaders (Greaves et al., 2010). School leaders must consider teacher preparation for utilization of the laptops well before any implementation effort (Brown et al., 2004; Greaves et al., 2010; Strother, 2013). These professional development opportunities should include providing teachers with the ability to become comfortable with their laptops well before implementation with students (Annable, 2013; Kellen, 2013; Silvernail & Buffington, 2009). Professional development experiences should also include activities designed to familiarize teachers with hardware, software, content management platforms as well as integrating each technological resource into classroom instruction (Balanskat et al., 2013; Harris et al., 2007; Rutledge et al., 2007; USDOE, 2010).

Research Questions

The following research questions guided this study:

RQ1. What is the statistical difference in the teachers' perceived value of various types of professional development activities for the purpose of preparing to implement a 1:1 laptop initiative?

RQ2. What is the relationship between the length of time teachers have had access to the same device students have been provided in 1:1 laptop initiative and the change in teacher instructional behaviors involving technology use within the classroom?

RQ3. What is the relationship between the time spent on professional development preparation prior to the implementation of a 1:1 laptop initiative and the change in teacher instructional behaviors involving technology use in the classroom?

RQ4. What is the relationship between the level of perceived value of various types of professional development activities and the change in teacher instructional behaviors involving technology use in the classroom?

Null Hypotheses

The following hypotheses were posed within this study:

$H1_0$. There is no statistical difference in the teachers' perceived value of various types of professional development activities for the purpose of preparing to implement a 1:1 laptop initiative.

$H2_0$. There is no statistical relationship between the length of time teachers have had access to the same device students have been provided in 1:1 laptop initiative and the change in teacher instructional behaviors involving technology use within the classroom.

$H3_0$. There is no statistical relationship between the time spent on professional development preparation prior to the implementation of a 1:1 laptop initiative and the change in teacher instructional behaviors involving technology use in the classroom.

$H4_0$. There is no statistical relationship between the level of perceived value of various types of professional development activities and the change in teacher instructional behaviors involving technology use in the classroom.

Rationale for Quantitative Research

A quantitative research design was selected as the research method in this study. Muijs (2010) explained that quantitative research is the methodology utilized to explain relationships or differences among groups with numerical data using statistically-based methods. In this study, the analysis of time, particularly with the amount of time teachers were exposed to professional development opportunities designed to prepare them for the 1:1 laptop initiative experience and the length of time teachers had access to their laptops prior to laptop implementation with students, provided readily available data for quantitative study; however, the determination of teachers' value of their various professional experiences does not naturally provide numerical data for quantitative research. The utilization of a quality survey instrument enabled these value determinations to be collected and represented in a numerical format for quantitative statistical comparisons (Muijs, 2010).

The primary data utilized within this research study were the teacher survey responses from the 1:1 Laptop Implementation Survey that provided quantifiable data concerning teachers' professional development experiences in preparation for the 1:1 laptop initiative implementation and teachers' classroom instructional behaviors prior to and during 1:1 laptop initiative implementation. As Muijs (2010) indicated, some survey responses require converting belief and value statements into numerical data that can be used for statistical comparison within a quantitative study.

Context and Access

This research study was conducted in southwest Missouri during the fall of 2013. This study involved teachers of three high schools who had implemented a 1:1 laptop

initiative during the spring semester of the 2012-2013 school year, beginning in January 2013. Permission to utilize teachers as participants in this study was sought from the superintendent of each school district. An online survey instrument was developed by the researcher to attain responses from each teacher participant concerning each of the four research questions. As a result, no particular access to this survey had to be secured at any particular location.

Instrumentation

Teacher participants within this study were administered a 1:1 Laptop Implementation Survey (see Appendix A) in August 2013. This survey instrument was developed to answer the four research questions. The 1:1 Laptop Implementation Survey was created based upon the current literature surrounding the types of instructional change expected within 1:1 laptop initiatives along with the suggested models for professional development needed for effective implementation of these initiatives (Bebell & Kay, 2010; Greaves et al., 2010; Sell et al., 2012). This survey instrument was also modeled, in part, after the teacher survey developed for the Berkshire Wireless Learning Initiative (2008) created by the Technology and Assessment Study Collaboration from Boston College (p. 6).

This survey was field-tested prior to implementation within this research study. Principals, teachers, and college professors were administered the survey to ensure survey statements were clear and concise. The participants within this field-test provided the researcher with valuable feedback concerning the clarity of each survey question/statement and response.

The 1:1 Laptop Implementation Survey consisted of 16 questions/statements. The first two questions provided simple demographic information related to the school in which the teacher respondent worked and the number of years of overall teaching experience for each teacher respondent. The following two questions elicited information from the teachers in terms of the length of time they had access to their own laptops prior to the laptop implementation with students and the length of time they had undergone professional development specifically designed to prepare them for the implementation of the 1:1 initiative.

The next question was designed to determine teacher perceptions of four different types of professional development experiences and their value to the teacher's individual preparation for the 1:1 laptop initiative. The final 11 questions were designed to collect information relating to teacher practices in various instructional activities. Teachers were asked how frequently they used technology to perform the various instructional activities within their own classrooms prior to the 1:1 laptop initiative implementation as well as during the actual 1:1 laptop initiative implementation.

Population and Sample

Participants in this study were teachers from three high schools in southwest Missouri, each of which began implementation of a 1:1 laptop initiative in January 2013. The total population of teachers within these three high schools was 160. School A had a total of 31 teachers; School B had a total of 95 teachers; and School C had a total of 34 teachers. Ninety-percent of teachers (n = 144) within each of the three schools identified within this research study were randomly selected for participation: School A (28 teachers), School B (85 teachers), and School C (31 teachers).

This method of random sampling is commonly referred to as proportionate stratified random sampling (Daniel, 2012). Proportionate stratified random sampling ensured that the same percentage of participants was selected from each participating school (Daniel, 2012). This particular method of random sampling was selected because it provides greater precision than standard random sampling and guards against unrepresentative samples (Daniel, 2012). To ensure a true proportionate stratified random sampling of the 160 members of the total teacher population between the three schools, potential participants were selected by utilizing an online random number generator to select 90% of the teachers from each high school.

Although the three high schools were all located within a similar region in southwest Missouri, these high schools varied in student population as well as building and district-level leadership. In addition, while each of the three superintendents was a participant in a research-based study conducted by the Ozarks Educational Research Initiative offered through Missouri State University focusing upon best practices in classroom technology integration, each of these three high schools approached its 1:1 laptop initiatives in a different manner.

Data Collection

After approval from the Institutional Review Board of Lindenwood University (see Appendix B), written permission was sought from each of the three school district superintendents to allow their high school teachers to participate in this research study. Each of the three superintendents granted permission to contact high school teachers within his/her respective school district to recruit participants for this survey. High school principals from each of the three high schools provided names and electronic

communication (email) addresses of teachers who had participated in the 1:1 laptop initiative implementation during the previous spring semester of the 2012-2013 school year.

Each of the 144 participants selected within the random selection process was recruited for participation within this study through a letter of introduction sent via e-mail (see Appendix C). This e-mail letter also included the official informed consent for participation within the research study (see Appendix D). A link to the actual survey was inserted within the letter to provide all participants easy access to the survey instrument. This survey was constructed using the SurveyMonkey online application.

Participants were given two weeks to complete the survey. Upon the conclusion of this two-week period, 67 teachers had completed the survey instrument. A minimum sample size of 30 was needed to ensure a normal distribution of the sample means (Blumen, 2010). In addition, the minimum sample size for correlational studies was also determined by calculating sample size requirements through the use of an online calculation tool (www.statstodo.com). The minimum sample size for the correlational comparisons utilized within this study was 39 participants. This figure assumed an alpha level = 0.05 (risk of a Type I error), a Power (1-beta) level = 0.95 (risk of a Type II error), and a correlation coefficient of 0.50. This minimum sample size would reflect a survey return rate of 28.8%. The overall return rate for participants within this study was 46.5%.

Data Analysis

After the survey responses were collected in September 2013, the investigator transferred the data from the SurveyMonkey collection tool to an Excel spreadsheet to allow for more thorough data analysis. In Research Question #1, teachers were asked to

rate the value of four separate professional development experiences within their own preparation for the 1:1 laptop initiative implementation. Learning to use hardware; learning to use software, application and programs; learning to use content management and instructional delivery platforms; and learning to implement technology within technology were the professional development activities examined within this study. Five possible teacher responses were available to teachers, ranging from *no value to my preparation* to *significant value to my preparation*. Teachers were also given an option of *N/A*, which indicated no value rating for that particular professional development experience. These responses were assigned a score of *0*. All other responses were converted to a numerical format by assigning a number to each response on the five-point Likert scale (see Table 1).

Table 1

Likert Scale Responses for Perceived Value of Professional Development Experiences

Response	Score
No Value to My Participation	1
Little Value to My Participation	2
Marginal Value to My Participation	3
Good Value to My Participation	4
Significant Value to My Participation	5

Note. Teachers scored each value statement using the Likert scale response score. Teachers determined their own value of each professional development experience related to their 1:1 laptop initiative preparation.

The Friedman test procedure was selected to analyze the aggregate differences between each of the four professional development activity responses. Responses to the four different professional development activities were non-linear in nature and converted to an ordinal number in the five-point Likert scale, thus creating the need for a non-parametric analysis. The Friedman test was listed as the non-parametric alternative to the repeated measures ANOVA test and has often been utilized to determine differences between the distributions of three or more related groups with data that does not meet the assumption of an equal-interval scale of measurement (Lowry, n.d.).

The remaining three research questions involved the correlational analysis of the relationship between various factors of professional development preparation and the actual change in teacher instructional practices after 1:1 laptop initiative implementation. The professional development factors examined within this correlational analysis were the length of time teachers reported to have access to their own laptops prior to the actual student implementation, the length of time (in semesters) teachers reported for their own professional development preparation specifically targeted towards 1:1 laptop implementation, and the teacher responses to the value of the four professional development experiences (listed in Research Question #1) on teacher preparation for their 1:1 laptop initiative implementation.

Teacher access to laptops was measured in the amount of time that teachers had access to their own laptops prior to student implementation. Survey responses ranged from *less than one semester* to *more than one year*. Survey responses were converted to numerical form by converting each response to an ordinal number in a four-point scale (see Table 2).

Table 2

Likert Scale Responses for Length of Time of Teacher Access to Laptops

Response	Score
Less than One Semester	1
One Semester	2
One Year	3
More than One Year	4

Note. Teachers scored each value statement using the Likert scale response score. Teachers determined their length of time having access to laptops prior to student implementation.

The length of time teachers were involved in professional development preparation designed to prepare them for the 1:1 laptop initiative was measured in semesters. Survey responses ranged from *no formal preparation* to *more than six (6) semesters.* Survey responses were converted to numerical form within an eight-point scale that was linear in nature (see Table 3).

Table 3

Likert Scale Responses for Length of Teacher Professional Development Preparation

Response	Score
No Formal Preparation	1
One (1) Semester	2
Two (2) Semesters	3
Three (3) Semesters	4
Four (4) Semesters	5
Five (5) Semesters	6
Six (6) Semesters	7
More than Six (6) Semesters	8

Note. Teachers determined their length of professional development experience in preparation for the 1:1 laptop initiative.

The frequency of utilization of each instructional behavior was measured by asking teachers to respond to their frequency of use involving each of the 11 instructional activities within their own classrooms. Teachers were asked to respond to their own behavior prior to 1:1 laptop initiative implementation as well as during the 1:1 laptop initiative implementation. Responses to these survey questions included six potential choices ranging between *never* and *daily*. As previously explained, these responses were converted to numerical form by converting each six-point Likert scale response to an ordinal number (see Table 4)

Table 4

Likert Scale Responses for Frequency of Use of Teacher Instructional Practices

Response	Score
Never	1
Once or Twice a Year	2
Once or Twice a Semester	3
Once or Twice a Month	4
Once or Twice a Week	5
Daily	6

Note. Teachers scored each value statement using the Likert scale response score. Teachers determined their own frequency of use relating to each instructional practice both pre- and during-1:1 laptop initiative implementation.

Change in instructional practices for each of the 11 instructional activities was calculated by subtracting the ordinal number corresponding to the response for each instructional practice prior to 1:1 laptop implementation from the ordinal number corresponding to the rating of the same instructional practice during 1:1 laptop implementation. Descriptive statistics, including mean and mode, were compiled for each of the 11 instructional activities to illustrate the actual amount of change that occurred within each instructional activity examined. The Wilcoxon Signed-Rank test was also utilized as the non-parametric alternative to the correlated samples *t*-test to examine the differences between the frequency of use for each of the 11 instructional practices pre-1:1 laptop initiative implementation and the correlated frequency of use during the first semester of 1:1 laptop initiative implementation (Lowry, n.d.).

The Spearman rank order correlational analysis was selected as the statistical method to analyze the relationship between the variables in each of these three research questions. This methodology was selected because at least one of the independent variables (perceived value of professional development activities or change in instructional practices) involved non-linear, ordinal data, thus making the variables in this correlational analysis non-parametric in nature (Lowry, n.d.). Research Question #2 involved comparing the responses of length of time teachers had access to their own laptop prior to student implementation for the 1:1 laptop initiative to the calculated change in instructional practices for each of the 11 instructional activities. Research Question #3 involved comparing the responses of length of time teachers spent in professional development activities designed to prepare them for the 1:1 laptop initiative to the same calculated change in instructional practices for the 11 instructional activities. Research Question #4 involved comparing the responses of the perceived value from teachers of the four professional development experiences to the calculated change in instructional practice for each of the 11 instructional activities.

Summary

This quantitative research study was designed to examine the impact of various professional development factors on the implementation of 1:1 laptop initiatives. This study involved teachers from three high schools in southwest Missouri who had recently participated in the implementation of a 1:1 laptop initiative in their respective schools. Professional development factors examined within this study were the length of time teachers had access to their own laptop prior to laptop implementation with students, the length of professional development experience to which teachers were exposed in

preparation for the 1:1 laptop initiative, and the teachers' perceived value of various types of professional development experience to their preparation for the 1:1 laptop initiative.

Impact on the implementation of 1:1 laptop initiatives was measured by the amount of instructional change that occurred comparing teacher instructional practices before and during 1:1 laptop initiative implementation. These instructional activities included teacher planning, instructional delivery, student assessment, use of digital resources to supplement existing curriculum and creation of presentations, differentiation and/or personalization of instruction to meet individual student needs, utilization of webpages and/or content management platforms to improve student accessibility to classroom instructional materials, activities to increase students' critical thinking and collaboration, and posting of student work to a global audience.

This research study focused on the examination of the four distinct professional development experiences to determine if teachers valued any of these professional development experiences more than others in relation to their preparation for the 1:1 laptop initiative implementation. A correlational analysis was also conducted to determine if the length of time teachers had access to their own laptops prior to student implementation or the length of time teachers were exposed to professional development opportunities in preparation for their 1:1 laptop initiative were related to any change in teacher instructional practices. Similarly, the teachers' responses to their own perceived value of each professional development experience were correlated to any change in teacher instructional practices to determine any significant relationships.

In Chapter Four, the results of statistical analysis for each of the methods utilized in the study are presented. First, the teacher ratings of value for four different

professional development activities were examined in an effort to determine if there were any significant differences in the value teachers place on these professional development activities in their preparation for a 1:1 laptop initiative. Next, the actual change in frequency of use of 11 different instructional activities pre-1:1 laptop initiative implementation and during the first semester of implementation. Finally, the amount of change occurring in the frequency of use of each of the 11 instructional activities as a result of the 1:1 laptop initiative implementation were correlated with various professional development factors, including the amount of time teachers had access to their own laptops prior to implementation with students, the length of professional development experience teachers were involved in to prepare them for the 1:1 laptop initiative implementation, and the values teachers placed on the four different types of professional development activities examined previously.

Chapter Four: Analysis of Data

Review of Study

Today's educational leaders have lauded classroom technology integration as the most significant tool for transforming teaching and learning in the 21st century (Blackboard, 2012; Center for Digital Education, 2011). The cost of implementation has continued to decrease, thus enabling the ubiquitous availability of technology for every teacher and student a distinct possibility (USDOE, 2013). One-to-one computing initiatives have become a very common solution for school districts hopeful of transforming their classrooms through technology integration (Bebell & Kay, 2010; Storz & Hoffman, 2013). Students in today's world are surrounded by constant access to digital technology; the goal for school districts in the implementation of a 1:1 computing initiatives is to bring that same access the classroom (OPSBA, n.d.).

Effective implementation of 1:1 computing initiatives throughout the country has enabled teachers to become more innovative with their teaching practices by leveraging the laptop technology to engage students in learning activities not possible before (Storz & Hoffman, 2013). Effective integration of 1:1 computing initiatives within the classroom has to be supported by quality professional development and training (USDOE, 2010). These professional development support systems should include hands-on experiences for teachers to learn to use the hardware and software as well as exploring methods to infuse the technology into classrooms in creative and innovative ways (Nadelson et al., 2013; Rodriguez & Knuth, 2000).

The responses gathered as a result of this research identified the value teachers placed upon various professional development experiences in their preparation for the

implementation of a 1:1 laptop initiative within a high school setting. Also examined were the relationship between various professional development factors and the amount of instructional change that occurs within classrooms as teachers transition to a 1:1 laptop initiative. This study provided valuable information for school leaders who may be considering the future implementation of a 1:1 laptop initiative.

Research Questions

The following research questions guided this study:

RQ1. What is the statistical difference in the teachers' perceived value of various types of professional development activities for the purpose of preparing to implement a 1:1 laptop initiative?

RQ2. What is the relationship between the length of time teachers have had access to the same device students have been provided in a 1:1 laptop initiative and the change in teacher instructional behaviors involving technology use within the classroom?

RQ3. What is the relationship between the time spent on professional development preparation prior to the implementation of a 1:1 laptop initiative and the change in teacher instructional behaviors involving technology use in the classroom?

RQ4. What is the relationship between the level of perceived value of various types of professional development activities and the change in teacher instructional behaviors involving technology use in the classroom?

Null Hypotheses

The following hypotheses were posed within this study:

$H1_0$. There is no statistical difference in the teachers' perceived value of various types of professional development activities for the purpose of preparing to implement a 1:1 laptop initiative.

$H2_0$. There is no statistical relationship between the length of time teachers have had access to the same device students have been provided in a 1:1 laptop initiative and the change in teacher instructional behaviors involving technology use within the classroom.

$H3_0$. There is no statistical relationship between the time spent on professional development preparation prior to the implementation of a 1:1 laptop initiative and the change in teacher instructional behaviors involving technology use in the classroom.

$H4_0$. There is no statistical relationship between the level of perceived value of various types of professional development activities and the change in teacher instructional behaviors involving technology use in the classroom.

Perceived Value of Professional Development Experiences

Teacher participants in the survey were asked to rate the value of four separate professional development experiences in relationship to their preparation for the 1:1 initiative. The four professional development experiences identified for this study were learning to use hardware; learning to use software, applications and programs; learning to use content management and instructional delivery platforms; and learning to implement the technology within instruction. Teachers rated each of these professional learning experiences on a five-point Likert scale with responses ranging from *no value to my*

preparation on the lowest end of the spectrum to *significant value to my preparation* on the high end of the spectrum. These Likert scale responses were converted to an ordinal number between *1* and *5* for statistical evaluation purposes. The following figures (Figure 1, 2, 3, and 4) summarize the teacher responses to their perceptions of value of the four professional development experiences in relation to its preparation for the 1:1 initiative.

Teacher participants in the study were asked to rate the value of learning to use hardware in their preparation for the 1:1 laptop initiative. After analyzing the response data, it was determined that 69.69% of teachers valued learning to use hardware at either the *good value to my preparation* or *significant value to my preparation* (see Figure 1). In contrast, only 18.19% of teachers valued learning to use hardware as *no value to my preparation* or *little value to my preparation*.

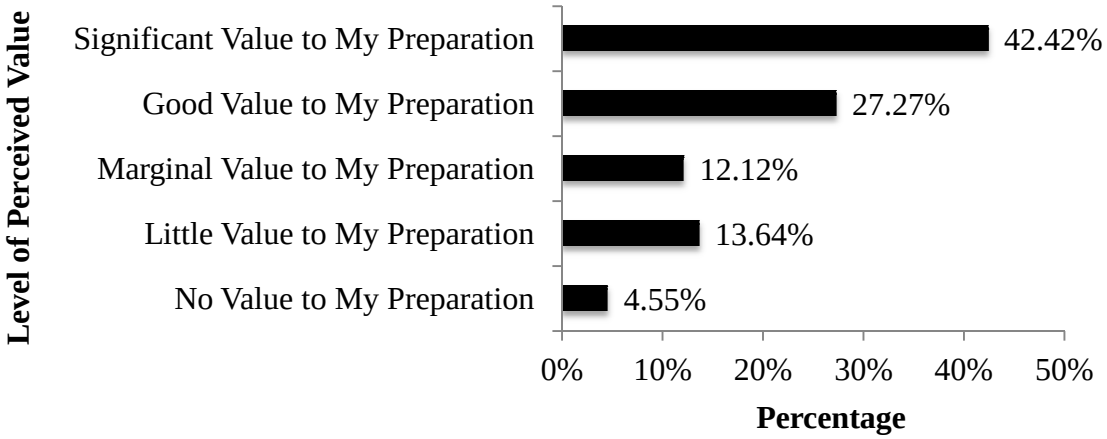

Figure 1. Level of teachers' perceived value of learning to use hardware in their preparation for the 1:1 laptop initiative.

Teacher participants in the study were asked to rate the value of learning to use software, applications, and programs in their preparation for the 1:1 laptop initiative. After analyzing the response data, it was determined that 77.61% of teachers valued learning to use software, applications, and programs at either the *good value to my preparation* or *significant value to my preparation* (see Figure 2). In contrast, only 7.46% of teachers valued learning to use software, applications, and programs as *no value to my preparation* or *little value to my preparation*.

