ONE-TO-ONE COMPUTING:

A MIXED-METHODS STUDY DESIGNED TO UNCOVER THE PERCEIVED EFFECTS ON THE OVERALL CLASSROOM ENVIRONMENT

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AUTHORIZATION TO SUBMIT

DISSERTATION

This dissertation of Christopher R. Prososki, submitted for the degree of Doctor of Education with a major in Educational Leadership and titled "One-to-One Computing: A Mixed-Methods Study Designed to Uncover the Perceived Effects on the Overall Classroom Environment" has been reviewed in final form. Permission, as indicated by the signatures and dates given below, is now granted to submit final copies.

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DEDICATION

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ABSTRACT

The rapid surge of technology throughout both our society and our schools has changed many of the traditional functions of our daily lives. The traditional classroom has changed with the advent of one-to-one computing in the United States. Conventional teaching methods that were once thought to be customary and accepted are now a thing of the past. The trend of one-to-one computing has swept across the United States at an accelerated rate. Students in schools across the United States are now provided with an opportunity to not only learn basic curriculum, but to also enhance their overall academic journey with the availability of technology resources. Many schools across the United States have already put aside funds to implement a one-to-one computing environment for their district. The purpose of this study was to examine one-to-one computing environments based upon the perceived effects on the overall classroom environment by administrators and teachers in three high schools in the midwestern United States. Data for this study were gathered based upon an online survey and interviews from both administrators and teachers. A Mann-Whitney *U* test revealed statistical significance when analyzing the variable of gender within teachers' work environment. Female teachers believed the overall work environment was more conducive in a one-to-one computing environment. Themes that emerged from the interviews revealed benefits associated with increased student engagement and laptops allowed teachers to share and obtain information with students. Concerns were expressed regarding lack of technology support and the absence of training opportunities throughout the school year. School districts should provide full-time technology support for teachers, implement regular trainings for lesson planning with laptops, and promote classroom management skills that are necessary in this new environment.

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Chapter I

Introduction

The rapid surge of technology throughout society and schools has changed many of the traditional functions of daily lives. Today's youth are comfortable utilizing the Internet, computers, and mobile devices as an integral part of their lives (Carr, 2012; Donovan, Green, & Hansen, 2011; Penuel, 2006). The digital age has had a profound impact on the function of schools as well (Lei & Zhao, 2008; Subramaniam & Kandasamy, 2011). One-to-one computing has been one of the fastest growing trends in education today (Donovan, Hartley, & Strudler, 2007; Lei & Zhao, 2008; Maninger & Holden, 2009; Penuel, 2006). The introduction of technology into the classroom setting has sparked a number of new variables that have had an overall impact on student learning and student engagement (Donovan et al., 2011; Hur & Oh, 2012). Many districts are employing one-to-one computing environments in an attempt to close the achievement gap and provide every student with access to a high-quality education (Donovan et al., 2011). It is very apparent the overall educational environment is changing in schools across the United States through the implementation of classroom technology (Donovan et al., 2007; Maninger & Holden, 2009; Penuel, 2006).

There are different concerns associated with implementing a one-to-one computing environment. The recent drop in the price of computers coupled with the widespread availability of wireless Internet have increased school districts' decisions to invest funds into one-to-one computing environments for their students (Carr, 2012; Hur & Oh, 2012; Maninger & Holden, 2009). The rapid change in classroom technology has been a factor of great concern for many individuals who believe solid research is lacking in one-to-one computing environments (Dawson, Cavanaugh, & Ritzhaupt, 2008; Howard, Chan, & Caputi, 2014; Lei & Zhao, 2008;

Maninger & Holden, 2009; Mouza, 2008; Penuel, 2006). For school districts that implement one-to-one computing environments, the districts will often be the sole funding provider necessary to support the new educational environment (Lei, 2010). As with any change that occurs, there will also be some resistance