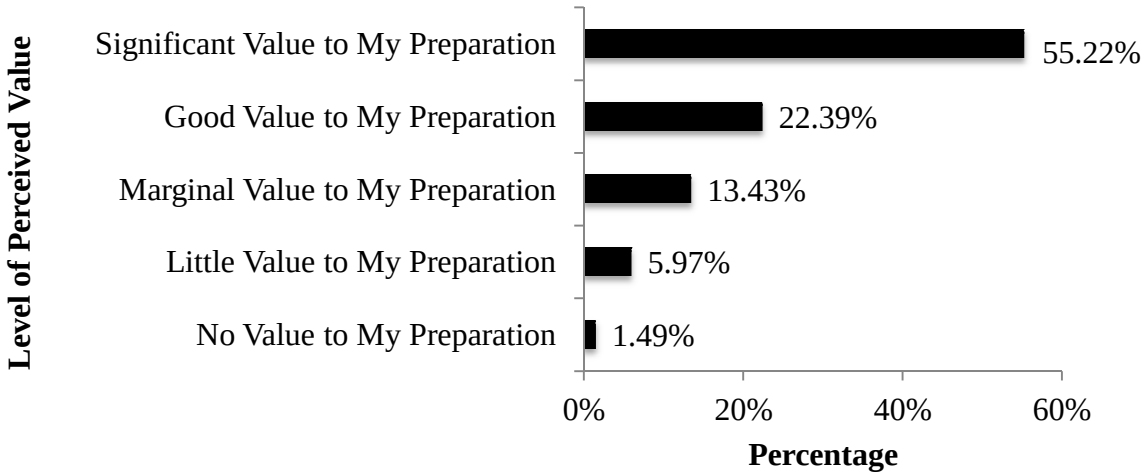

Figure 2. Level of teachers' perceived value of learning to use software, applications, and program in their preparation for the 1:1 laptop initiative.

Teacher participants in the study were asked to rate the value of learning to use content management and instructional delivery platforms in their preparation for the 1:1 laptop initiative. After analyzing the response data, it was determined that 62.68% of teachers valued learning to use content management and instructional delivery platforms at either the *good value to my preparation* or *significant value to my preparation* (see Figure 3). In contrast, only 11.95% of teachers valued learning to use content management and instructional delivery platforms as *no value to my preparation* or *little value to my preparation*.

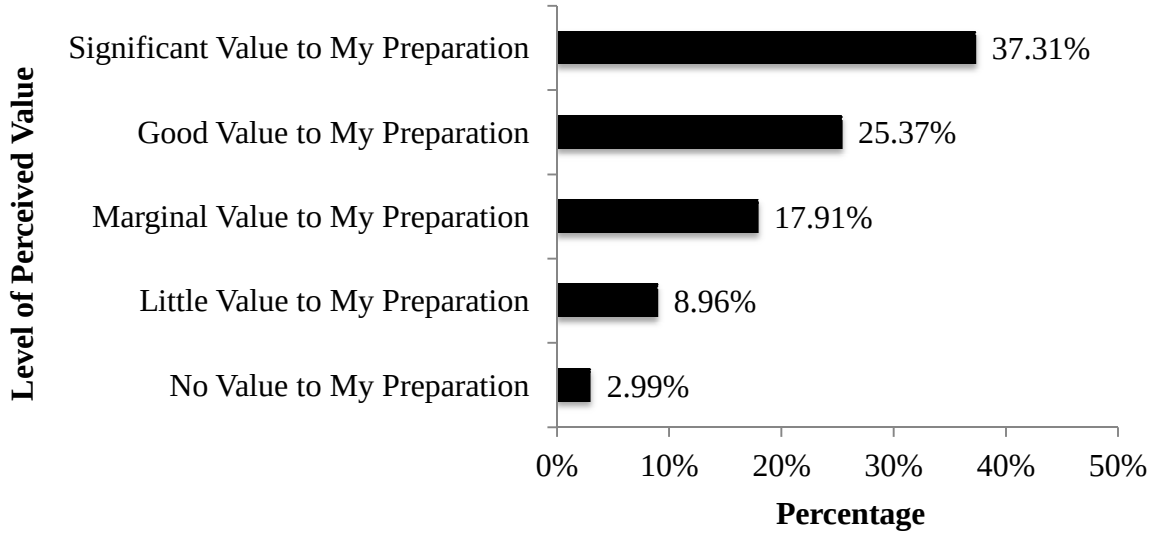

Figure 3. Level of teachers' perceived value of learning to use content management and instructional delivery platforms in their preparation for the 1:1 laptop initiative.

Teacher participants in the study were asked to rate the value of learning to integrate technology within instruction in their preparation for the 1:1 laptop initiative. After analyzing the response data, it was determined that 83.58% of teachers valued learning to integrate technology within instruction at either the *good value to my preparation* or *significant value to my preparation* (see Figure 4). In contrast, only 4.48% of teachers valued learning to integrate technology within instruction as *no value to my preparation* or *little value to my preparation*.

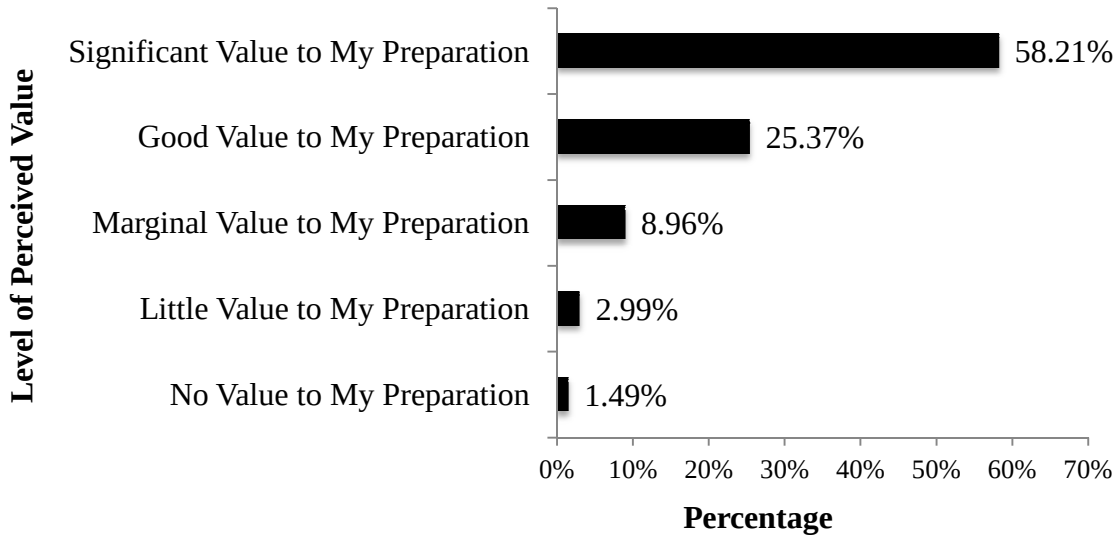

Figure 4. Level of teachers' perceived value of learning to implement the technology within instruction in their preparation for the 1:1 laptop initiative.

Teachers indicated the integration of technology within instruction as the most valued (83.58%) professional development experience in their preparation for the 1:1 learning initiative. Conversely, teachers indicated learning to use hardware as the lowest valued (69.69%) professional development experience in their preparation for the 1:1 learning initiative. Despite the fact that teachers rated learning to use hardware lowest, it is important to note that over two-thirds of teachers indicated *good* or *significant* value to each of the four professional development activities examined.

The Friedman test was selected to analyze the differences between the teacher value-related responses for each of the four professional development experiences and to serve as the non-parametric alternative to the repeated measures ANOVA test (Lowry, n.d.). There was not an equal interval scale of measurement for the five possible responses within these survey questions; thus, the non-parametric method of analysis was required.

Teacher responses to each of the value responses for each of the four professional development activities examined were ranked from *1* to *4* in relation to each other with the smallest ranking receiving a *1*, the next smallest a *2*, and the largest ranking a *4*. In the case of ties, or responses that were scored the same, the rankings were averaged to provide the actual rank score. These individual rankings served as the primary data within the Friedman test for determining the aggregate group differences.

The aggregate group differences were determined by calculating the sum of squared differences between the individual group means and the means of the overall array of data, multiplied by the overall number of responses (Lowry, n.d.). In this study, the number of individual groups was $k = 4$. The overall number of individual responses

was $n = 67$. *T* refers to the sum of the rankings for each individual group. The *T* for the learning to use hardware values was 151.5. The *T* for learning to use software, applications, and programs was 174.5. The *T* for learning to use content management and instructional delivery platforms was 149.0. The *T* for learning to integrate technology within instruction was 185.0. The resulting sum of squared deviates score ($SS_{bg(r)}$) for these four groups was 14.07.

The next step of the Friedman test analysis was to determine the sampling distribution of the $SS_{bg(r)}$. For larger samples, $k > 5$ or $n > 13$, the sampling distribution is determined by chi-square for $df = k - 1$. The resulting $X_2 = 8.43$. With $df = 3$ and $\alpha = .05$, the critical value for the $X_2 = 7.815$. Because the calculated X_2 for the $SS_{bg(r)}$ of 8.43 was greater than the critical value of 7.815, the aggregate difference between the four groups examined within this study was statistically significant. In addition, the resulting $p = .038$. In summary, the Friedman test indicated that there were aggregate differences between each of the four groups examined within this study; therefore, $H1_0$ was rejected because there was a statistically significant aggregate group difference in the teachers' perceived value of the four different types of professional development activities for the purpose of preparing to implement a 1:1 laptop initiative.

Changes in Instructional Practices

The purpose of Research Questions #2, #3, and #4 was to examine the relationship between various professional development factors and the amount of instructional change indicated by teachers that occurred as a result of the implementation of the 1:1 laptop initiative. Instructional change was dismissed as a central research question after reviewing the abundance of literature that indicated instructional change

was commonplace within 1:1 laptop initiatives. The amount of instructional change, however, was determined by the researcher to be an essential component in the analysis of the overall impact of the various professional development factors on the change in teacher instructional practices.

For the purposes of this study, instructional change was measured by asking teachers to respond to the frequency they utilized 11 distinct instructional activities within their own classrooms. The 11 instructional activities examined within this study were as follows: instructional planning, instructional delivery, student assessment, digital resource use to supplement the textbook and/or curriculum, creation and/or downloading of presentations that can be utilized by students outside of the classroom, differentiation or personalization of instruction to meet the unique needs of individual students, creation of learning activities designed to challenge students to think in a critical manner, creation of webpages or use of content management platforms, asking students to use technology to complete assignments, asking students to collaborate on assignments, and asking students to post their work to or communicate with a global audience.

Teachers were asked to respond to their frequency of use involving each of the 11 instructional activities prior to 1:1 laptop initiative implementation as well as during the 1:1 laptop initiative implementation. Teacher responses were converted to numerical form by converting each six-point Likert scale response to an ordinal number. Change in instructional practices for each of the 11 instructional activities was calculated by subtracting the ordinal number corresponding to the response for each instructional practice prior to 1:1 laptop implementation from the ordinal number corresponding to the rating of the same instructional practice during 1:1 laptop implementation. Figure 5

through Figure 15 illustrate the changes teachers indicated within their own instructional practice as a result of the 1:1 laptop initiative implementation.

Teacher participants in the study rated their frequency of technology use to plan for instruction both pre- and during the 1:1 laptop initiative. After analyzing the response data, it was determined that 70.97% of teachers utilized technology to assist in planning for classroom instruction daily or at least once or twice a week prior to the 1:1 laptop initiative (see Figure 5). This number rose to 98.38% of teachers utilizing technology to plan for instruction during the 1:1 initiative implementation.

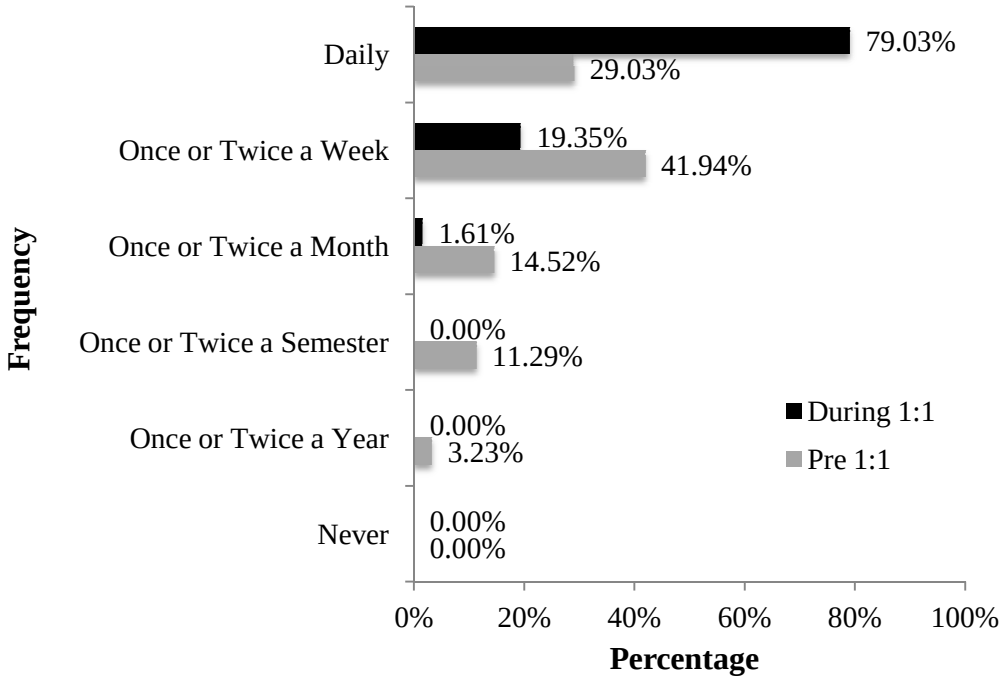

Figure 5. Teacher responses to the frequency of technology use to plan for instruction both pre- and during 1:1 laptop initiative implementation.

Teacher participants in the study rated their frequency of using technology to deliver classroom instruction both pre- and during the 1:1 laptop initiative implementation. After analyzing the response data, it was determined that 67.69% of teachers utilized technology to deliver classroom instruction daily or at least once or twice a week prior to the 1:1 laptop initiative (see Figure 6). This number rose to 95.38% of teachers utilizing technology to deliver classroom instruction during the 1:1 initiative implementation.

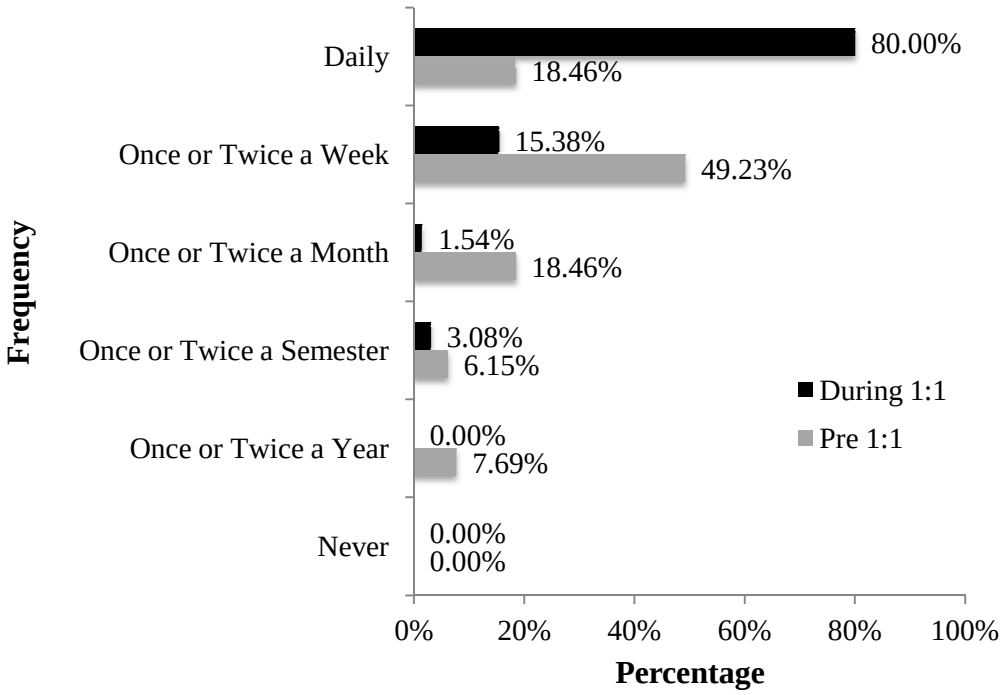

Figure 6. Teacher responses to the frequency of using technology to deliver classroom instruction both pre- and during 1:1 laptop initiative implementation.

Teacher participants in the study rated their frequency of using technology to assess student learning both pre- and during the 1:1 laptop initiative. After analyzing the response data, it was determined that only 20.89% of teachers utilized technology to assess student learning daily or at least once or twice a week prior to the 1:1 laptop initiative (see Figure 7). This number rose to 73.13% of teachers utilizing technology to assess student learning during the 1:1 initiative implementation. In addition, before the 1:1 laptop initiative implementation 14.93% of teachers indicated they had never used technology to assess students compared to only 2.99% who indicated they had not utilized the technology to assess students during the 1:1 implementation phase.

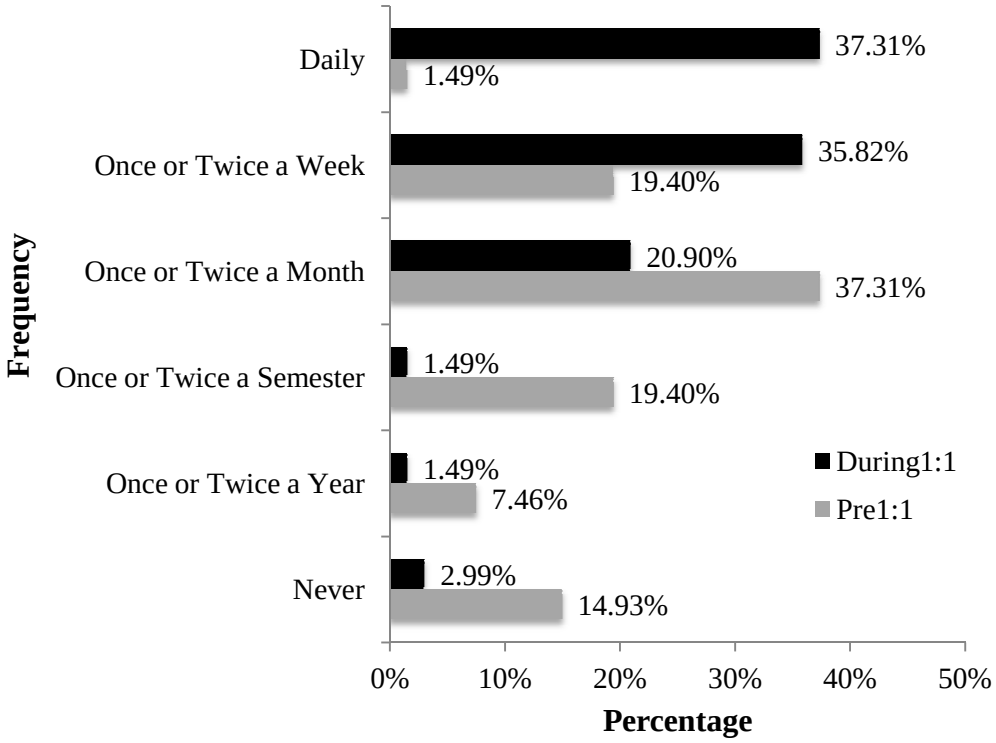

Figure 7. Teacher responses to the frequency of using technology to assess student learning both pre- and during 1:1 laptop initiative implementation.

Teacher participants in the study rated their frequency of using digital resources to supplement the existing curriculum both pre- and during the 1:1 laptop initiative. After analyzing the response data, it was determined that 37.88% of teachers utilized digital resources to supplement the existing curriculum daily or at least once or twice a week prior to the 1:1 laptop initiative (see Figure 8). This number rose to 83.34% of teachers using digital resources to supplement the existing curriculum during the 1:1 initiative implementation.

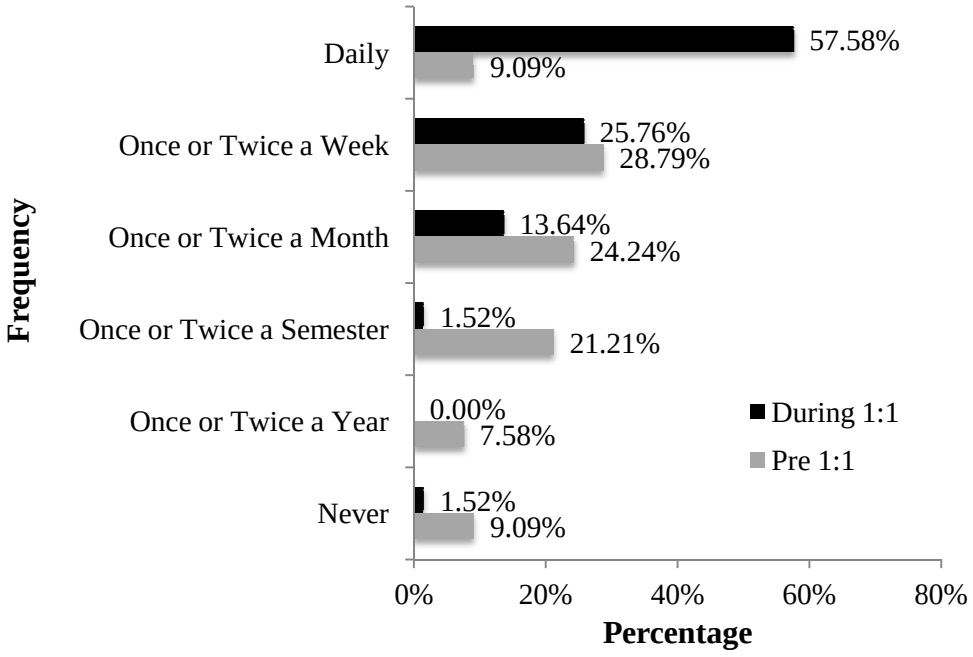

Figure 8. Teacher responses to the frequency of using digital resources to supplement the curriculum both pre- and during 1:1 laptop initiative implementation.

Teacher participants in the study rated their frequency of creating and/or downloading presentations that could be utilized by students outside of the classroom both pre- and during the 1:1 laptop initiative. Only 21.21% of teachers indicated utilizing technology to create and/or download these presentations daily or at least once or twice a week prior to the 1:1 laptop initiative (see Figure 9). This number rose to 57.58% of teachers during the 1:1 initiative implementation. In addition, before the 1:1 laptop initiative implementation, 34.85% of teachers indicated they had never used technology to create and/or download presentations compared to only 6.06% who responded similarly during the 1:1 laptop implementation.

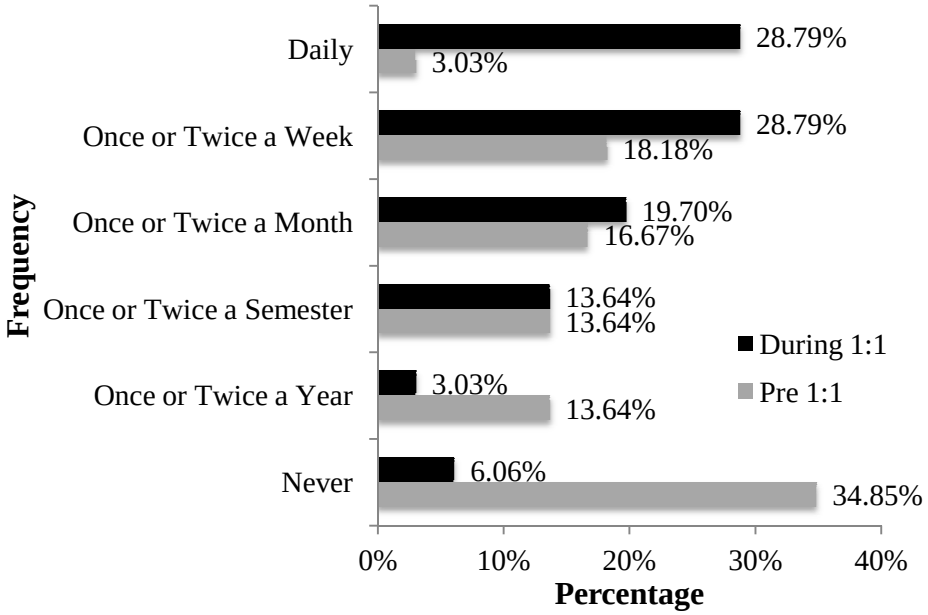

Figure 9. Teacher responses to the frequency of using technology to create and/or download presentations that can be utilized by students outside of the classroom both pre- and during 1:1 laptop initiative implementation.

Teacher participants in the study rated their frequency of using technology to differentiate or personalize instruction to meet the unique needs of individual students both pre- and during the 1:1 laptop initiative. Only 17.46% of teachers indicated utilizing technology to differentiate or personalize instruction with technology daily or at least once or twice a week prior to the 1:1 laptop initiative (see Figure 10). This number rose to 58.73% of teachers during the 1:1 initiative implementation. In addition, before the 1:1 laptop initiative implementation, 23.81% of teachers indicated they had never used technology to differentiate or personalize instruction compared to only 4.76% who responded similarly during the 1:1 laptop implementation.

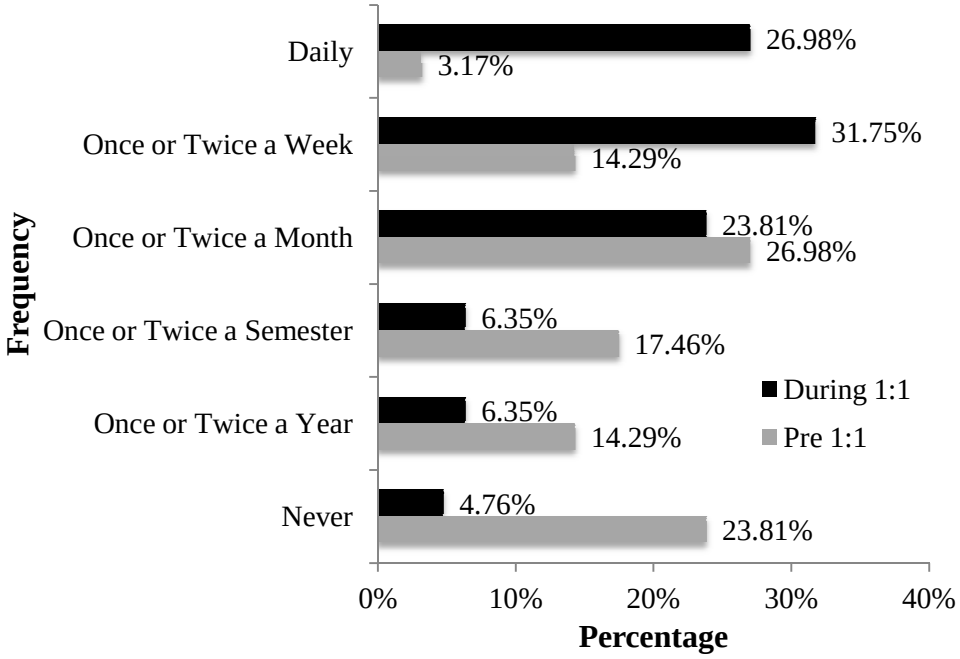

Figure 10. Teacher responses to the frequency of using technology to differentiate or personalize instruction to meet the unique needs of individual students both pre- and during 1:1 laptop initiative implementation.

Teacher participants in the study rated their frequency of using technology to create learning activities designed to challenge students to think in a critical manner both pre- and during the 1:1 laptop initiative. After analyzing the response data, it was determined that 40.33% of teachers used technology to create critical thinking activities for students daily or at least once or twice a week prior to the 1:1 laptop initiative (see Figure 11). This number rose to 74.19% of teachers using technology to create critical thinking activities for students during the 1:1 initiative implementation.

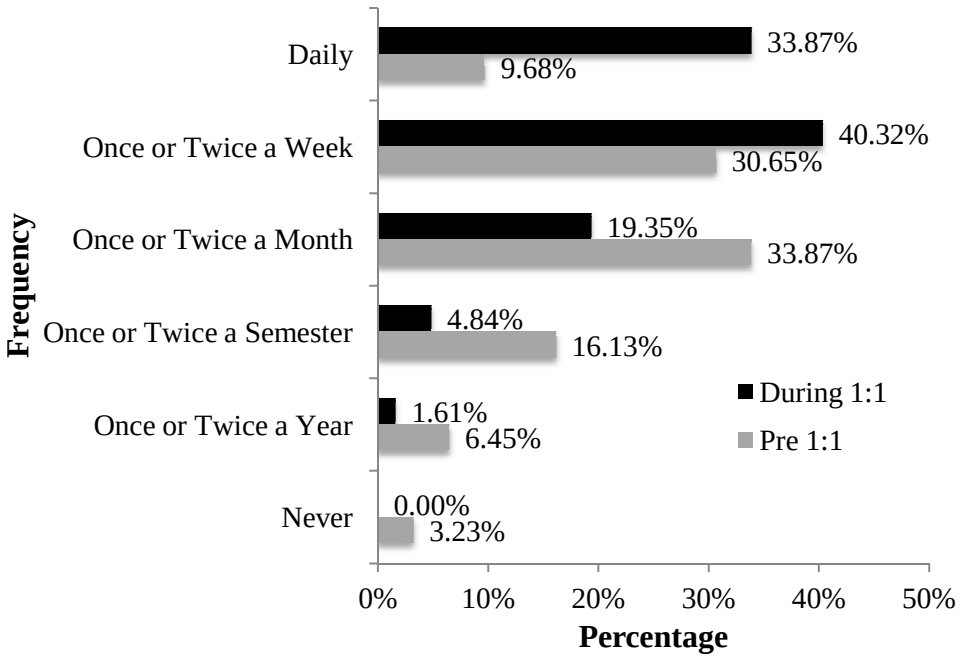

Figure 11. Teacher responses to the frequency of using technology to create learning activities designed to challenge students to think in a critical manner both pre- and during 1:1 laptop initiative implementation.

Teacher participants in the study rated their frequency of creating webpages or using a content management platform both pre- and during the 1:1 laptop initiative. Only 13.85% of teachers indicated they had created a webpage or used a content management platform daily or at least once or twice a week prior to the 1:1 laptop initiative (see Figure 12). This number rose to 69.23% of teachers during the 1:1 initiative implementation. In addition, before the 1:1 laptop initiative implementation, 41.54% of teachers indicated they had never created a webpage or used a content management platform compared to only 4.62% who responded similarly during the 1:1 laptop implementation.

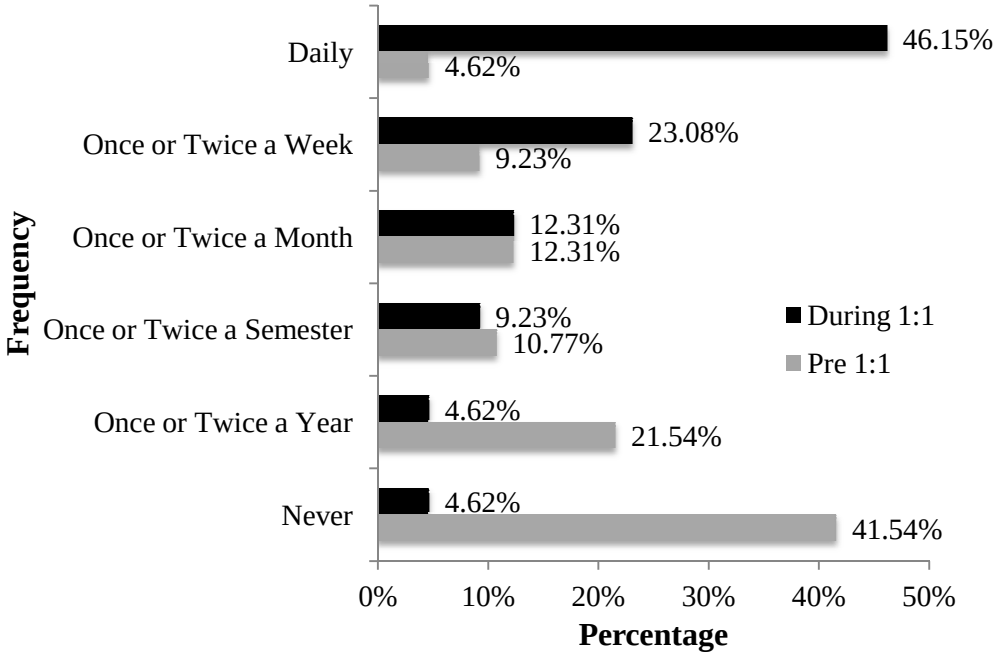

Figure 12. Teacher responses to the frequency of using technology to create webpages or use content management platforms both pre- and during 1:1 laptop initiative implementation.

Teacher participants in the study rated their frequency of asking students to use technology to complete assignments both pre- and during the 1:1 laptop initiative. Only 13.44% of teachers indicated asking students to use technology to complete assignments daily or at least once or twice a week prior to the 1:1 laptop initiative (see Figure 13). This number rose to 82.09% of teachers during the 1:1 initiative implementation. In addition, before the 1:1 laptop initiative implementation, 29.85% of teachers indicated they had asked students to use technology to complete assignments a maximum of once or twice a year compared to none who responded similarly during the 1:1 laptop implementation.

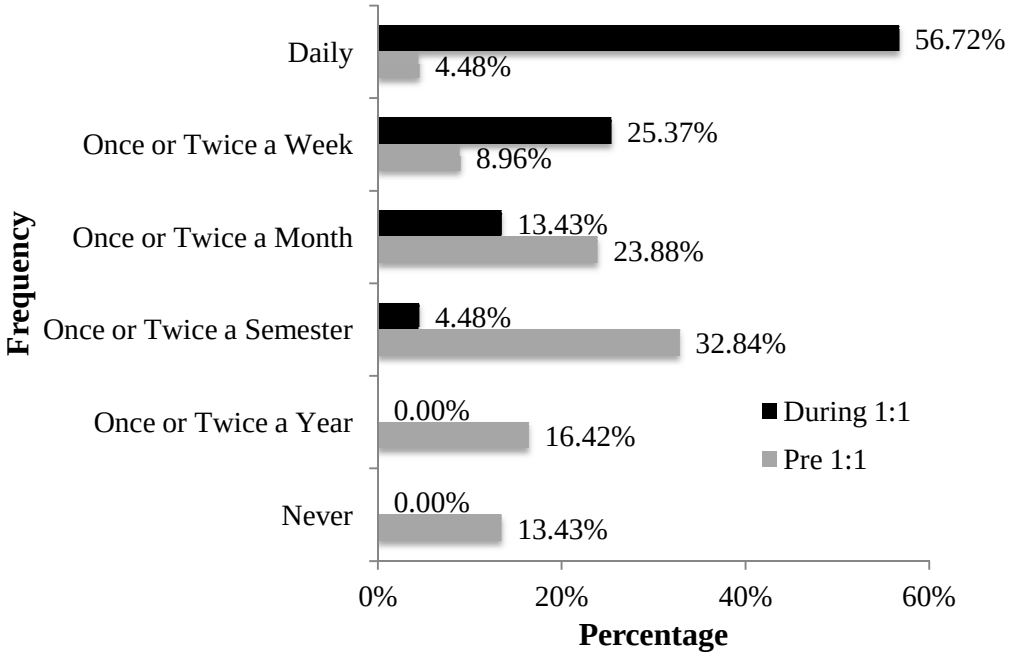

Figure 13. Teacher responses to the frequency of asking students to use technology to complete classroom assignments both pre- and during 1:1 laptop initiative implementation.

Teacher participants in the study were asked to rate their frequency of asking students to collaborate on assignments with technology both pre- and during the 1:1 laptop initiative. After analyzing the response data, it was determined that 37.10% of teachers asked students to use technology to collaborate on assignments daily or at least once or twice a week prior to the 1:1 laptop initiative (see Figure 14). This number rose to 69.35% of teachers asking students to collaborate on assignments with technology during the 1:1 initiative implementation.

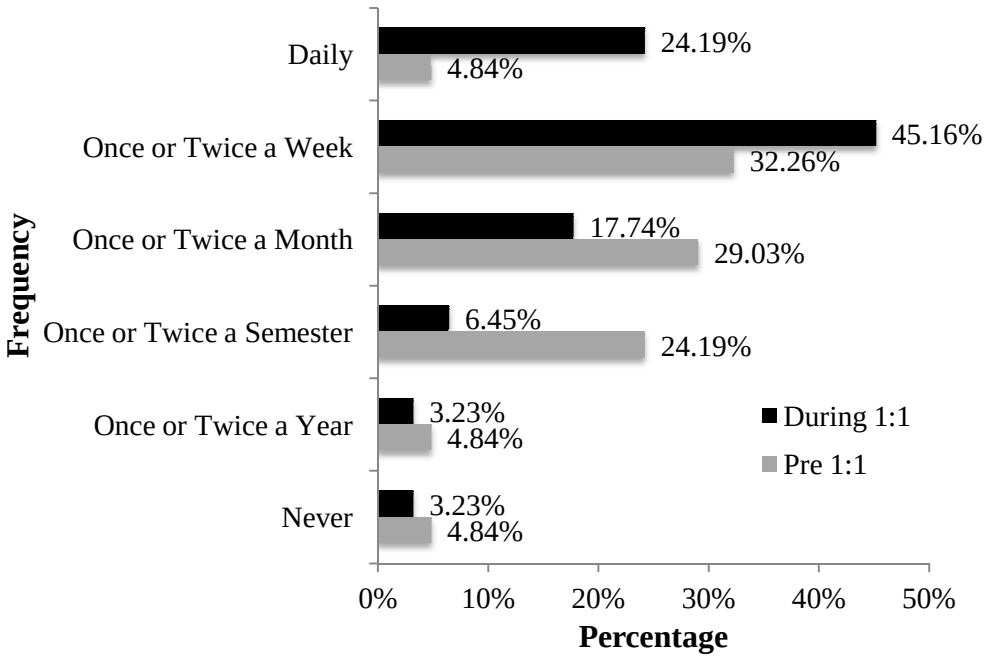

Figure 14. Teacher responses to the frequency of asking students to collaborate on classroom assignments both pre- and during 1:1 laptop initiative implementation.

Teacher participants in the study rated their frequency of asking students to post their work to or communicate with a global audience both pre- and during the 1:1 laptop initiative. Only 7.81% of teachers indicated they had asked students to post their work to or communicate with a global audience daily or at least once or twice a month prior to the 1:1 laptop initiative (see Figure 15). This number rose to 31.25% of teachers during the 1:1 initiative implementation. In addition, before the 1:1 laptop initiative implementation, 76.56% of teachers indicated they had never asked students to post their work to or communicate with a global audience compared to only 39.06% who responded similarly during the 1:1 laptop implementation.

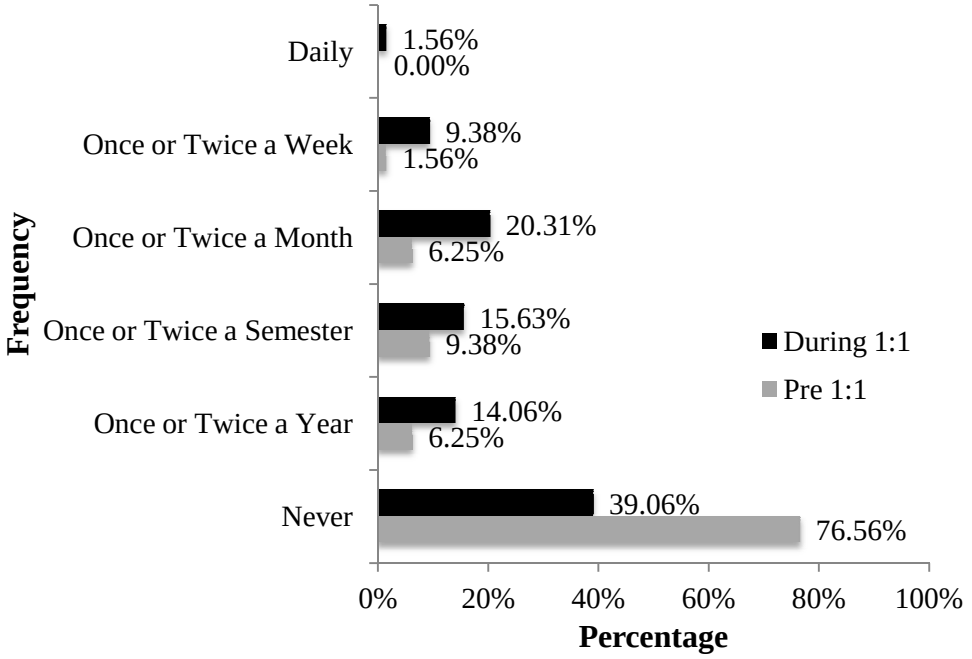

Figure 15. Teacher responses to the frequency of asking students to post their work to or communicate with a global audience both pre- and during 1:1 laptop initiative implementation.

The examination of teacher responses to their own instructional practices both pre- and during the 1:1 laptop initiative implementation indicated increases in utilization for each of the 11 instructional activities as a result of the 1:1 laptop initiative implementation. The mean change for each instructional activity is shown in Figure 16. The mean and mode descriptive data for each instructional activity both pre- and during 1:1 laptop initiative implementation along with the z scores that show statistical significance for the change in each instructional activity as a result of 1:1 laptop implementation are provided in Table 5.

The Wilcoxon Signed-Rank test was utilized as the non-parametric alternative to the correlated samples *t*-test to examine the differences between the pre-1:1 laptop initiative implementation frequency ratings and the frequency ratings during the 1:1 laptop initiative implementation (Lowry, n.d.). The critical value of z for the Wilcoxon Signed-Rank test for the .05 level of significance was 1.960. The implementation of the 1:1 laptop initiative produced a statistically significant change for each instructional activity examined within this study.

The creation of webpages or use of content management platforms by teachers showed the greatest level of change as a result of the 1:1 laptop initiative implementation. The mean response pre-1:1 initiative was 2.4, indicating that the average frequency of use for this instructional activity was slightly more than once or twice per year; however, during the 1:1 laptop initiative implementation, the mean response score rose to 4.831, an increase of 101.28%, indicating that the average frequency of use rose to almost once or twice per week. It should also be noted that the most common teacher response rose

from *never* to *daily* for the use of webpages and content management platforms as a result of 1:1 laptop initiative implementation.

The next highest change in instructional practice cited within this study was that of teachers requiring students to utilize technology to complete assignments. The mean response pre-1:1 initiative was 3.119, indicating that the average frequency of use for this instructional activity was slightly more than once or twice per semester; however, during the 1:1 laptop initiative implementation the mean response score rose to 5.343, an increase of 71.29%, indicating that the average frequency of use rose to just over once or twice per week. The most common teacher response rose from *once or twice a semester* to *daily* for requiring students to use technology to complete assignments as a result of 1:1 laptop initiative implementation.

Teachers asking students to post their work to or communicate with a global audience was the instructional activity with the next highest change. The mean response pre-1:1 initiative was 1.5, indicating that the average frequency of use for this instructional activity was between one or twice per year and once or twice a semester; however, during the 1:1 laptop initiative implementation the mean response score rose to 2.516, an increase of 67.71%, indicating that the average frequency of use rose to just over once or twice per week.

The lowest increases in the frequency of instructional activity use were found in the use of technology to plan for instruction (19.73%) and in asking students to collaborate with each other to complete assignments (19.67%). Although each of these factors began with teacher response ratings of 4.646 and 3.935 respectively, which were among the highest utilized instructional activities with technology pre-1:1 laptop initiative implementation, the nearly 20% change that occurred was still statistically significant.

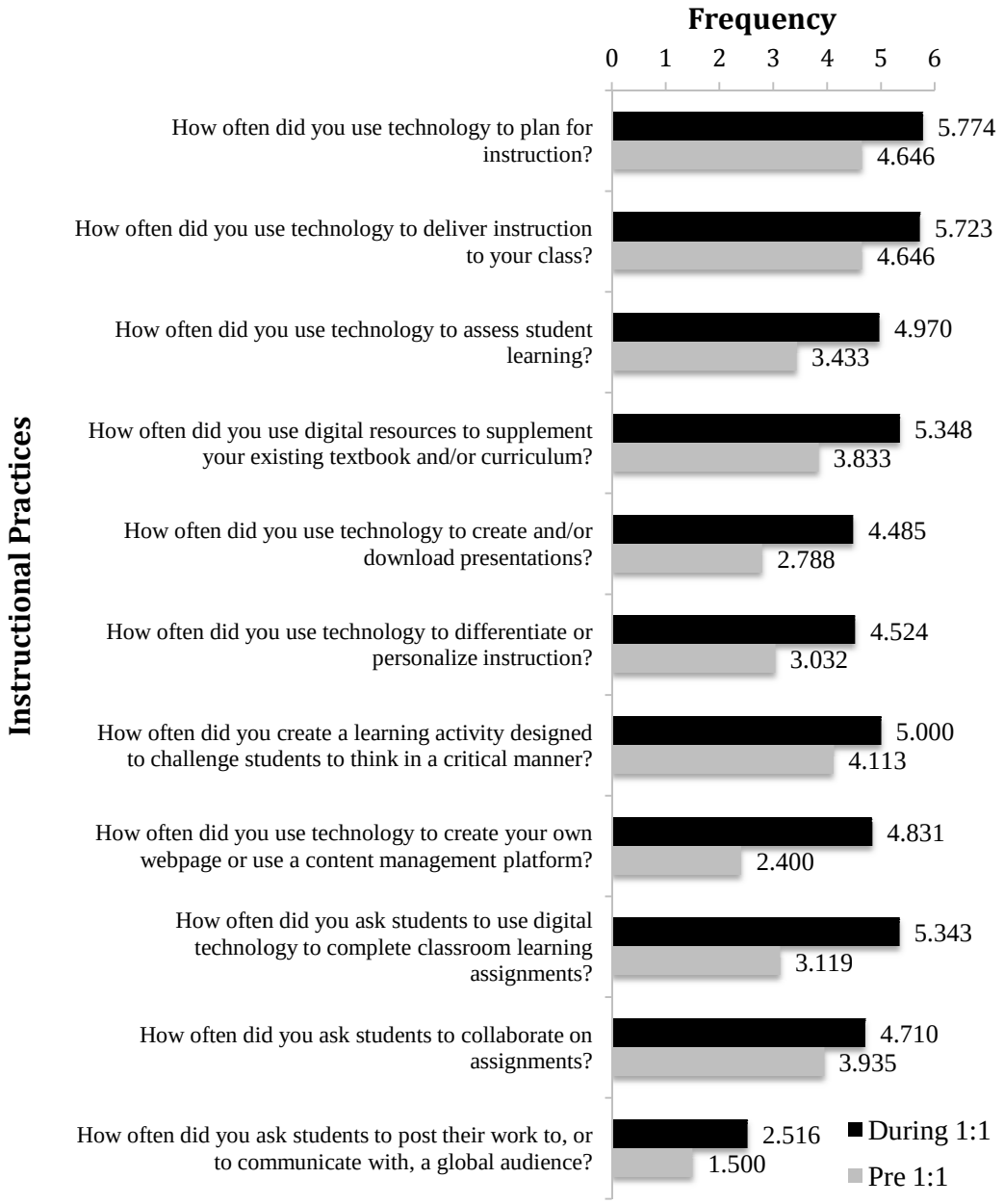

Figure 16. Comparison of mean differences for each instructional practice both pre- and during 1:1 laptop initiative implementation.

Table 5

Overall Comparison of Teacher Responses to Frequency of Instructional Practices

	Pre-1:1		During 1:1			
Instructional Practice	*M*	*Mo*	*M*	*Mo*	% Change	*z*
Planning	4.823	5	5.774	6	19.73	5.58
Instructional Delivery	4.646	5	5.723	6	23.18	6.030
Assessment	3.433	4	4.97	6	44.78	6.620
Supplementation of the Curriculum	3.833	5	5.348	6	39.53	6.330
Creation/Downloading of Presentations	2.788	1	4.485	6	60.87	6.210
Differentiation/ Personalization of Instruction	3.032	4	4.524	5	49.21	6.090
Challenging Students to Think Critically	4.113	4	5	5	21.57	5.240
Use of Webpage or Content Management Platform	2.4	1	4.831	6	101.28	6.620
Asking Students to Utilize Technology to Complete Assignments	3.119	3	5.343	6	71.29	6.840
Asking Students to Collaborate on Assignments	3.935	5	4.71	5	19.67	5.150
Asking Students to Post Work to a Global Audience	1.5	1	2.516	1	67.71	4.770

Note. M indicates the mean score. *Mo* indicates the mode score. The % change refers to the change in means from pre-1:1 to during 1:1 implementation. The critical value of z for the Wilcoxon Signed-Rank test at a .05 level of significance is 1.960.

Teacher Access to Laptops and Change in Instructional Practice

To address Research Question #2, the relationship between the length of time teachers had access to the same device students had been provided in a 1:1 laptop initiative to the amount of change in teacher instructional behaviors involving technology use within the classroom was examined. Shown in Figure 17 are the teacher responses to the length of time they had access to their own laptops prior to implementation with students. Over 98% of teachers indicated they were given their computers at least a semester prior to implementation with students, and nearly 75% indicated they had access to their own laptops at least a year before the students.

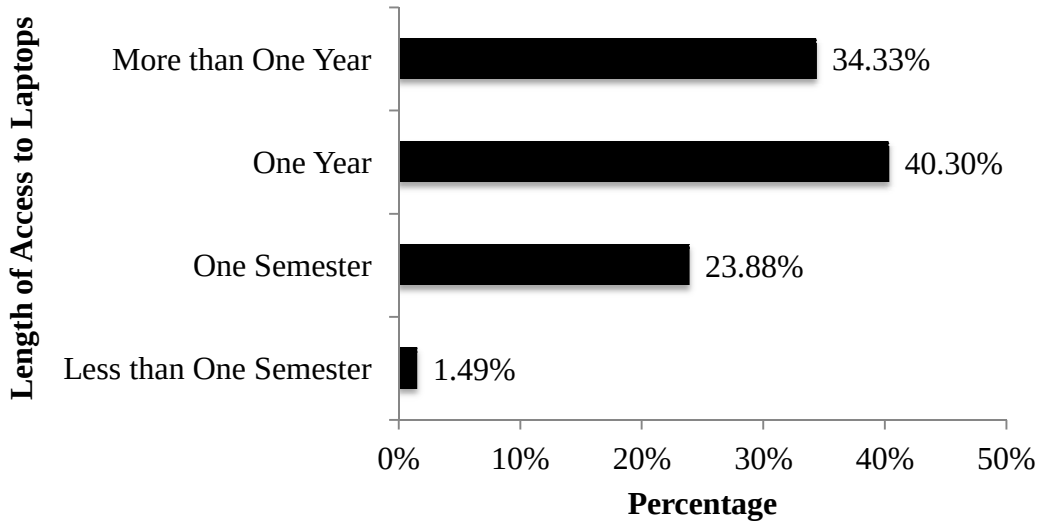

Figure 17. Amount of time teachers had access to their own laptops prior to student laptop implementation.

The Spearman rank order correlation was selected as the statistical method to determine the strength of the relationship between the length of time teachers had access to their own laptops prior to 1:1 laptop initiative implementation and the amount of instructional change that occurred within each instructional activity examined as a result of the 1:1 laptop initiative implementation. The Spearman rank order correlation is the non-parametric alternative to the Pearson product moment correlation for data that are not linear, but ordinal, in nature (Lowry, n.d.). Shown in Table 6 are the Spearman rank order correlation coefficients and the resulting *p* values for each of the correlations between the length of time teachers had access to their own laptops prior to the 1:1 laptop initiative and each of the 11 instructional activities examined. The level of significance for each of these correlations was set at the .05 level.

The correlation between the length of time teachers had access to their own laptops prior to student implementation and the change in frequency involving teachers asking students to collaborate on assignments provided the highest Spearman rank order correlation coefficient ($r_s =$ 0.323). This coefficient indicated a moderate to low relationship between the two variables (length of time and change in frequency of use); therefore, as the length of time teachers had access to their own laptops increased, the change in frequency involving teachers asking students to collaborate on assignments increased in a moderate to low relationship. The *p* value for this correlation coefficient was 0.011, thus indicating statistical significance for this particular relationship. As a result of this statistical significance, $H2_0$ was rejected because there was a statistically significant correlational relationship between the amount of time teachers had access to their own laptops prior to student implementation in the 1:1 laptop initiative and the

change in frequency involving teachers asking students to collaborate on assignments as a result of the 1:1 laptop initiative implementation.

Each of the other correlations between the length of time teachers had access to their own laptops prior to student laptop implementation and the change in frequency of use involving each of the other ten instructional activities as a result of the 1:1 laptop initiative implementation resulted in Spearman rank order correlation coefficients too low to be meaningful. These lower level correlation coefficients also produced *p* values that were well above the .05 level, thus indicating that any correlational relationship between the variables was not statistically significant. As a result, $H2_0$ was not rejected for each of the following relationships:

- There was no relationship between the length of time teachers had access to their own laptops prior to the 1:1 laptop implementation and the change in frequency involving teacher use of technology for planning as a result of the 1:1 laptop initiative implementation.
- There was no relationship between the length of time teachers had access to their own laptops prior to the 1:1 laptop implementation and the change in frequency involving teacher use of technology for instructional delivery as a result of the 1:1 laptop initiative implementation.
- There was no relationship between the length of time teachers had access to their own laptops prior to the 1:1 laptop implementation and the change in frequency involving teacher use of technology for assessment as a result of the 1:1 laptop initiative implementation.

- There was no relationship between the length of time teachers had access to their own laptops prior to the 1:1 laptop implementation and the change in frequency involving teacher use of resources to supplement their existing textbook and/or curriculum as a result of the 1:1 laptop initiative implementation.
- There was no relationship between the length of time teachers had access to their own laptops prior to the 1:1 laptop implementation and the change in frequency involving teacher use of technology to create and/or download presentations for student use outside of the classroom as a result of the 1:1 laptop initiative implementation.
- There was no relationship between the length of time teachers had access to their own laptops prior to the 1:1 laptop implementation and the change in frequency involving teacher use of technology to differentiate or personalize learning to meet individual student needs as a result of the 1:1 laptop initiative implementation.
- There was no relationship between the length of time teachers had access to their own laptops prior to the 1:1 laptop implementation and the change in frequency involving teacher use of technology to create assignments that challenge students to think in a critical manner as a result of the 1:1 laptop initiative implementation.
- There was no relationship between the length of time teachers had access to their own laptops prior to the 1:1 laptop implementation and the change in

frequency involving teacher creation of webpages or use of content management platforms as a result of the 1:1 laptop initiative implementation.

- There was no relationship between the length of time teachers had access to their own laptops prior to the 1:1 laptop implementation and the change in frequency involving teacher use of technology to require students to utilize technology to complete assignments as a result of the 1:1 laptop initiative implementation.
- There was no relationship between the length of time teachers had access to their own laptops prior to the 1:1 laptop implementation and the change in frequency involving teacher use of technology to ask students to post their work to or communicate with a global audience as a result of the 1:1 laptop initiative implementation.

Table 6

Spearman Rank Order Correlation Values: Teachers' Access to Laptops and Instructional Change

Instructional Practice	r_s	p
Planning	0.071	0.584
Instructional Delivery	0.017	0.889
Assessment	0.133	0.284
Supplementation of the Curriculum	0.044	0.727
Creation/Downloading of Presentations	0.017	0.889
Differentiation/Personalization of Instruction	0.108	0.399
Challenging Students to Think Critically	0.016	0.905
Use of Webpage or Content Management Platform	-0.045	0.720
Asking Students to Utilize Technology to Complete Assignments	-0.036	0.773
Asking Students to Collaborate on Assignments	0.323	0.011
Asking Students to Post Work to a Global Audience	0.083	0.512

Note. The r_s value indicates the Spearman rank order correlation. The p value for this Spearman rank order correlation was set at the .05 level.

Professional Development Experience and Change in Instructional Practices

To determine a response to Research Question #3, the relationship between the time spent on professional development preparation prior to the implementation of the 1:1 laptop initiative and the amount of change in teacher instructional behaviors involving technology use in the classroom was examined. Teacher responses to the length of time they had undergone professional development specifically designed to prepare them for the implementation of the 1:1 laptop initiative are shown in Figure 18. All teachers indicated they were provided some level of professional development preparation, and nearly 80% indicated they had undergone professional development in preparation of the 1:1 laptop initiative implementation at least a year prior to actual implementation.

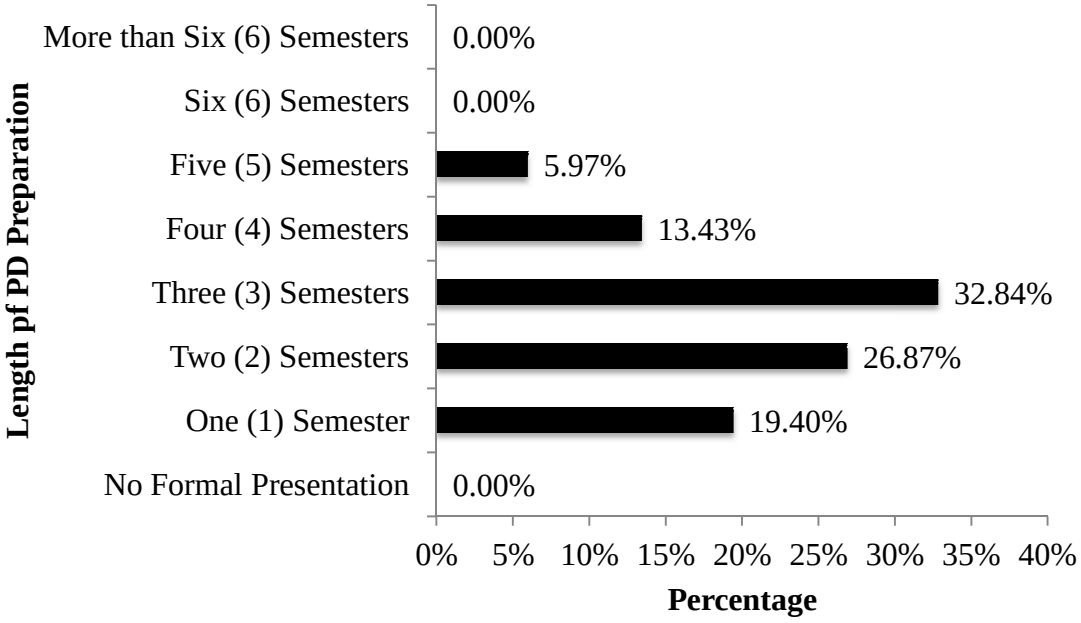

Figure 18. The length of time devoted to professional development experience in preparation for the 1:1 laptop initiative implementation.

As with Research Question #2, the Spearman rank order correlation was selected as the statistical method to analyze the strength of relationship between the length of time teachers spent on professional development prior to the implementation of the 1:1 laptop initiative and the amount of instructional change that occurred within each instructional activity examined as a result of the 1:1 laptop initiative implementation. Shown in Table 7 are the Spearman rank order correlation coefficients and the resulting *p* values for each of the correlations between the length of time teachers spent on professional development prior to the 1:1 laptop initiative and each of the 11 instructional activities examined. The level of significance for these correlations was set at the .05 level.

The correlation between the length of time teachers spent on professional development prior to the implementation of the 1:1 laptop initiative and the change in frequency involving teachers asking students to post their work to or communicate with a global audience resulting from the implementation of the 1:1 laptop initiative provided the highest Spearman rank order correlation coefficient ($r_s = 0.219$). This coefficient indicated a weak to low relationship between the two variables. The *p* value for this correlation coefficient was 0.083, thus indicating no statistical significance for this particular relationship; therefore, $H3_0$ was not rejected because there was not a statistically significant correlational relationship between the amount of time teachers spent in professional development specifically designed to prepare them for the implementation of the 1:1 laptop initiative and the change in frequency involving teachers asking students to post their work to or communicate with a global audience as a result of the 1:1 laptop initiative implementation.

The correlation between the length of time teachers spent on professional development prior to the implementation of the 1:1 laptop initiative and the change in frequency involving teachers utilizing the technology to deliver classroom instruction as a result of the 1:1 laptop initiative implementation provided the next highest Spearman rank order correlation coefficient ($r_s = 0.155$). This coefficient also indicated a weak to low relationship between the two variables. The *p* value for this correlation coefficient was 0.220, thus indicating no statistical significance for this particular relationship; therefore, $H3_0$ was not rejected because there was not a statistically significant correlational relationship between the amount of time teachers spent in professional development specifically designed to prepare them for the implementation of the 1:1 laptop initiative and the change in frequency involving teacher utilization of technology to deliver classroom instruction as a result of the 1:1 laptop initiative implementation.

Each of the other correlations between the length of time teachers spent on professional development activities prior to the 1:1 laptop initiative implementation and the change in frequency involving each of the other nine instructional activities as a result of the 1:1 laptop initiative implementation resulted in Spearman rank order correlation coefficients too low to be meaningful. These lower level correlation coefficients also produced *p* values that were well above the .05 level, thus indicating that any correlational relationship between the variables was not statistically significant. As a result, $H3_0$ was not rejected for each of the following relationships:

- There was no relationship between the length of time teachers spent on professional development activities prior to the 1:1 laptop initiative

implementation and the change in frequency involving teacher use of technology for planning as a result of the 1:1 laptop initiative implementation.

- There was no relationship between the length of time teachers spent on professional development activities prior to the 1:1 laptop initiative implementation and the change in frequency involving teacher use of technology for assessment as a result of the 1:1 laptop initiative implementation.
- There was no relationship between the length of time teachers spent on professional development activities prior to the 1:1 laptop initiative implementation and the change in frequency involving teacher use of resources to supplement the existing textbook and/or curriculum as a result of the 1:1 laptop initiative implementation.
- There was no relationship between the length of time teachers spent on professional development activities prior to the 1:1 laptop initiative implementation and the change in frequency involving teacher creation and/or downloading of presentations that can be utilized by students outside of the classroom as a result of the 1:1 laptop initiative implementation.
- There was no relationship between the length of time teachers spent on professional development activities prior to the 1:1 laptop initiative implementation and the change in frequency involving teacher use of technology to differentiate or personalize learning to meet individual student needs as a result of the 1:1 laptop initiative implementation.

- There was no relationship between the length of time teachers spent on professional development activities prior to the 1:1 laptop initiative implementation and the change in frequency involving teacher use of technology to create assignments that challenge students to think in a critical manner as a result of the 1:1 laptop initiative implementation.
- There was no relationship between the length of time teachers spent on professional development activities prior to the 1:1 laptop initiative implementation and the change in frequency involving teacher creation of webpages or use of content management platforms as a result of the 1:1 laptop initiative implementation.
- There was no relationship between the length of time teachers spent on professional development activities prior to the 1:1 laptop initiative implementation and the change in frequency involving teacher use of technology to require students to utilize technology to complete assignments as a result of the 1:1 laptop initiative implementation.
- There was no relationship between the length of time teachers spent on professional development activities prior to the 1:1 laptop initiative implementation and the change in frequency involving teachers asking students to collaborate on assignments as a result of the 1:1 laptop initiative implementation.

Table 7

Spearman Rank Order Correlation Values: Length of Professional Development Preparation and Instructional Change

Instructional Practice	r_s	p
Planning	-0.057	0.662
Instructional Delivery	0.155	0.220
Assessment	0.032	0.796
Supplementation of the Curriculum	0.054	0.661
Creation/Downloading of Presentations	0.082	0.512
Differentiation/Personalization of Instruction	-0.002	0.992
Challenging Students to Think Critically	-0.089	0.493
Use of Webpage or Content Management Platform	0.002	0.984
Asking Students to Utilize Technology to Complete Assignments	-0.093	0.456
Asking Students to Collaborate on Assignments	0.079	0.538
Asking Students to Post Work to a Global Audience	0.218	0.083

Note. The r_s value indicates the Spearman rank order correlation. The p value for this Spearman rank order correlation was set at the .05 level.

Perceived Value of Professional Development and Change in Instructional Practices

To determine a response to Research Question #4, the relationship between the level of perceived value of various types of professional development activities and the change in teacher instructional behaviors involving technology use in the classroom was examined. The professional development activities examined included learning to use hardware; learning to use software, applications, and programs; learning to content management and instructional delivery platforms; and learning to integrate the technology within instruction. Shown in Figure 19 is a summary of the teacher responses for each of these four different types of professional development activities.

Teachers indicated strong value for all four professional development activities with over 60% of teacher respondents indicating they valued the professional development activity at a *good* or *significant* value level. Teachers indicated they valued the professional development activities designed to assist them in integrating the technology into instruction the highest with 83.58% of teachers rating this particular professional development activity as *good* to *significant* value to their preparation for the 1:1 laptop initiative implementation. Teachers also indicated they valued the professional development activities designed to teach them to use software, applications, and programs as the second highest variable with 77.61% of teachers rating this particular professional development activity as *good* to *significant* value to their preparation for the 1:1 laptop initiative implementation.

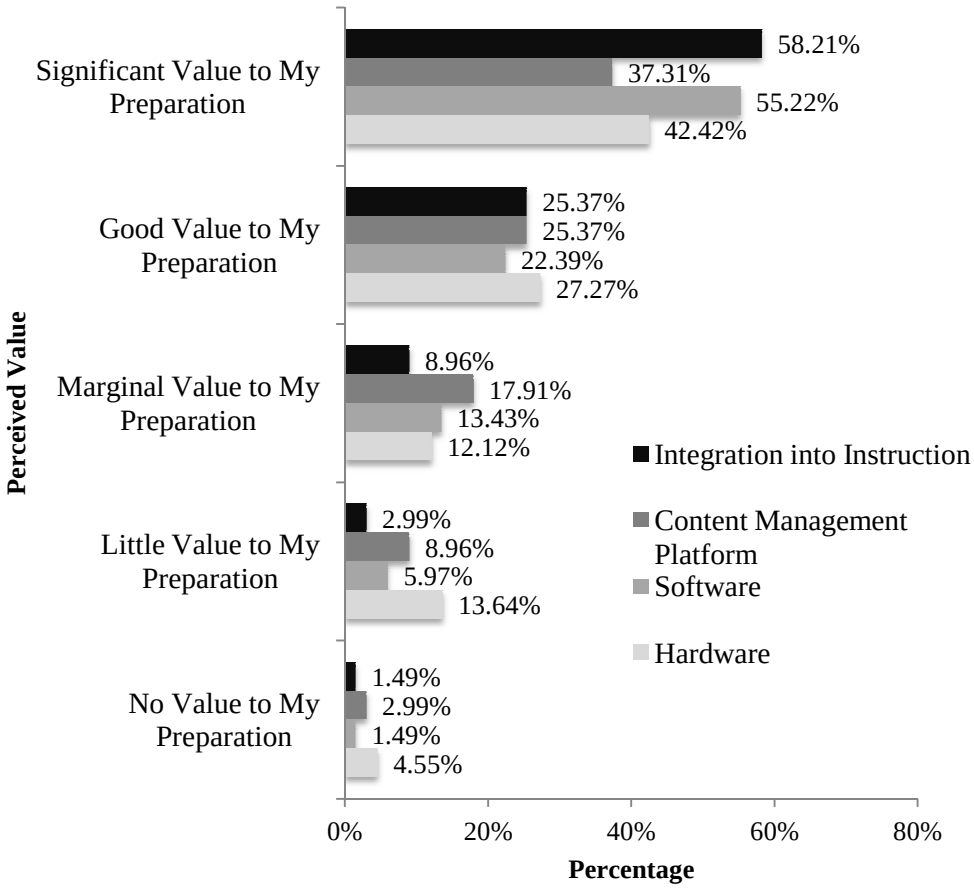

Figure 19. Level of teachers' perceived value of learning to use professional development experiences in their preparation for the 1:1 laptop initiative.

Value of learning to use hardware. As with Research Questions #2 and #3, the Spearman rank order correlation was selected as the statistical method to determine the strength of the relationship between teachers' perceived value of learning to use hardware and the amount of instructional change that occurred within each instructional activity examined as a result of the 1:1 laptop initiative implementation. Shown in Table 8 are the Spearman rank order correlation coefficients and the resulting *p* values for significance for each of the correlations between teachers' perceived value of learning to use hardware and each of the 11 instructional activities examined. The level of significance for these correlations was set at the .05 level.

The correlation between the teachers' perceived value of learning to use hardware and the change in frequency of use involving teacher creation of webpages or use of content management platforms as a result of the 1:1 laptop initiative implementation provided the highest Spearman rank order correlation coefficient ($r_{s=}$ 0.290). This coefficient indicated a moderate to low relationship between the two variables. The *p* value for this correlation coefficient was 0.020, thus indicating statistical significance for this particular relationship. As a result of this statistical significance, $H4_0$ was rejected for this particular analysis because there was a statistically significant correlational relationship between the teachers' perceived value of learning to use hardware and the change in frequency involving teacher creation of webpages or use of content management platforms as a result of the 1:1 laptop initiative implementation.

The correlation between the teachers' perceived value of learning to use hardware and the change in frequency involving the teacher use of technology to deliver instruction as a result of the 1:1 laptop initiative implementation provided the next highest Spearman

rank order correlation coefficient ($r_s =$ 0.289). This coefficient indicated a moderate to low relationship between the two variables. The *p* value for this correlation coefficient was 0.021, thus indicating statistical significance for this particular relationship. As a result of this statistical significance, $H4_0$ was rejected for this particular analysis because there was a statistically significant correlational relationship between the teachers' perceived value of learning to use hardware and the change in frequency involving teachers' use of technology to deliver instruction as a result of the 1:1 laptop initiative implementation.

The correlation between the teachers' perceived value of learning to use hardware in preparation for the 1:1 laptop initiative implementation and the change in frequency involving teacher use of technology to plan for instruction resulting from the implementation of the 1:1 laptop initiative provided a weak to low Spearman rank order correlation coefficient (r_s = -0.181). The *p* value for this correlation coefficient was 0.161, thus indicating no statistical significance for this particular relationship; therefore, $H4_0$ was not rejected for this particular analysis because there was not a statistically significant correlational relationship between the teachers' perceived value of learning to use hardware in preparation for the 1:1 laptop initiative implementation and the change in frequency involving teacher use of technology to plan for instruction as a result of the 1:1 laptop initiative implementation.

The correlation between the teachers' perceived value of learning to use hardware in preparation for the 1:1 laptop initiative implementation and the change in frequency involving teachers asking students to post their work to or communicate with a global audience resulting from the implementation of the 1:1 laptop initiative provided a

negative, weak to low Spearman rank order correlation coefficient (r_s = -0.171). This meant that as the teachers' perceived value to learning to use hardware increased, the amount of change in how often students were asked post their work to or communicate with a global audience decreased and visa-versa. The *p* value for this correlation coefficient was 0.179, thus indicating no statistical significance for this particular relationship; therefore, $H4_0$ was not rejected for this particular analysis because there was not a statistically significant correlational relationship between the teachers' perceived value of learning to use hardware in preparation for the 1:1 laptop initiative implementation and the change in frequency involving teachers asking students to post their work to or communicate with a global audience as a result of the 1:1 laptop initiative implementation.

Each of the other correlations between the teachers' perceived value of learning to use hardware and the change in frequency involving each of the other seven instructional activities as a result of the 1:1 laptop initiative implementation resulted in Spearman rank order correlation coefficients too low to be meaningful. These lower level correlation coefficients also produced *p* values that were well above the .05 level, thus indicating that any correlational relationship between the variables was not statistically significant. As a result, $H4_0$ was not rejected for each of the following relationships:

- There was no relationship between the teachers' perceived value of learning to use hardware and the change in frequency involving teacher use of technology for assessment as a result of the 1:1 laptop initiative implementation.
- There was no relationship between the teachers' perceived value of learning and the change in frequency involving teacher use of resources to supplement

the existing textbook and/or curriculum as a result of the 1:1 laptop initiative implementation.

- There was no relationship between the teachers' perceived value of learning to use hardware and the change in frequency involving teacher use of technology to differentiate or personalize learning to meet individual student needs as a result of the 1:1 laptop initiative implementation.
- There was no relationship between the teachers' perceived value of learning to use hardware and the change in frequency involving teacher use of technology to create assignments that challenge students to think in a critical manner as a result of the 1:1 laptop initiative implementation.
- There was no relationship between the teachers' perceived value of learning to use hardware and the change in frequency involving teacher use of technology to require students to utilize technology to complete assignments as a result of the 1:1 laptop initiative implementation.
- There was no relationship between the teachers' perceived value of learning to use hardware and the change in frequency involving teacher use of technology to ask students to collaborate on assignments as a result of the 1:1 laptop initiative implementation.
- There was no relationship between the teachers' perceived value of learning to use hardware and the change in frequency involving teacher use of technology to ask students to post their work to or communicate with a global audience as a result of the 1:1 laptop initiative implementation.

Table 8

Spearman Rank Order Correlation Values: Perceived Value of Learning to Use Hardware and Instructional Change

Instructional Practices	r_s	*p*
Planning	0.181	0.161
Instructional Delivery	0.289	0.021
Assessment	0.08	0.524
Supplementation of the Curriculum	0.016	0.897
Creation/Downloading of Presentations	0.106	0.399
Differentiation/Personalization of Instruction	0.137	0.289
Challenging Students to Think Critically	-0.005	0.968
Use of Webpage or Content Management Platform	0.290	0.020
Asking Students to Utilize Technology to Complete Assignments	0.101	0.421
Asking Students to Collaborate on Assignments	0.070	0.591
Asking Students to Post Work to a Global Audience	-0.171	0.179

Note. The r_s value indicates the Spearman rank order correlation. The *p* value for this Spearman rank order correlation was set at the .05 level.

Value of learning to use software, applications, and programs. The Spearman rank order correlation was also selected as the statistical method to determine the strength of the relationship between teachers' perceived value of learning to use software, applications, and programs and the amount of instructional change that occurred within each instructional activity examined as a result of the 1:1 laptop initiative implementation. Shown in Table 9 are the Spearman rank order correlation coefficients and the resulting *p* values for each of the correlations between teachers' perceived value of learning to use software, applications, and programs and each of the 11 instructional activities examined. The level of significance for these correlations was set at the .05 level.

The correlation between the teachers' perceived value of learning to use software, applications, and programs and the change in frequency involving how often teachers asked students to collaborate on assignments as a result of the implementation of a 1:1 laptop initiative provided the highest Spearman rank order correlation coefficient ($r_s =$ 0.254). This coefficient indicated a moderate to low relationship between the two variables. The *p* value for this correlation coefficient was 0.047, thus indicating statistical significance for this particular relationship. As a result of this statistical significance, $H4_0$ was rejected for this particular analysis because there was a statistically significant correlational relationship between the teachers' perceived value of learning to use software, applications, and programs and the change in frequency involving how often teachers asked students to collaborate on assignments as a result of the 1:1 laptop initiative implementation.

The correlation between the teachers' perceived value of learning to use software, applications, and programs in preparation for the 1:1 laptop initiative implementation and

the change in frequency involving how often teachers used technology to plan for instruction resulting from the implementation of the 1:1 laptop initiative provided a weak to low Spearman rank order correlation coefficient (r_s = -0.219). The *p* value for this correlation coefficient was 0.087, thus indicating no statistical significance for this particular relationship; therefore, $H4_0$ was not rejected for this particular analysis because there was not a statistically significant correlational relationship between the teachers' perceived value of learning to use software, applications, and programs in preparation for the 1:1 laptop initiative implementation and the frequency of change involving how often teachers used technology to plan for instruction as a result of the 1:1 laptop initiative implementation.

The correlation between the teachers' perceived value of learning to use software, applications, and programs in preparation for the 1:1 laptop initiative implementation and the change in frequency involving how often teachers used technology to deliver instruction resulting from the implementation of the 1:1 laptop initiative also provided a weak to low Spearman rank order correlation coefficient (r_s = -0.187). The *p* value for this correlation coefficient was 0.136, thus indicating no statistical significance for this particular relationship; therefore, $H4_0$ was not rejected for this particular analysis because there was not a statistically significant correlational relationship between the teachers' perceived value of learning to use software, applications, and programs in preparation for the 1:1 laptop initiative implementation and the frequency of change involving how often teachers used technology to deliver instruction as a result of the 1:1 laptop initiative implementation.

Each of the other correlations between the teachers' perceived value of learning to use software, applications, and programs and the amount of change in the other eight instructional activities as a result of the 1:1 laptop initiative implementation resulted in Spearman rank order correlation coefficients too low to be meaningful. These lower level correlation coefficients also produced *p* values that were well above the .05 level, thus indicating that any correlational relationship between the variables was not statistically significant. As a result, $H4_0$ was not rejected for each of the following relationships:

- There was no relationship between the teachers' perceived value of learning to use software, applications, and programs and the frequency of change involving teacher use of technology for assessment as a result of the 1:1 laptop initiative implementation.
- There was no relationship between the teachers' perceived value of learning to use software, applications, and programs and the frequency of change involving teacher use of resources to supplement the existing textbook and/or curriculum as a result of the 1:1 laptop initiative implementation.
- There was no relationship between the teachers' perceived value of learning to use software, applications, and software and the frequency of change involving teacher use of technology to create and/or download presentations for students to utilize outside of the classroom as a result of the 1:1 laptop initiative implementation.
- There was no relationship between the teachers' perceived value of learning to use software, applications, and software and the frequency of change involving

teacher use of technology to differentiate or personalize learning to meet individual student needs as a result of the 1:1 laptop initiative implementation.

- There was no relationship between the teachers' perceived value of learning to use software, applications, and programs and the frequency of change involving teacher use of technology to create assignments that challenge students to think in a critical manner as a result of the 1:1 laptop initiative implementation.
- There was no relationship between the teachers' perceived value of learning to use software, applications, and programs and the frequency of change involving teacher creation of webpages or use of content management platforms as a result of the 1:1 laptop initiative implementation.
- There was no relationship between the teachers' perceived value of learning to use software, applications, and programs and the frequency of change involving teacher use of technology to require students to utilize technology to complete assignments as a result of the 1:1 laptop initiative implementation.
- There was no relationship between the teachers' perceived value of learning to use software, applications, and programs and the frequency of change involving teacher use of technology to ask students to post their work to or communicate with a global audience as a result of the 1:1 laptop initiative implementation.

Table 9

Spearman Rank Order Correlation Value: Perceived Value of Learning to Use Software, Applications, and Programs with Instructional Change

Instructional Practice	r_s	p
Planning	0.219	0.087
Instructional Delivery	0.187	0.136
Assessment	-0.079	0.524
Supplementation of the Curriculum	-0.013	0.913
Creation/Downloading of Presentations	0.119	0.341
Differentiation/Personalization of Instruction	0.048	0.705
Challenging Students to Think Critically	0.128	0.321
Use of Webpage or Content Management Platform	0.127	0.312
Asking Students to Utilize Technology to Complete Assignments	0.011	0.929
Asking Students to Collaborate on Assignments	0.254	0.047
Asking Students to Post Work to a Global Audience	0.110	0.388

Note. The r_s value indicates the Spearman rank order correlation. The p value for this Spearman rank order correlation was set at the .05 level.

Value of learning to use content management and instructional delivery platforms. The Spearman rank order correlation was also selected as the statistical method to determine the strength of the relationship between teachers' perceived value of learning to use content management and instructional delivery platforms and the amount of instructional change that occurred within each instructional activity examined as a result of the 1:1 laptop initiative implementation. Shown in Table 10 are the Spearman rank order correlation coefficients and the resulting *p* values for each of the correlations between teachers' perceived value of learning to use content management and instructional delivery platforms and each of the 11 instructional activities examined. The level of significance for these correlations was set at the .05 level.

The correlation between the teachers' perceived value of learning to use content management and instructional delivery platforms in preparation for the 1:1 laptop initiative implementation and the change in frequency involving how often teachers asked students to collaborate on assignments resulting from the implementation of the 1:1 laptop initiative provided a weak to low Spearman rank order correlation coefficient ($r_s = 0.201$). The *p* value for this correlation coefficient was 0.117, thus indicating no statistical significance for this particular relationship; therefore, $H4_0$ was not rejected for this particular analysis because there was not a statistically significant correlational relationship between the teachers' perceived value of learning to use content management and instructional delivery platforms in preparation for the 1:1 laptop initiative implementation and the frequency of change involving how often teachers asked students to collaborate on assignments as a result of the 1:1 laptop initiative implementation.

The correlation between the teachers' perceived value of learning to use content management and instructional delivery platforms in preparation for the 1:1 laptop initiative implementation and the change in frequency involving how often teachers created learning activities designed to challenge students to think in a critical manner resulting from the implementation of the 1:1 laptop initiative provided another weak to low Spearman rank order correlation coefficient ($r_s = 0.151$). The *p* value for this correlation coefficient was 0.321, thus indicating no statistical significance for this particular relationship; therefore, $H4_0$ was not rejected for this particular analysis because there was not a statistically significant correlational relationship between the teachers' perceived value of learning to use content management and instructional delivery platforms in preparation for the 1:1 laptop initiative implementation and the frequency of change involving how often teachers created learning activities designed to challenge students to think in a critical manner as a result of the 1:1 laptop initiative implementation.

Each of the other correlations between the teachers' perceived value of learning to use content management and instructional delivery platforms and the frequency of change involving each of the other nine instructional activities as a result of the 1:1 laptop initiative implementation resulted in Spearman rank order correlation coefficients too low to be meaningful. These lower level correlation coefficients also produced *p* values that were well above the .05 level, thus indicating that any correlational relationship between the variables was not statistically significant. As a result, $H4_0$ was not rejected for each of the following relationships:

- There was no relationship between the teachers' perceived value of learning to use content management and instructional delivery platforms and the frequency of change involving teacher use of technology to plan for instruction as a result of the 1:1 laptop initiative implementation.
- There was no relationship between the teachers' perceived value of learning to use content management and instructional delivery platforms and the frequency of change involving teacher use of technology to deliver instruction as a result of the 1:1 laptop initiative implementation.
- There was no relationship between the teachers' perceived value of learning to use content management and instructional delivery platforms and the frequency of change involving teacher use of technology for assessment as a result of the 1:1 laptop initiative implementation.
- There was no relationship between the teachers' perceived value of learning to use content management and instructional delivery platforms and the frequency of change involving teacher use of resources to supplement the existing textbook and/or curriculum as a result of the 1:1 laptop initiative implementation.
- There was no relationship between the teachers' perceived value of learning to use content management and instructional delivery platforms and the frequency of change involving teacher use of technology to create and/or download presentations for students to utilize outside of the classroom as a result of the 1:1 laptop initiative implementation.

- There was no relationship between the teachers' perceived value of learning to use content management and instructional delivery platforms and the frequency of change involving teacher use of technology to differentiate or personalize learning to meet individual student needs as a result of the 1:1 laptop initiative implementation.
- There was no relationship between the teachers' perceived value of learning to use content management and instructional delivery platforms and the frequency of change involving teacher creation of webpages and use of content management platforms as a result of the 1:1 laptop initiative implementation.
- There was no relationship between the teachers' perceived value of learning to use content management and instructional delivery platforms and the frequency of change involving teacher use of technology to require students to utilize technology to complete assignments as a result of the 1:1 laptop initiative implementation.
- There was no relationship between the teachers' perceived value of learning to use content management and instructional delivery platforms and the frequency of change involving teacher use of technology to ask students to post their work to or communicate with a global audience as a result of the 1:1 laptop initiative implementation.

Table 10

Spearman Rank Order Correlation Values: Perceived Value of Learning to Use Content Management and Instructional Delivery Platforms with Instructional Change

Instructional Practice	r_s	p
Planning	0.02	0.873
Instructional Delivery	-0.110	0.382
Assessment	0.065	0.598
Supplementation of the Curriculum	0.007	0.960
Creation/Downloading of Presentations	-0.025	0.842
Differentiation/Personalization of Instruction	0.064	0.619
Challenging Students to Think Critically	0.151	0.243
Use of Webpage or Content Management Platform	-0.149	0.239
Asking Students to Utilize Technology to Complete Assignments	-0.027	0.827
Asking Students to Collaborate on Assignments	0.201	0.117
Asking Students to Post Work to a Global Audience	0.114	0.372

Note. The r_s value indicates the Spearman rank order correlation. The p value for this Spearman rank order correlation was set at the .05 level.

Value of learning to integrate technology into instruction. The Spearman rank order correlation was also selected as the statistical method to determine the strength of the relationship between teachers' perceived value of learning to integrate technology into instruction and the amount of instructional change that occurred within each instructional activity examined as a result of the 1:1 laptop initiative implementation. Shown in Table 11 are the Spearman rank order correlation coefficients and the resulting *p* values for each of the correlations between teachers' perceived value of learning to integrate technology into instruction and each of the 11 instructional activities examined. The level of significance for these correlations was set at the .05 level.

None of the correlations between the teachers' perceived value of learning to integrate technology into instruction and the frequency of change involving each of the 11 instructional activities as a result of the 1:1 laptop initiative implementation resulted in Spearman rank order correlation coefficients high enough to be meaningful. These lower level correlation coefficients also produced *p* values that were well above the .05 level, thus indicating that any correlational relationship between the variables was not statistically significant. As a result, $H4_0$ was not rejected for each of the following relationships:

- There was no relationship between the teachers' perceived value of learning to integrate technology into instruction and the frequency of change involving teacher use of technology to plan for instruction as a result of the 1:1 laptop initiative implementation.
- There was no relationship between the teachers' perceived value of learning to integrate technology into instruction and the frequency of change involving

teacher use of technology to deliver instruction as a result of the 1:1 laptop initiative implementation.

- There was no relationship between the teachers' perceived value of learning to integrate technology into instruction and the frequency of change involving teacher use of technology for assessment as a result of the 1:1 laptop initiative implementation.
- There was no relationship between the teachers' perceived value of learning to integrate technology into instruction and the frequency of change involving teacher use of resources to supplement the existing textbook and/or curriculum as a result of the 1:1 laptop initiative implementation.
- There was no relationship between the teachers' perceived value of learning to integrate technology into instruction and the frequency of change involving teacher use of technology to create and/or download presentations for students to utilize outside of the classroom as a result of the 1:1 laptop initiative implementation.
- There was no relationship between the teachers' perceived value of learning to integrate technology into instruction and the frequency of change involving teacher use of technology to differentiate or personalize learning to meet individual student needs as a result of the 1:1 laptop initiative implementation.
- There was no relationship between the teachers' perceived value of learning to integrate technology into instruction and the frequency of change involving teacher creation of assignments that challenge students to think in a critical manner as a result of the 1:1 laptop initiative implementation.

- There was no relationship between the teachers' perceived value of learning to integrate technology into instruction and the frequency of change involving teacher creation of webpages and use of content management platforms as a result of the 1:1 laptop initiative implementation.
- There was no relationship between the teachers' perceived value of learning to integrate technology into instruction and the frequency of change involving teacher use of technology to require students to utilize technology to complete assignments as a result of the 1:1 laptop initiative implementation.
- There was no relationship between the teachers' perceived value of learning to integrate technology into instruction and the frequency of change involving teacher use of technology to ask students to collaborate on assignments as a result of the 1:1 laptop initiative implementation.
- There was no relationship between the teachers' perceived value of learning to integrate technology into instruction and the frequency of change involving teacher use of technology to ask students to post their work to or communicate with a global audience as a result of the 1:1 laptop initiative implementation.

Table 11

Spearman Rank Order Correlation Values: Perceived Value of Learning to Integrate Technology into Instruction with Instructional Change

Instructional Practice	r_s	p
Planning	0.027	0.834
Instructional Delivery	0.025	0.850
Assessment	0.131	0.289
Supplementation of the Curriculum	-0.007	0.960
Creation/Downloading of Presentations	0.001	0.992
Differentiation/Personalization of Instruction	-0.001	1.000
Challenging Students to Think Critically	0.005	0.968
Use of Webpage or Content Management Platform	0.101	0.421
Asking Students to Utilize Technology to Complete Assignments	-0.008	0.952
Asking Students to Collaborate on Assignments	0.061	0.640
Asking Students to Post Work to a Global Audience	-0.091	0.474

Note. The r_s value indicates the Spearman rank order correlation. The p value for this Spearman rank order correlation was set at the .05 level.

Summary

Teachers from three southwest Missouri high schools were administered the 1:1 Laptop Implementation Survey during the fall of 2013 to examine various professional development factors and their impact on instructional behaviors in the classroom. Teachers were asked to rate the value of four separate professional development activities in their preparation for the 1:1 laptop initiative they had recently implemented. These professional development activities included learning to use hardware; learning to use software, applications, and programs; learning to use content management and instructional delivery platforms; and, learning to integrate the technology into instruction. Teachers indicated they valued learning to integrate technology into instruction the highest with over 83% rating this type of professional development activity at least a *good* value to their 1:1 laptop initiative preparation. A Friedman test identified significant differences between the teacher responses for the four professional development activities.

All other evaluation of data within this study involved the correlational analysis of various professional development factors and the amount of instructional change that occurred within 11 different instructional activities as a result of the 1:1 laptop initiative implementation. A Wilcoxon Signed-Ranks test determined significant change in frequency of use for each of the 11 instructional activities as a result of the 1:1 laptop initiative implementation. Teacher creation of webpages or use of content management platforms and requiring students to utilize technology in completing classroom assignments were the instructional activities identified with the most change.

Nearly 75% of teacher respondents in this study cited they had access to their own laptops at least one year prior to student implementation. When correlated with the frequency of change involving each of the 11 instructional activities, only the relationship between the length of time teachers had access to their laptops and the change in frequency involving teachers asking students to collaborate on assignments produced a positive significant correlation as measured by a Spearman rank order correlation. Although over 80% of teachers responded they had received professional development training at least one year prior to the 1:1 laptop initiative implementation, there were no significant correlations identified between length of professional development preparation and the change in frequency involving any of the 11 instructional activities.

The teacher value ratings of the four different types of professional development activities were also correlated with the change in frequency of each of the 11 instructional activities. Significant positive relationships were identified through the use of the Spearman rank order correlation between the change in frequency of teacher use of technology to deliver instruction and teacher creation of webpages or use of content management platforms to the teacher value ratings for learning to use hardware. Significant positive relationships were also identified between the change in frequency of use of teachers asking students to collaborate on assignments to the teacher value ratings of learning to use software, applications, and programs, as well as the teacher value ratings of learning to use content management and instructional delivery platforms.

In Chapter Five, conclusions are drawn from the data that have been analyzed within this chapter. The actual findings from this chapter are summarized to provide a more concise look into the impact of the various professional development factors on the

frequency of use of the 11 different instructional activities as a result of the implementation of a 1:1 laptop initiative. Based upon the findings, conclusions have also been provided to explain the aforementioned relationships. These conclusions lead to suggestions and implications for future practice that can be utilized by school leaders as they consider the future implementation of 1:1 laptop initiatives. Finally, recommendations for future research are provided that would expand the body of knowledge involving 1:1 laptop initiatives and encourage further analysis in determining the best preparatory factors that would result in successful future 1:1 laptop initiative implementations.

Chapter Five: Summary and Conclusions

The infusion of technology into today's classrooms has become more prevalent in recent years. One-to-one computing initiatives have become a popular option for school leaders to consider when planning for widespread technology integration for students. These initiatives have been defined within this study as a learning initiative in which students are given a laptop computer for learning use during school hours and outside of the regular school setting.

This type of learning initiative has required tremendous investments in fiscal resources by school leaders, thus requiring some level of evidence that the investment will provide sufficient return in positive effects to the teaching and learning process. Much of the research involving 1:1 computing initiatives has involved determining the type of instructional change that has occurred as a result of the implementation of such programs (Bebell & Kay, 2010; Bebell & O'Dwyer, 2010; Bennison & Goos, 2010; Cengiz Gulik & Demirtas, 2005; Dawson et al., 2008; Drayton et al., 2010; Dunleavy et al., 2007; Penuel, 2006; Sell et al., 2012; Shapley et al., 2010; Silvernail & Lane, 2004). Additional research is needed to determine what factors provide the best chance for these 1:1 computing initiatives to succeed and, subsequently, to justify the significant fiscal investments made by school leaders (Sell et al., 2012).

Purpose Summary

This study was conducted to examine various factors of professional development preparation on teacher instructional practices during the early implementation of a 1:1 laptop initiative within high schools. This research will provide educators a glimpse of the types of instructional changes that can likely be expected upon initial implementation

of a 1:1 laptop initiative and the relationship of various factors of professional development to those instructional changes.

Findings

Perceived value of professional development experiences. Teacher participants in this study were asked to rate the value of four different professional development activities in relation to their own preparation for the 1:1 laptop initiative implementation. Professional development activities involving learning to integrate technology into instruction were rated as the activity with the highest value in preparing teachers for the implementation of the 1:1 laptop initiative, with 89.58% of teachers indicating *good* or *significant* value. These findings mirrored the conclusions from Bennison and Goos (2010), who found that teachers' main desire was to learn how to utilize technology within their classroom at their disposal. Similarly, Higgins and Russell (2003) cited that nearly 90% of teachers in their study remarked that professional development activities focused upon the integration of technology into classroom instruction were beneficial for continued growth in teaching and student learning.

Learning to use software, applications, and programs was the next highest rated professional development activity within this study, with 77.61% of teachers indicating *good* or *significant* value to their preparation for the 1:1 laptop initiative implementation. These results were similar to those of Nadelson et al. (2013) who concluded that teachers most often gain confidence first in the use of word processing, presentation and spreadsheet software. Similarly, Higgins and Russell (2003) found that 75% of their teacher participants found professional development experiences involving learning to

use software, applications, and programs to be beneficial in their preparation for the 1:1 laptop initiative implementation.

Learning to use hardware was the next highest rated professional development experience within this study, with 69.69% of teachers indicating *good* or *significant* value to their preparation for the 1:1 laptop initiative implementation. Kellen (2013) cited that initial teacher training with technology must begin with becoming familiar with the equipment. Silvernail and Lane (2004) found little difference between teachers' perceived effectiveness of professional development designed to learn how to use the laptops and the professional development deigned to learn to integrate the technology into classroom instruction. O'Connor et al. (2004) cited that over two-thirds of teachers indicated that insufficient professional development support in the area of operational use of technology was an obstacle for effective implementation of technology in the classroom.

Learning to use content management and instructional delivery platforms was the lowest rated professional development experience within this study, with 62.68% of teachers indicating *good* or *significant* value to their preparation for the 1:1 laptop initiative implementation. These results mirrored those found with aspiring teachers in the Project Tomorrow (2010) study, which cited that while almost half of the aspiring teachers surveyed believed that learning management systems were a viable option for enhancing student achievement. In addition, less than one-quarter indicated they had actually used this type of instructional strategy with their students (Project Tomorrow, 2010). These results were also similar to Higgins and Russell's (2003) findings, which identified nearly two-thirds of teachers indicated value for professional development

experiences involving learning to use content management platforms. On the other hand, the Project Tomorrow (2010) study revealed that less than 15% of middle and secondary-level students had participated in some form of online experience with a teacher.

Research Question #1: What is the statistical difference in the teachers' perceived value of various types of professional development activities for the purpose of preparing to implement a 1:1 laptop initiative? The Friedman test was selected to analyze the aggregate group differences of the teacher value rankings for the four professional development activities studied. The resulting X_2 score of 8.43 was determined to be statistically significant at the .05 level; therefore, $H1_0$ was rejected because there was a statistical difference in the teachers' perceived value of the various types of professional development activities for the purpose of preparing teachers to implement a 1:1 laptop initiative.

Changes in instructional practices. Instructional change, as measured by the change in frequency of use of 11 different instructional activities, was a key component of study for Research Questions #2, #3, and #4. The Wilcoxon Signed-Ranks test was used to examine the differences between the pre-1:1 laptop frequency ratings and the frequency ratings during the 1:1 laptop initiative implementation. All 11 instructional activities examined in this study indicated significant change as a result of the 1:1 laptop initiative implementation.

Teachers' use of webpages or content management platforms increased 101.28% from a mean rating of 2.4 (*once or twice a year*) pre-1:1 laptop initiative implementation to 4.83 (*once or twice a month*) during the first semester of implementation. The most common teacher rating response prior to the 1:1 laptop initiative implementation was

never and the most common teacher rating response during the 1:1 laptop implementation was *daily*, thus indicating a major shift in use of this particular instructional activity as a result of the 1:1 laptop initiative implementation. These results were contrary to those found by O'Connor et al. (2004) in which little evidence of teachers' use of webpages or content management platforms was found. However, Drayton et al. (2010) found that a majority of teachers were utilizing their own websites to provide increased accessibility to resources for students.

Teachers asking students to utilize technology to complete assignments increased 71.29% from a mean rating of 3.12 (*once or twice a semester*) pre-1:1 laptop initiative implementation to 5.34 (*once or twice a week*) during the first semester of implementation. These findings mirrored those found by Bebell and Kay (2010) and Dunleavy et al. (2007) in the area of student use of technology to complete assignments within a 1:1 laptop initiative.

Teachers asking student to post their work to or communicate with a global audience increased 67.71% from a mean rating of 1.5 (*once or twice a year*) pre-1:1 laptop initiative implementation to 2.52 (*once or twice a semester*) during the first semester of implementation. Students in the Project Tomorrow (2010) study indicated that this type of learning was a cornerstone for their vision of 21st century learning. In addition, the instructional change found within this study for teachers asking students to post their work to or communicate with a global audience far outweighed those of O'Connor et al. (2004), in which identified only 10% of teachers indicated asking students to post their work to or communicate with a global audience.

Teachers' creation or downloading of presentations that could be utilized by students outside of the classroom increased 60.87% from a mean rating of 2.79 (*once or twice a semester*) pre-1:1 laptop initiative implementation to 4.49 (*once or twice a month*) during the first semester of implementation. In a 2012 Blackboard study, nearly two-thirds of principals indicated the ability of teachers to create and utilize presentations within instruction was essential for effective technology integration. Similarly, Silvernail and Lane (2004) found that nearly two–thirds of teachers created or downloaded presentations for student use after implementation of a 1:1 laptop initiative. Teachers' use of technology to differentiate or personalize instruction to meet the unique learning needs of individual students increased 49.21% from a mean rating of 3.03 (*once or twice a semester*) pre-1:1 laptop initiative implementation to 4.52 (*once or twice a week*) during the first semester of implementation. These results were similar to those of Silvernail and Lane (2004) in which over two-thirds of teachers indicated their laptops helped them to differentiate and/or personalize instruction for individual students.

Teachers' use of technology to assess student performance increased 44.78% from a mean rating of 3.43 (*once or twice a semester*) pre-1:1 laptop initiative implementation to 4.97 (*once or twice a week*) during the first semester of implementation. In comparison, Annable (2013) cited that assessment techniques were one of the aspects of classroom instruction that changed the most after 1:1 laptop initiative implementation. In comparison, Silvernail and Lane (2004) found only slight overall increases in use of technology to assess student performance as a result of 1:1 laptop initiative implementation; however, teachers who rated themselves as advanced or expert did utilize technology to assess students at a higher frequency.

Teachers' use of digital resources to supplement the existing textbook or curriculum increased 39.53% from a mean rating of 3.83 (*once or twice a month*) pre-1:1 laptop initiative implementation to 5.35 (*once or twice a week*) during the first semester of implementation. Drayton et al. (2010) cited that with the addition of laptop technology the Internet became a tremendous source for discovering additional content for teachers. Silvernail and Lane (2004) also found increases in teachers researching the Internet for instructional resources after being given a laptop.

Teachers' use of technology to deliver classroom instruction increased 23.18% from a mean rating of 4.65 (*once or twice a week*) pre-1:1 laptop initiative implementation to 4.49 (*daily*) during the first semester of implementation. Bebell and Kay (2010) found that almost immediately upon 1:1 laptop implementation teachers began to utilize the laptop technology at their disposal. Annable (2013) added that the addition of laptop technology in the classroom enabled the teacher to facilitate classroom instruction to effectively meet the needs of students.

Teachers' use of technology to create assignments designed to challenge students to think critically increased 21.57% from a mean rating of 4.11 (*once or twice a month*) pre-1:1 laptop initiative implementation to 4.49 (*once or twice a week*) during the first semester of implementation. These results confirmed similar conclusions from Bebell and Kay (2010), Warshauer (2005), and Rutledge, Duran, and Carroll-Miranda (2007). Teachers nationwide indicated in the Project Tomorrow (2010) study that students were developing their creativity and problem solving skills as a result of technology integration in the classroom.

Teachers' use of technology to plan for instruction increased 19.73% from a mean rating of 4.82 (*once or twice a week*) pre-1:1 laptop initiative implementation to 5.78 (*daily*) during the first semester of implementation. In comparison, Silvernail and Lane (2004) found a 10% growth in teachers' use of their laptops to plan for classroom instruction after three semesters of use. Finally, teachers asking students to use technology to collaborate on assignments increased 19.67% from a mean rating of 3.94 (*once or twice a month*) pre-1:1 laptop initiative implementation to 4.71 (*once or twice a week*) during the first semester of implementation. Bebell and Kay (2010) found that 44% of teachers indicated increased levels of student collaboration on assignments as a result of the 1:1 laptop initiative implementation.

Teacher access to laptops and change in instructional practices. The amount of change within each of the aforementioned instructional activities was correlated with six different professional development factors to determine any significant relationships between the variables in an effort to answer Research Questions #2, #3, and #4. The first professional development factor examined was the length of time teachers had access to their own laptop prior to implementation with students in the 1:1 laptop initiative. Nearly 80% of teacher respondents in this study indicated they had access to their own laptops at least one year prior to the 1:1 laptop initiative implementation with students.

Almost 20% of those teachers had access to their own laptops for more than two years. These results indicated that the schools had followed best practice guidelines for providing teachers ample time to work with their own laptop prior to implementation with students (Annable, 2013; Greaves et al., 2010). Higgins and Russell (2003) cited that nearly 90% of teachers in their study indicated having access to their own laptop was

valuable to their own teaching. Silvernail and Lane (2004) concluded that the level of teachers' use of laptops in the classroom was directly affected by the amount of prior exposure they had to the laptops prior to implementation with students.

Research Question #2: What is the relationship between the length of time teachers have had access to the same device students have been provided in 1:1 laptop initiative and the change in teacher instructional behaviors involving technology use within the classroom? The Spearman rank order correlation method was utilized to determine the relationship between the variables (length of time teachers had access to laptops and the change in frequency of use for each of the teacher instructional activities examined).

The correlation between the length of time teachers had access to their own laptop prior to implementation with students in the 1:1 laptop initiative implementation and the change in frequency of teachers asking students to collaborate on assignments produced the highest positive relationship between variables (.323). This Spearman correlation coefficient indicated a moderate to low significant relationship between the two variables; therefore, $H2_0$ was rejected because of the statistically significant correlational relationship between the amount of time teachers had access to their own laptops prior to implementation with students and the change in frequency of teachers asking students to collaborate on assignments as a result of the 1:1 laptop initiative implementation. Each of the other relationships examined between the length of time teachers had access to their own laptops prior to student implementation and the other ten instructional activities produced Spearman correlation coefficients that were too low to be considered

meaningful. After reviewing these results, $H2_0$ was not rejected for each of the remaining ten correlations examined with Research Question #2.

Professional development experience and change in instructional practices. The next professional development factor examined was the length of time teachers spent on professional development activities prior to the 1:1 laptop initiative implementation. Over 98% of teacher respondents in this study indicated they had undergone professional development designed to prepare them for the 1:1 laptop initiative implementation. Nearly 75% responded they had experienced the same professional development preparation for at least one year, and over one-third of the teacher respondents indicated they had experienced the preparatory professional development for more than one year prior to the 1:1 laptop initiative implementation. These results indicated that the schools involved in this study followed the best practices outlined in research for providing teachers with ample professional development support prior to the implementation of 1:1 laptop initiatives (Annable, 2013; Greaves et al., 2010; Shapley et al., 2010). Tweed (2013) found a weak, positive relationship between the hours spent in professional development preparation and actual technology integration in the classroom.

Research Question #3: What is the relationship between the time spent on professional development preparation prior to the implementation of a 1:1 laptop initiative and the change in teacher instructional behaviors involving technology use in the classroom? The Spearman rank order correlation method was utilized to determine the relationship between the two variables (length of time spent of professional development preparation and the change in frequency of use for each of the teacher instructional activities examined). The correlation between the length of time teachers

had access to their laptops prior to implementation with students and the change in frequency of teachers asking students to post their work to or communicate with a global audience produced the strongest relationship between these variables (.218).

However, this Spearman correlation coefficient indicated only a weak to low relationship but was not significant enough to positively state any non-coincidental relationship between the two variables. Each of the other relationships examined between the length of time teachers had access to their own laptops prior to student implementation and all 11 instructional activities produced Spearman correlation coefficients that were too low to be considered meaningful. After reviewing these results, $H3_0$ was not rejected for each of the 11 correlations examined with Research Question #3.

Perceived value of professional development and change in instructional practices. Research Question #4: What is the relationship between the level of perceived value of various types of professional development activities and the change in teacher instructional behaviors involving technology use in the classroom? The professional development activities examined for this analysis were the teacher value rankings for learning to use hardware; learning to use software, applications, and programs; learning to use content management and instructional delivery platforms; and learning to integrate technology within instruction (see Research Question #1). The Spearman rank order correlation method was utilized to determine the relationship between each of the variables (teachers' perceived value of professional development activities and the change in frequency of use of each teacher instructional activity examined).

The first set of correlations analyzed were those involving teachers' perceived value of learning to use hardware in the preparation for the 1:1 laptop initiative implementation and each of the 11 teacher instructional activities. The correlation between teachers' perceived value of learning to use hardware in preparation for the 1:1 laptop initiative implementation and the change in frequency of teachers' use of webpages or content management platforms produced the strongest relationship between variables (.290). This Spearman correlation coefficient indicated a weak to low significant relationship between the two variables.

The correlation between teachers' perceived value of learning to use hardware in preparation for the 1:1 laptop initiative implementation and the change in frequency of teachers' use of technology to deliver classroom instruction produced the next strongest relationship between variables (.289). This Spearman correlation coefficient also indicated a weak to low significant relationship between the two variables. As a result of these positive significant correlations, $H4_0$ was rejected for each of these relationships.

Each of the other relationships examined between the teachers' perceived value of learning to use hardware in preparation for the 1:1 laptop initiative implementation and the other eight instructional activities produced Spearman correlation coefficients that were too low to be considered meaningful. After reviewing these results, $H4_0$ was not rejected for each of these remaining nine correlations between the teachers' perceived value of learning to use hardware in preparation for the 1:1 laptop initiative implementation and the change in frequency of the remaining instructional activities.

The next set of correlations analyzed were those involving teachers' perceived value of learning to use software, applications, and programs in the preparation for the

1:1 laptop initiative implementation and each of the 11 teacher instructional activities. The correlation between teachers' perceived value of learning to use software, applications, and programs in preparation for the 1:1 laptop initiative implementation and the change in frequency of teachers asking students to collaborate on assignments produced the strongest relationship between variables (.254). This Spearman correlation coefficient indicated a weak to low significant relationship between the two variables; therefore, $H4_0$ was rejected for this correlational analysis.

The correlation between teachers' perceived value of learning to use software, applications, and programs in preparation for the 1:1 laptop initiative implementation and the change in frequency of teachers' use of technology to plan for instruction produced the next strongest relationship between variables (.219). This Spearman correlation coefficient also indicated a weak to low relationship, but was not significant enough to positively state any non-coincidental relationship between the two variables; therefore, $H4_0$ was not rejected for this correlational analysis.

Each of the other relationships examined between the teachers' perceived value of learning to use software, applications, and programs in preparation for the 1:1 laptop initiative implementation and the other eight instructional activities produced Spearman correlation coefficients that were too low to be considered meaningful. After reviewing these results, $H4_0$ was not rejected for each of these remaining eight correlations between the teachers' perceived value of learning to use software, applications, and programs in preparation for the 1:1 laptop initiative implementation and the change in frequency of the remaining instructional activities.

The next set of correlations analyzed were those involving teachers' perceived value of learning to use content management and instructional delivery platforms for the 1:1 laptop initiative implementation and each of the 11 teacher instructional activities. The correlation between teachers' perceived value of learning to use content management and instructional delivery platforms in preparation for the 1:1 laptop initiative implementation and the change in frequency of teachers asking students to collaborate on assignments produced the strongest relationship between variables (.201). This Spearman correlation coefficient indicated a weak to low relationship but was not significant enough to positively state any non-coincidental relationship between the two variables; therefore, $H4_0$ was not rejected for this correlation as a result of the lack of a statistically significant relationship between the variables.

The correlation between teachers' perceived value of learning to use content management and instructional delivery platforms in preparation for the 1:1 laptop initiative implementation and the change in frequency of teachers' creation of assignments designed to challenge students to think in a critical manner produced the next strongest relationship between variables (.151). This Spearman correlation coefficient indicated a weak to low relationship but was not significant enough to positively state any non-coincidental relationship between the two variables; therefore, $H4_0$ was not rejected for this correlation as a result of the lack of a statistically significant relationship between the variables.

Each of the other relationships examined between the teachers' perceived value of learning to use content management and instructional delivery platforms in preparation for the 1:1 laptop initiative implementation and the other nine instructional activities

produced Spearman correlation coefficients that were too low to be considered meaningful. After reviewing these results, $H4_0$ was not rejected for each of these remaining nine correlations between the teachers' perceived value of learning to use software, applications, and programs in preparation for the 1:1 laptop initiative implementation and the change in frequency of the remaining instructional activities.

The final set of correlations analyzed were those involving teachers' perceived value of learning to integrate technology into instruction in the preparation for the 1:1 laptop initiative implementation and each of the 11 teacher instructional activities. None of the relationships examined between the teachers' perceived value of learning to integrate technology into instruction in preparation for the 1:1 laptop initiative implementation produced Spearman correlation coefficients that were strong enough to be considered meaningful. After reviewing these results, $H4_0$ was not rejected for each of these correlations between the teachers' perceived value of learning to integrate technology into instruction in preparation for the 1:1 laptop initiative implementation and the change in frequency of each of the instructional activities examined in this study.

Conclusions

Teacher participants in this study indicated strong value levels for each of the four professional development activities examined in relation to their preparatory experience for the 1:1 laptop initiative implementation. Over 60% of teacher participants in this study found each of the four professional development activities a *good* or *significant* value to their preparation for the 1:1 laptop initiative implementation, with learning to integrate technology into classroom instruction leading the way at 83.58%. Despite the fact that the value ratings for each of these four professional development activities were

grouped together relatively tightly, the Friedman test indicated significant differences between the ratings for the four different professional development activities. With this information, one could conclude these teachers valued learning to integrate the technology into classroom instruction first, with learning to use software, applications, and programs second. Learning to use hardware was the third highest rated professional development activity, and learning to use content management and instructional delivery platforms were the lowest rated professional development activity.

Similar to students in a classroom, the teachers in this study entered the 1:1 laptop initiative implementation with different levels of training, experience, and competence in relation to technology readiness. This explains why all four professional development activities were valued at such a high level by the overall group. Teachers clearly responded to these questions of value that learning to integrate the technology into classroom instruction was most critical for their preparation for the 1:1 laptop initiative implementation; however, it was obvious that most of the teacher respondents valued each of the other three professional development activities in terms of their preparatory experience, as well.

Significant changes in frequency of use were observed with the use of the Wilcoxon Signed-Ranks test within each of the 11 instructional activities in this study as a result of the 1:1 laptop initiative implementation. With the infusion of laptop technology into the classroom, one would expect classroom instruction and the student learning environment to change. It is interesting that many of the instructional activities with the greatest gains from pre-1:1 laptop initiative implementation to during the first

semester of implementation were activities that were not frequently utilized activities in pre-1:1 classrooms.

For instance, the frequency of teachers' use of webpages and content management platforms increased two-fold as a result of the 1:1 laptop initiative implementation. Prior to 1:1 implementation, the mean frequency of use for this activity was *once or twice a semester*. After implementation, however, the mean frequency of use for this activity rose to *once or twice a week.*

Similarly, teachers asking students to post their work to or communicate with a global audience also increased nearly 70% as a result of the 1:1 laptop initiative implementation. Prior to 1:1 implementation, the mean frequency of use for this activity was *once or twice a year*. After implementation, however, the mean frequency of use for this activity rose to *once or twice a semester*. These results would suggest that instructional activities that would not be as possible, or probable, in a non-1:1 laptop initiative classroom could experience very significant immediate gains in frequency of use as a result of the implementation of a 1:1 laptop initiative.

Traditional instructional activities, such as planning for daily instruction, teacher use of technology, creating assignments that challenge students to think in a critical manner, and asking students to collaborate on assignments also increased significantly in frequency of use as a result of the 1:1 laptop initiative implementation. Although these observed increases were not as drastic, each was significant in nature; therefore, one may conclude that most instructional activities can be enhanced as a result of the implementation of a 1:1 laptop initiative and sufficient teacher preparation prior to the actual implementation.

The three high schools participating in this study obviously made the decision to provide laptops to their teachers well in advance of the implementation of the 1:1 laptop initiative with students. By providing this advanced access to the laptop technology, teachers were able to become more familiar with the device and more competent with its use. One cannot help but conclude that the significant levels of instructional change observed in this study were impacted somewhat by the fact that teachers were provided access to their own laptops prior to the implementation with students.

The only significant correlation observed within the Spearman rank order correlation between the length of time teachers had access to their laptop prior to implementation with students and the change in frequency of use of instructional activities was in the area of teachers asking students to collaborate on assignments. One may conclude from these results that teachers had become more comfortable with the use of their own computer, and many had begun the process of creating their own webpages, working within content management platforms, and experimenting with various types of software, applications, and programs. Many of the features within each of these digital instructional resources encourage student collaboration and discussion in a virtual format, thus explaining the significant relationship between the length of time teachers had access to their own laptop and the change in frequency of their asking students to collaborate on assignments.

The three high schools participating in this study also made the decision to provide professional development experiences specifically designed to prepare teachers for the 1:1 laptop initiative well in advance of the actual implementation. These professional development activities were most likely strategically designed to instruct

teachers in the basics of how to utilize the hardware, software, and other applications and programs to which they would be exposed in the future. As the teachers became more comfortable with these digital features, the professional development most likely transitioned to learning to integrate the digital tools and features into classroom instruction. The significant increases in frequency of use for each of the 11 instructional activities examined in this study were positively impacted by the ample amount of professional development preparation provided to the teacher participants in this study; however, none of the Spearman rank order correlations between the length of time provided for professional development preparation and the change in frequency of use of the instructional activities was found to be significant.

The Spearman rank order correlation between teachers' perceived value of learning to use hardware and the change in frequency of use of the various instructional activities produced two significant weak to low correlations: teachers' use of webpages or content management platforms and teachers' use of technology to deliver instruction. Teachers' use of technology to plan for instruction also produced a weak to low non-significant correlation with the teachers' perceived value of learning to use hardware. Moreover, learning to use the hardware, especially laptops, is a basic level professional development activity that provided teachers with confidence and competence with the device and its subsequent use in classroom instruction. The more comfortable teachers were in working with their own laptop, the more likely they were to utilize the laptops in classroom instruction. One may conclude that the development of a teacher webpage is an introductory task that is often combined with learning to use the computer, thus explaining the significant relationship between the teachers' value rating of learning to

use hardware and the change in frequency of teacher use of webpages or content management platforms.

The Spearman rank order correlation between teachers' perceived value of learning to use software, applications, and programs and the change in frequency of use of the various instructional activities produced one significant weak to low correlation with teachers asking students to collaborate on assignments. As previously mentioned, many software, applications, and programs are designed to allow for and to encourage student collaboration and discussion. For instance, Skype enables students to work together on assignments from a distance, and Google Docs enable students to simultaneously work on writing assignments. As teachers became more comfortable with these types of applications, the frequency of their use in the classroom also increased.

The Spearman rank order correlation between teachers' perceived value of learning to use content management and instructional delivery platforms and the change in frequency of use of the various instructional activities did not produce any significant correlations. Although not significant at the .05 level, teachers' asking students to collaborate on assignments produced a weak to low positive relationship with teachers' perceived value of learning to use content management and instructional delivery platforms. Teacher webpages and content management platforms provide students with opportunities for conveying thoughts through discussion boards and other collaborative tools.

As teachers became more competent in the use of their own webpages and content management platforms their ability to ask students to utilize the tools available to collaborate on the assignments also increased. None of the Spearman rank order

correlations between teachers' perceived value of learning to integrate technology into instruction and the change in frequency of use of the instructional activities were found to be significant. This was particularly interesting because teachers indicated that learning to integrate the technology into instruction was their most valued professional development experience.

These results, along with the lack of significant relationships observed within each of the other variables, led to the conclusion that there are obviously many factors that impact instructional change in the implementation of a 1:1 laptop initiative. This study separated each professional development factor and examined the relationship with the change in frequency of use for each of the 11 instructional activities. There was not much doubt that the amount of time teachers had access to their laptops, the length of professional development preparation, and the various types of professional development experiences teachers in each of the three participating high schools played a critical role in the change in frequency of use that occurred with all 11 instructional activities as a result of the 1:1 laptop initiative implementation; however, because of the lack of widespread significant correlational relationship between the individual variables, this researcher concluded that these professional development factors must be utilized together to attain the significant instructional changes that were observed in this study.

Implications for Practice

This study provided sufficient evidence that instructional change can occur immediately upon implementation of a 1:1 laptop initiative. In this study, 11 different instructional activities were examined to identify the change in frequency of use pre-1:1 laptop initiative implementation and during the first semester of implementation. These

instructional activities ranged from teachers' use of technology to plan and deliver instruction to teachers asking students to use the technology to complete classroom assignments, collaborate with their peers, and post their work to a global audience. In each instance, significant increases, as measured by the Wilcoxen Signed-Rank test, were observed in all instructional activities as a result of the 1:1 laptop implementation.

The Spearman rank order correlations examined the relationships between six different professional development factors and the change in frequency of use of the 11 different instructional activities each of which resulted in limited significant results when analyzed individually. Only limited significant relationships were determined between the professional development factors and the change in frequency of use of the 11 different instructional activities; however, significant instructional change did occur. This would lead one to conclude that each of the professional development factors, when combined, had an impact on the significant amount of instructional change that occurred in the classrooms of the three high schools participating in this study as a result of the 1:1 laptop initiative implementation.

One of the professional development factors examined in this study was the length of time teachers were provided access to their own laptop prior to implementation with students. It was evident that each of the participating high schools had provided their teachers with laptops for over one year prior to the 1:1 laptop initiative implementation. By doing so, the teachers in these high schools had the opportunity to become familiar with the device and thus began the process of developing confidence and competence with its use.

Certainly the increased confidence and competence levels impacted the actual amount laptop use with students during the implementation of the 1:1 laptop initiative. These results suggest that school leaders should certainly consider providing laptops to teachers well before implementation of any 1:1 laptop initiative. If teacher gains in confidence and competence of utilizing the laptops are the ultimate goals of this strategic step, then the longer the teachers have access to the laptop the better.

The length of time teachers were exposed to professional development activities specifically designed to prepare them for the 1:1 laptop initiative implementation was also examined within this study. Similar to providing teachers with access to laptops, each of the three participating high schools had committed to providing their teachers with these professional development experiences at least one year prior to the 1:1 laptop initiative implementation. Once again, by doing so, this enabled teachers to become more competent and confident with not only their laptop, but also the multitude of software, applications, and programs that would enable them to integrate the laptop technology into classroom instruction in the future. The results of this study also suggest that school leaders should consider their plan for providing professional development preparation for teachers well before any implementation of a 1:1 laptop initiative. These professional development activities should be tailored to individual teacher learning needs, as well as the ultimate goals and objectives of the school.

Teachers in this study were also asked to provide value ratings for four different types of professional development activities: learning to use hardware; learning to use software, learning to use content management and instructional delivery platforms; and learning to integrate technology into instruction. Teachers' perceived value for each

professional development activity was examined to determine relationships with the change in frequency of use of each of the 11 instructional activities. Although when analyzed individually, these comparisons did not result in many significant relationships; these individual professional development experiences, when combined with the overall length of professional development preparation and prior access to laptops, enabled teachers to become more confident and competent with utilizing the laptops for instructional change in the 1:1 laptop initiative implementation.

As school leaders begin the process of planning for a future 1:1 laptop initiative, they must understand their teachers will begin preparation for the 1:1 laptop initiative with different levels of readiness. In this study, each of the four professional development activities examined resulted in high levels of value for the preparation of a 1:1 laptop initiative implementation. These results would suggest that school leaders should plan on providing a wide array of professional development activities to meet the needs of all teachers in their preparation for implementation of a 1:1 laptop initiative.

Recommendations for Future Research

This research study involved only three schools in a relatively close geographical region of southwest Missouri. It would be interesting to expand the population of this study to areas that might not have experienced as much professional development preparation in their pursuit of a 1:1 laptop initiative. Additionally, future research may also include a longitudinal study, comparing the impact of professional development on instructional change at several times during schools' 1:1 laptop initiative journey.

Each of the professional development factors examined contributed to the amount of instructional change observed in each of the 11 different instructional activities

observed as a result of the 1:1 laptop initiative implementation, despite that when examined individually, there were limited significant relationships between the variables. Future research could employ a multiple regression statistical procedure to further explain any individual impact of the respective professional development factors or any other preparatory factors that might be considered for the implementation of a 1:1 laptop initiative.

Teachers' perceived value of several professional development activities in their preparation for the 1:1 laptop initiative implementation was a primary focus in this study. Future research should include comparisons of teacher efficacy levels and their impact on instructional behaviors in the classroom. This type of analysis would determine any significant relationships between teacher confidence and competence levels and instructional change as a result of the 1:1 laptop initiative implementation. Another professional development factor that would be interesting to study would be teachers' desired modes of professional development delivery. Whether provided by consultants inside or outside of the school district, seated or virtual, as a one-time activity or embedded within day-to-day instruction, there are many modes of professional development delivery for school leaders' consideration.

Summary

One-to-one computing initiatives have become more commonplace in K-12 education as school leaders endeavor to infuse technology into classrooms to meet the needs of the 21st century learner. Although mobile computer technology, including laptops, have become much more affordable in recent years, the financial commitment needed to implement a 1:1 laptop initiative is certainly a factor that must be considered.

As a result, school leaders must be able to justify the expense by the potential impact that can be made in improving classroom instruction and student learning. School leaders must also identify best practices for preparing their teaching staff to effectively utilize the technology at their disposal upon the implementation of these 1:1 laptop initiatives to ensure the best return on investment.

This study examined the impact of various factors of professional development preparation on teacher instructional practices during the early implementation of a 1:1 laptop initiative. The amount of time teachers were provided access to their own laptops prior to implementation with students, the length of professional development preparation specifically designed to prepare teachers for the 1:1 laptop initiative, and teachers' perceived values of four different professional development activities as each related to the teachers' preparations for the 1:1 laptop initiative implementation were the professional development factors explored in this study. Learning to use hardware; learning to use software, application, and programs; learning to use content management and instructional delivery platforms; and learning to integrate technology into instruction were the professional development activities examined. Frequencies of use for 11 different instructional activities were also determined in this study: planning, instructional delivery, use of digital resources to supplement the curriculum, creation or downloading of presentations for student use outside of the classroom, differentiation or personalization of instruction to meet the unique needs of individual students, creating assignments to challenge students to think in a critical manner, using webpages or content management platforms, requiring students to utilize technology to complete assignments,

asking students to collaborate on assignments, and asking students to post their work to or communicate with a global audience.

Teachers from three high schools in southwest Missouri who had begun implementation of a 1:1 laptop initiative were invited to participate in this study. The teacher participants were administered a 16-question survey designed to determine their perceived values concerning the aforementioned professional development activities, the length of time they had access to their own laptops prior to student implementation, the length of professional development preparations they received prior to the implementation of the 1:1 laptop initiatives implementation, and the frequency of use for each of the instructional activities pre-1:1 and during 1:1 laptop initiative implementation.

A Friedman test was conducted to determine the aggregate group difference between teachers' perceived value ratings for the four professional development activities. This test showed significant differences among the teachers' perceived value ratings, in which all four professional development activities were rated as either a *good* or *significant* value level by teacher participants. Descriptive statistics and a Wilcoxon Signed-Ranks test were utilized to determine the amount of change that occurred between the frequency of use of each instructional activity pre-1:1 and during the 1:1 laptop initiative implementation. The overall change in frequency of use for each of the 11 instructional activities was determined to be statistically significant as a result of the 1:1 laptop initiative implementation.

Finally, a Spearman rank order correlation was conducted to determine the strength of the relationship between each of the professional development factors and the overall change in frequency of use that occurred within each of the 11 instructional

activities as a result of the implementation of the 1:1 laptop initiative. A statistically significant moderate to low relationship was determined between the length of time teachers had access to their own laptops prior to student implementation and teachers asking students to collaborate on assignments. In addition, a statistically significant relationship was determined between teachers perceived value of learning to use hardware and the amount of change that occurred in teachers using technology for instructional delivery and using webpages or content management platforms as a result of the 1:1 laptop initiative implementation. Finally, a statistically significant relationship was also determined between teachers perceived value of learning to use software, applications and programs and the amount of change that occurred in teachers asking students to collaborate on assignments as a result of the 1:1 laptop initiative implementation.

This research study provided a thorough analysis of three participating high schools' professional development practices in their respective preparation for the 1:1 laptop initiative experience. These experiences, when combined with the change in frequency of use for the 11 different instructional activities, provided a useful snapshot of the impact various professional development practices have on instructional change in 1:1 laptop initiatives within high schools. The results of this study will shed some light on the best practices in professional development preparation that can be utilized by school leaders considering a future 1:1 laptop initiative.

Appendix A

1:1 Laptop Initiative Implementation Survey

Please answer the following demographic questions that relate to you as an educator.

1. In what school district are you employed?

2. How many years have you taught in your career as a certified teacher?

A. Less than 1 year
B. 1-2 years
C. 3-5 years
D. 6-10 years
E. 11-15 years
F. More than 15 years

Please answer the following questions related to the length of professional development training you have experienced in preparation for the 1:1 Laptop Initiative. For the purposes of this study, the following terms have been defined to assist your thought process in answering survey questions:

1:1 Laptop Initiative is a learning initiative where students are given a laptop computer for learning use, both during school hours and outside of the regular school setting (Bebell & O'Dwyer, 2010; CASTLE, 2012).

Professional Development is any learning activity for teachers designed to prepare the teacher to utilize instructional technology in the classroom for the benefit of student learning ("Definition of Professional Learning," 2008).

3. How long have you had access to the same type of laptop that your students are using in the 1:1 program?

A. Less than One Semester
B. One Semester
C. One Year
D. More than One Year

4. How long has your school undergone professional development specifically designed to prepare you for the implementation of a 1:1 laptop initiative?

A. No formal preparation
B. One (1) Semester
C. Two (2) Semesters
D. Three (3) Semesters
E. Four (4) Semesters
F. Five (5) Semesters
G. Six (6) Semesters
H. More than Six (6) Semesters

Please answer the following questions by rating the value of each specific type of professional development to its value in your own individual preparation for the 1:1 laptop initiative. You may select N/A if you did not participate in any of these types of professional development. For the purposes of this study, the following terms have been defined to assist your thought process in answering survey questions:

Content Management and Instructional Delivery Platforms refer to software applications/programs that allow teachers to organize instructional material for student use, delivering classroom instruction, gathering student work, facilitating digital communication within a class, as well as assessing student learning. Examples of content management and instructional delivery platforms include, but are not limited to, Blackboard and Moodle (Glahn, 2014).

Hardware is a term used to refer to the actual physical technological products utilized in today's classrooms; including laptop computers, LCD projectors, SmartBoards and Promethian Boards, document cameras, student response systems, etc. (Chatterji & Jones, 2012).

Software Applications, and Programs refer to the actual applications/programs that are typically downloaded to computers to give users the ability to accomplish various tasks as prescribed by the software (Lee, Waxman, Wu, Michko, & Lin, 2013).

5. Rate the following types of professional development as to its respective value in your individual preparation for the 1:1 laptop initiative:

	No Value to My Preparation	Little Value to My Preparation	Marginal Value to My Preparation	Good Value to My Preparation	Significant Value to My Preparation	N/A
Learning to use Hardware (Ex: Laptops, Projectors, SmartBoards, etc.)	☐	☐	☐	☐	☐	☐
Learning to use Software Applications and Programs (Ex: Microsoft Office, Prezi, Edmodo, Geogebra, etc.)	☐	☐	☐	☐	☐	☐
Learning to use Content Management and Instructional Delivery Platforms (Ex: Blackboard, Angel, Moodle, etc.)	☐	☐	☐	☐	☐	☐
Learning to implement the technology within instruction	☐	☐	☐	☐	☐	☐

Please answer the following questions by indicating the frequency of your use of the specific instructional technology practice both prior to 1:1 laptop implementation and during this past semester of initial implementation of the 1:1 laptop initiative. For the purposes of this study, the following terms have been defined to assist your thought process in answering survey questions (This portion of the survey was adapted from Berkshire Wireless Learning Initiative, 2008, p. 6):

Differentiated (Personalized) Instruction refers to targeting instruction to each student's ability level and curricular needs (USDOE, 2013).

Global Audience refers to allowing students to communicate with others outside of their own school for purposes of learning. This term can also refer to the posting of student work to educationally related Internet websites in an effort to expand the range of those able to view and give feedback towards student work (USDOE, 2010).

6. How often did you use technology to plan for instruction?

	Never	Once or Twice a Year	Once or Twice a Semester	Once or Twice a Month	Once or Twice a Week	Daily
Prior to 1:1 Laptop Initiative Implementation	☐	☐	☐	☐	☐	☐
During 1:1 Laptop Initiative Implementation	☐	☐	☐	☐	☐	☐

7. How often did you use technology to deliver instruction to your class?

	Never	Once or Twice a Year	Once or Twice a Semester	Once or Twice a Month	Once or Twice a Week	Daily
Prior to 1:1 Laptop Initiative Implementation	☐	☐	☐	☐	☐	☐
During 1:1 Laptop Initiative Implementation	☐	☐	☐	☐	☐	☐

8. How often did you use technology to assess student learning?

	Never	Once or Twice a Year	Once or Twice a Semester	Once or Twice a Month	Once or Twice a Week	Daily
Prior to 1:1 Laptop Initiative Implementation	☐	☐	☐	☐	☐	☐
During 1:1 Laptop Initiative Implementation	☐	☐	☐	☐	☐	☐

9. How often did you use digital resources to supplement your existing textbook and/or curriculum?

	Never	Once or Twice a Year	Once or Twice a Semester	Once or Twice a Month	Once or Twice a Week	Daily
Prior to 1:1 Laptop Initiative Implementation	☐	☐	☐	☐	☐	☐
During 1:1 Laptop Initiative Implementation	☐	☐	☐	☐	☐	☐

10. How often did you use technology to create and/or download presentations that can be utilized by students outside of the classroom?

	Never	Once or Twice a Year	Once or Twice a Semester	Once or Twice a Month	Once or Twice a Week	Daily
Prior to 1:1 Laptop Initiative Implementation	☐	☐	☐	☐	☐	☐
During 1:1 Laptop Initiative Implementation	☐	☐	☐	☐	☐	☐

11. How often did you use technology to differentiate or personalize instruction to meet the unique needs of individual students in your classroom?

	Never	Once or Twice a Year	Once or Twice a Semester	Once or Twice a Month	Once or Twice a Week	Daily
Prior to 1:1 Laptop Initiative Implementation	☐	☐	☐	☐	☐	☐
During 1:1 Laptop Initiative Implementation	☐	☐	☐	☐	☐	☐

12. How often did you create a learning activity designed to challenge students to think in a critical manner?

	Never	Once or Twice a Year	Once or Twice a Semester	Once or Twice a Month	Once or Twice a Week	Daily
Prior to 1:1 Laptop Initiative Implementation	☐	☐	☐	☐	☐	☐
During 1:1 Laptop Initiative Implementation	☐	☐	☐	☐	☐	☐

13. How often did you use technology to create your own webpage, or use a content management platform, where students can access learning materials and/or turn in assignments in a digital format?

	Never	Once or Twice a Year	Once or Twice a Semester	Once or Twice a Month	Once or Twice a Week	Daily
Prior to 1:1 Laptop Initiative Implementation	☐	☐	☐	☐	☐	☐
During 1:1 Laptop Initiative Implementation	☐	☐	☐	☐	☐	☐

14. How often did you ask students to use digital technology to complete classroom learning assignments?

	Never	Once or Twice a Year	Once or Twice a Semester	Once or Twice a Month	Once or Twice a Week	Daily
Prior to 1:1 Laptop Initiative Implementation	☐	☐	☐	☐	☐	☐
During 1:1 Laptop Initiative Implementation	☐	☐	☐	☐	☐	☐

15. How often did you ask students to collaborate on assignments?

	Never	Once or Twice a Year	Once or Twice a Semester	Once or Twice a Month	Once or Twice a Week	Daily
Prior to 1:1 Laptop Initiative Implementation	☐	☐	☐	☐	☐	☐
During 1:1 Laptop Initiative Implementation	☐	☐	☐	☐	☐	☐

16. How often did you ask students to post their work to or communicate with a global audience (outside of your school setting)?

	Never	Once or Twice a Year	Once or Twice a Semester	Once or Twice a Month	Once or Twice a Week	Daily
Prior to 1:1 Laptop Initiative Implementation	☐	☐	☐	☐	☐	☐
During 1:1 Laptop Initiative Implementation	☐	☐	☐	☐	☐	☐

Appendix B

Disposition Letter from IRB Committee

LINDENWOOD

LINDENWOOD UNIVERSITY ST. CHARLES, MISSOURI

DATE:	August 8, 2013
TO:	Bradley Hanson, Ed.D.
FROM:	Lindenwood University Institutional Review Board
STUDY TITLE:	[489771-1] The Impact of Professional Development on Early Implementation of a 1:1 Laptop Initiative
IRB REFERENCE #:	
SUBMISSION TYPE:	New Project
ACTION:	APPROVED
APPROVAL DATE:	August 8, 2013
EXPIRATION DATE:	August 8, 2014
REVIEW TYPE:	Expedited Review

Thank you for your submission of New Project materials for this research project. Lindenwood University Institutional Review Board has APPROVED your submission. This approval is based on an appropriate risk/benefit ratio and a study design wherein the risks have been minimized. All research must be conducted in accordance with this approved submission.

This submission has received Expedited Review based on the applicable federal regulation.

Please remember that informed consent is a process beginning with a description of the study and insurance of participant understanding followed by a signed consent form. Informed consent must continue throughout the study via a dialogue between the researcher and research participant. Federal regulations require each participant receive a copy of the signed consent document.

Please note that any revision to previously approved materials must be approved by this office prior to initiation. Please use the appropriate revision forms for this procedure.

All SERIOUS and UNEXPECTED adverse events must be reported to this office. Please use the appropriate adverse event forms for this procedure. All FDA and sponsor reporting requirements should also be followed.

All NON-COMPLIANCE issues or COMPLAINTS regarding this project must be reported promptly to the IRB.

This project has been determined to be a Minimal Risk project. Based on the risks, this project requires continuing review by this committee on an annual basis. Please use the completion/amendment form for this procedure. Your documentation for continuing review must be received with sufficient time for review and continued approval before the expiration date of August 8, 2014.

Please note that all research records must be retained for a minimum of three years.

If you have any questions, please contact Tameka Moore at (618) 616-7027 or tmoore@lindenwood.edu. Please include your study title and reference number in all correspondence with this office.

If you have any questions, please send them to IRB@lindenwood.edu. Please include your project title and reference number in all correspondence with this committee.

This letter has been electronically signed in accordance with all applicable regulations, and a copy is retained within Lindenwood University Institutional Review Board's records.

Appendix C

Cover Letter for Survey

August 26, 2013

Dear <Title and/or name of participant>,

I am writing to request your participation in my doctoral dissertation research project at Lindenwood University. I believe the information gathered through this study will positively contribute to the body of knowledge by identifying best practices for professional development preparation to assist in the successful implementation of 1:1 laptop initiatives.

The purpose of the study is to identify the impact of various factors of professional development preparation on teacher instructional practice during the early implementation of a 1:1 laptop initiative.

Attached is an electronic document survey. Your participation in this research study is voluntary, and you may withdraw at any time. Confidentiality and anonymity are assured.

If you have questions, you can reach me at 417-xxx-xxxx or by electronic mail at bhanson@monett.k12.mo.us. Dr. Trey Moeller, my dissertation advisor for this research project, may be contacted by electronically at tmoeller@wcr7.org or by phone at 417-xxx-xxxx.

Please open the enclosed attachment to view the Informed Consent form and to complete the survey.

Thank you for your time,

Brad Hanson
Doctoral Candidate
Lindenwood University

Appendix D

Informed Consent for Participation in Research Activities

The Impact of Professional Development on Early Implementation of a 1:1 Laptop Initiative

Principal Investigator: Brad Hanson
Telephone: 417-xxx-xxxx E-mail: bhanson@monett.k12.mo.us

1. You are invited to participate in a research study conducted by Brad Hanson under the guidance of Dr. Trey Moeller. The purpose of this research is to identify the impact of various factors of professional development preparation on teacher instructional practice during the early implementation of a 1:1 laptop initiative.

2. a) Your participation will involve completion of the attached online survey that has been designed to seek out your experience with your own professional development preparation experience prior to the implementation of your 1:1 laptop initiative last January.

   This survey has also been designed to ascertain any instructional changes that you may have experienced during your first semester of 1:1 laptop initiative implementation.

   b) The amount of time involved in your participation will be approximately 10-15 minutes and you will receive "NO" compensation for your time in completing this survey.

   Approximately 142 participants will be involved in this research. These participants are all teachers from three high schools in the area that recently initiated 1:1 laptop initiatives.

3. There are no anticipated risks associated with this research.

4. There are no direct benefits for you participating in this study. However, your participation will contribute to the knowledge about how professional development planning can impact the early implementation of 1:1 laptop initiatives and may help school districts' contemplating future 1:1 laptop initiatives prepare more effectively for successful implementation.

5. Your participation is voluntary and you may choose not to participate in this research study or to withdraw your consent at any time. You may choose not to answer any questions that you do not want to answer. You will NOT be penalized in any way should you choose not to participate or to withdraw.

6. We will do everything we can to protect your privacy. As part of this effort, your identity will not be revealed in any publication or presentation that may result from

this study and the information collected will remain in the possession of the investigator in a safe location.

7. If you have any questions or concerns regarding this study, or if any problems arise, you may call the Investigator, (Brad Hanson @ 417-xxx-xxxx) or the Supervising Faculty, (Dr. Trey Moeller @ 417-xxx-xxxx). You may also ask questions of or state concerns regarding your participation to the Lindenwood Institutional Review Board (IRB) through contacting Dr. Jann Weitzel, Vice President for Academic Affairs at 636-949-4846.

   By clicking on the link below, I acknowledge I have read this consent form and have been given the opportunity to ask questions. I understand that I may also print a copy of this consent form for my records. I consent to my participation in the research described above.

   Click here to take survey

References

Adamson, F., & Darling-Hammond, L. (2013). *Policy pathways for 21st century skills*. Melbourne, Australia: Assessment & Teaching of 21st Century Skills.

Annable, C. J. (2013). *An investigation of laptop classrooms and the teaching and learning of mathematics.* (Doctoral thesis, University of Toronto, Canada). Retrieved from http://hdl.handle.net/1807/35766

Apple Computer, Inc. (2008). *Apple classrooms of tomorrow–today: Learning in the 21st century*. Retrieved from http://ali.apple.com/acot2/global/files/ACOT2_Background.pdf

Balanskat, A., Bannister, D., Hertz, B., Sigillo, E., & Vuorikari, R. (2013). *Overview and analysis of 1:1 learning initiatives in Europe*. JRC Scientific and Policy Report. Retrieved from http://ftp.jrc.es/EURdoc/JRC81903.pdf

Baylor, A., & Ritchie, D. (2002). What factors facilitate teacher skill, teacher morale, and perceived student learning in technology using classrooms? *Computers and Education*, *39*(4), 395-414.

Bebell, D., & Kay, R. (2010). One to one computing: A summary of the quantitative results from the Berkshire wireless learning initiative. *The Journal of Technology, Learning and Assessment*, *9*(2). Retrieved from http://napoleon.bc.edu/ojs/index.php/jtla/article/view/1607/1462

Bebell, D., & O'Dwyer, L. M. (2010). Educational outcomes and research from 1:1 computing settings. *Journal of Technology, Learning, and Assessment*, *9*(1). Retrieved from https://136.167.2.46/ojs/index.php/jtla/article/viewFile/1606/1463

Bennison, A., & Goos, M. (2010, April). Learning to teach mathematics with technology: A survey of professional development needs, experiences and impacts. *Mathematics Education Research Journal*, *22*(1), 31-56. Retrieved from http://files.eric.ed.gov/fulltext/EJ883876.pdf

Berkshire Wireless Learning Initiative. (2008). *Teacher survey*. Retrieved from http://www.bc.edu/research/intasc/researchprojects/bwli/pdf/bwli2008_teacherSurvey.pdf

Blackboard. (2012). *Learning in the 21st century: Digital experiences and expectations of tomorrow's teachers.* Retrieved from http://www.tomorrow.org/speakup/tomorrowsteachers_report2013.html

Blumen, A. G. (2010). *Elementary statistics: A step by step approach*. New York: McGraw Hill

Boardman, D. C. (2012). *Educator responses to technology influences in a 1:1 laptop middle school* (Doctoral dissertation). Retrieved from ProQuest Dissertations database. (UMI No. 3528200)

Bonifaz, A., & Zucker, A. (2004). *Lessons learned about providing laptops for all students*. Newton, MA: Northeast and the Islands Regional Technology in Education Consortium. Retrieved from http://perkinselementary.pbworks.com/f/LaptopLessonsRprt.pdf

Boss, S. (2011, September 7). Technology integration: What experts say. *Edutopia*. Retrieved from http://www.edutopia.org/technology-integration-experts.

Brown, A. H., Benson, B., & Uhde, A. P. (2004). You're doing what with technology? An expose on "Jane Doe" college professor. *College Teaching*, 100-104.

Cengiz Gulek, J., & Demirtas, H. (2005). Learning with technology: The impact of laptop use on student achievement. *The Journal of Technology, Learning and Assessment*, *3*(2). Retrieved from http://napoleon.bc.edu/ojs/index.php/jtla/article/view/1655/1501

Center for Digital Education. (2011). *Digital teaching and professional development*. Folsom, CA: Center for Digital Education. Retrieved from http://www.centerdigitaled.com/reports/q1-2011/

Center for Digital Education. (2012). *Special classroom technologies: Special report*. Folsom, CA: Center for Digital Education. Retrieved from http://www.centerdigitaled.com/reports/q4-2012/

Center for the Advanced Study of Technology Leadership in Education. (2012). *What does the research say about one-to-one computing initiatives?* (Issue Brief No. 1). University of Kentucky: Sauers, N. J., & McLeod, S.

Chatterji, A., & Jones, B. (2012, September). *Harnessing technology to improve K-12 education*. The Hamilton Project Discussion Paper. Retrieved from http://www.kellogg.northwestern.edu/faculty/jones-ben/htm/THP_ChatterjiJones_EdTech_DiscPaper.pdf

Chism, N. (2004). Using a framework to engage faculty in instructional technologies. *Educause Quarterly*, *27*(2), 39-45. Retrieved from https://net.educause.edu/ir/library/pdf/EQM0424.pdf

Colandrea, J. L. (2012). *The diffusion of computer-based technology in K-12 schools: Teachers' perspectives.* (Doctoral dissertation). Retrieved from ProQuest Dissertations database. (UMI No. 3518848)

Constant, M. D. (2011). *One-to-one laptop project: Perceptions of teachers, parents, and students*. (Doctoral dissertation). Retrieved from http://digitalcommons.wku.edu/cgi/viewcontent.cgi?article=1006&context=diss

Costa, J. (2012). *Digital learning for all now: A school leader's guide for 1:1 on a budget.* Thousand Oaks, CA: Sage.

Cuban, L. (2001). *Oversold and underused: Computers in the classroom*. Boston: Harvard University Press.

Daniel, J. (2012). Choosing the type of probability sampling. In V. Knight & L. Habib (Eds.), *Sampling Essentials* (pp. 125-174). Thousand Oaks, CA: Sage.

Dawson, K., Cavanaugh, C., & Ritzhaupt, A. D. (2008). Florida's EETT Leveraging Laptops Initiative and its impact on teaching practices. *Journal of Research on Technology in Education, 41*(2), 143-159. Retrieved from http://files.eric.ed.gov/fulltext/EJ826090.pdf

Definition of professional learning (2008). *Learning Forward.* Retrieved from http://learningforward.org/who-we-are/professional-learning-definition#DefinitionResources

Drayton, B., Falk, J. K., Stroud, R., Hobbs, K., & Hammerman, J. (2010). After installation: Ubiquitous computing and high school science in three experienced, high-technology schools. *Journal of Technology, Learning, and Assessment, 9*(3). Retrieved from https://napoleon.bc.edu/ojs/index.php/jtla/article/view/1608/1461

Duncan, A. (2010). *The new normal: Doing more with less*. Secretary Arne Duncan's remarks at the American Enterprise Institute. Retrieved from http://www.ed.gov/news/speeches/new-normal-doing-more-less-secretary-arne-duncans-remarks-american-enterprise-institute

Dunleavy, M., Dexter, S., & Heinecke, W. F. (2007). What added value does a 1:1 student to laptop ratio bring to technology-supported teaching and learning? *Journal of Computer Assisted Learning, 23*(5), 440-452. doi: 10.1111/j.1365-2729.2007.00227.x

Ferguson, T. B. (2012). *Technology expenditures: A policy analysis in a selected school and return on investment* (Doctoral dissertation, University of Florida). Retrieved from http://ufdcimages.uflib.ufl.edu/UF/E0/04/40/91/00001/FERGUSON_T.pdf

Fonkert, K. L. (2010). Student interactions in technology-rich classrooms. *Mathematics Teacher*, *104*(4), 302-307.

Franklin, C. (2007). Factors that influence elementary teachers use of computers. *Journal of Technology and Teacher Education*, 15(2), 267-293.

Fulton, K., Glenn, A. D., & Valdez, G. (2004). *Teacher education and technology planning guide*. North Central Regional Educational Laboratory. Naperville, IL: Learning Points Associates.

Glahn, C. (2014). Mobile learning operating systems. In M. Ally & A. Tsinakos (Eds.), *Increasing access through mobile learning* (pp. 141-157). Vancouver, B.C.: Commonwealth of Learning.

Greaves, T. W., Hayes, J., Wilson, L., Gielniak, M., & Peterson, E. L. (2010). *Revolutionizing education through technology*. Eugene, Oregon: International Society for Technology in Education.

Harris, J. B., Mishra, P., & Koehler, M. J. (2007). *Teachers' technological pedagogical content knowledge: Curriculum-based technology integration reframed.* Retrieved from http://mkoehler.educ.msu.edu/OtherPages/Koehler_Pubs/TECH_BY_DESIGN/AERA_2007/AERA2007_HarrisMishraKoehler.pdf on January 8, 2014.

Higgins, J., & Russell, M. (2003). *Teachers' beliefs about technology-related professional development*. Boston, MA: Technology and Assessment Study Collaborative, Boston College.

Hogue, R. (2013). Considerations for a professional development program to support iPads in higher education teaching. *Ubiquitous Learning, 5*(1), 1-15. Retrieved from http://www.ruor.uottawa.ca/fr/bitstream/handle/10393/24274/Hogue_Rebecca_2013_Considerations_for_a_Professional_Development_Program.pdf?sequence=1

International Society for Technology in Education. (2007). *ISTE standards for students*. Retrieved from http://www.iste.org/docs/pdfs/nets-s-standards.pdf?sfvrsn=2

International Society for Technology in Education. (2007). *ISTE standards for teachers*. Retrieved from http://www.iste.org/docs/pdfs/nets-t-standards.pdf?sfvrsn=2

Jenkins, P. T. (2012). *Teacher and principal experiences of effective professional development.* (Doctoral dissertation). Retrieved from ProQuest Dissertations database. (UMI No. 3502620)

Kellen, D. A. (2013). *Utilizing technology as leverage for instructional improvement in the classroom* (Doctoral dissertation, University of Michigan). Retrieved from http://hdl.handle.net/2027.42/97866

Lawless, K. A., & Pellegrino, J. W. (2007). Professional development in integrating technology into teaching and learning: Knowns, unknowns, and ways to pursue better questions and answers. *Review of Educational Research, 77*(4), 575-614.

Lee, Y. H., Waxman, H., Wu, J. Y., Michko, G., & Lin, G. (2013). Revisit the effect of teaching and learning with technology. *Educational Technology & Society, 16*(1), 133-146. Retrieved from http://www.ifets.info/journals/16_1/12.pdf

Lowry, R. (n.d.). *Concepts and applications of inferential statistics*. Retrieved from http://vassarstats.net/textbook/

Majeski, M. (2013). *Middle school teachers and principals perspectives on technology* (Doctoral dissertation). Retrieved from http://digitalcommons.unl.edu/cgi/viewcontent.cgi?article=1155&context=cehsedaddiss

Miranda, H., & Russell, M. (2011). Predictors of teacher-directed student use of technology in elementary classrooms: A multilevel SEM approach using data from the USEIT study. *Journal of Research on Technology in Education, 43*(4), 301-323. Retrieved from http://files.eric.ed.gov/fulltext/EJ930313.pdf

Muijs, D. (2010). *Doing quantitative research in education with SPSS*. Thousand Oaks, CA: Sage.

Nadelson, L. S., Bennett, S., Gwilliam, E., Howlett, C., Oswalt, S., & Sand, J. (2013). The intersection of preservice teachers' confidence, perceptions, and ideas for using instructional technology for teaching and learning. *International Journal of Higher Education*, *2*(4), 77-90. Retrieved from http://sciedu.ca/journal/index.php/ijhe/article/download/3461/2043

No Child Left Behind (NCLB) Act of 2001, Pub. L. No. 107-110, § 115, Stat. 1425 (2002).

O'Connor, K., Goldberg, A., Russell, M., Bebell, D., & O'Dwyer, L. (2004). *Teachers' beliefs about access, use, support, and obstacles in using instructional technology*. Boston, MA: Boston College, Technology and Assessment Study Collaborative.

One computing device per student grows six-fold new study reports. (2006, October 8). *eSchool News*. Retrieved from http://www.eschoolnews.com/2006/10/08/one-computing-device-per-student-grows-six-fold-new-study-reports/

Ontario Public School Boards' Association. (n.d). *A vision for learning and teaching in a digital world*. Retrieved from http://www.opsba.org/files/OPSBA_AVisionForLearning.pdf

Penuel, W. R. (2006). Implementation and effects of one-to-one computing initiatives: A research synthesis. *Journal of Research on Technology in Education*, *38*(3), 329. Retrieved from https://www.chatsworth.com.sg/uploaded/PDF_Forms/PDF_Images/implement-PBL.pdf

Project Tomorrow. (2010, May). *Unleashing the future: Educators "speak up" about the use of emerging technologies for students.* (Speak Up 2009 National Findings). Irvine, CA.

Raulston, C. G. (2009). *Analysis of teachers' perceptions and attitudes of a teacher laptop initiative*. (Doctoral dissertation). Retrieved from ProQuest Dissertations database. (UMI No. 3369782)

Rideout, V. J., Foehr, U. G., & Roberts, D. F. (2010, January). *Generation M^2: Media in the lives of 8- to 18-year-olds*. Menlo Park, CA: Henry J. Kaiser Family Foundation.

Rodriguez, G., & Knuth, R. (2000). Critical issue: Providing professional development for effective technology use. *Pathways to School Improvement*.

Russell, M., Bebell, D., O'Dwyer, L., & O'Connor, K. (2003). *Teachers' beliefs about and use of technology: Enhancing the use of technology for new and veteran teachers*. Boston, MA: Boston College, Technology and Assessment Study Collaborative.

Rutledge, D., Duran, J., & Carroll-Miranda, J. (2007). Three years of the New Mexico laptop learning initiative (NMLLI): Stumbling toward innovation. *AACE Journal*, *15*(4), 339-366. Retrieved from http://www.editlib.org/p/23576

Sell, R. G., Cornelius-White, J., Chang, C. W., McLean, A., & Roworth, W. R. (2012). *A meta-synthesis of research on 1:1 initiatives in K-12 education.* Unpublished manuscript, Institute for School Improvement, Missouri State University, Springfield, Missouri.

Shapley, K. S., Sheehan, D., Maloney, C., & Caranikas-Walker, F. (2010). Evaluating the implementation fidelity of technology immersion and its relationship with student achievement. *Journal of Technology, Learning, and Assessment*, *9*(4). Retrieved from https://ejournals.bc.edu/ojs/index.php/jtla/article/view/1609/1460

Silvernail, D. L., & Buffington, P. J. (2009). *Improving mathematics performance using laptop technology: The importance of professional development for success*. Maine Education Policy Research Institute. University of Southern Maine.

Silvernail, D. L., & Lane, D. M. (2004). *The impact of Maine's one-to-one laptop program on middle school teachers and students*. Maine Education Policy Research Institute (MEPRI), University of Southern Maine.

Sinay, E., & Yashkina, A. (2012). *Technology and innovation in education: Towards a single vision and plan for the Toronto district school board.* Toronto, Canada.

Spaulding, M. (2013). Preservice and in-service teachers' perceptions toward technology benefits and integration. *Learning in Higher Education*, *67*. Retrieved from http://jwpress.com/JLHE/Issues/JLHE-2013-Spring.pdf#page=79

Storz, M. G., & Hoffman, A. R. (2013). Examining responses to a one-to-one computer initiative: Student and teacher voices. *RMLE Online: Research in Middle Level Education*, *36*(6). Retrieved from http://www.amle.org/portals/0/pdf/publications/RMLE/rmle_vol36_no6.pdf

Strother, D. L. (2013). *Understanding the lived experiences of secondary teachers instructing in one-to-one computing classrooms* (Doctoral dissertation, Drake University). Retrieved from http://hdl.handle.net/2092/2021

Ten elements of high quality digital learning (2010). *Digital Learning NOW!* Retrieved from http://www.digitallearningnow.com/10elements/

Tweed, S. R. (2013). *Technology implementation: Teacher age, experience, self-efficacy, and professional development as related to classroom technology integration* (Doctoral dissertation). Retrieved from http://dc.etsu.edu/etd/1109/.

Twyman, J. S. (2014). Leveraging technology to accelerate school turnaround. In WestEd, *The state role in school turnaround: Emerging best practices* (pp. 99-113). Retrieved from http://centeronschoolturnaround.org/wp-content/uploads/2013/12/The-State-Role-in-School-Turnaround.pdf

U.S. Department of Education, Office of Educational Technology. (2010). Transforming American education: Learning powered by technology. *National Education Technology Plan 2010*. Retrieved from http://www.ed.gov/edblogs/technology/netp-2010/

U.S. Department of Education, Office of Educational Technology. (2013). *Expanding evidence approaches for learning in a digital world.* Retrieved from http://www.ed.gov/edblogs/technology/files/2013/02/Expanding-Evidence-Approaches.pdf

Warschauer, M. (2005). Going one-to-one. *Educational Leadership, 63*(4), 34. Retrieved from http://imoberg.com/files/Going_One-to-One_Warschauer_M._.pdf

Vita

Bradley (Brad) Alan Hanson graduated from high school in 1981 from Pittsburg, Kansas. After high school, Brad attended Pittsburg State University in Pittsburg, Kansas, before transferring the following year to the University of Central Arkansas in Conway, Arkansas, where he completed his Bachelor's Degree in Physical Education in 1986. In December 1985, Brad earned his first education job with the Pulaski County Special School District in Little Rock, Arkansas, as a high school science teacher and basketball coach. In 1989, Brad completed his Master's Degree in Physical Education from the University of Central Arkansas in Conway, Arkansas. In 1994, Brad received a position with the Cassville R-IV School District in Cassville, Missouri, as a high school physical education teacher and coach. In 2000, Brad became the assistant high school principal and athletic director at Cassville High School, and he became the high school principal at the same school in 2003. Brad completed his Educational Specialist's Degree with an emphasis in Educational Administration from Missouri State University in Springfield, Missouri, in 2007. In 2010, Brad moved to the Monett R-1 School District in Monett, Missouri, as the director of the Scott Regional Technology Center. Brad currently serves as the Monett R-1 School District Superintendent of Schools.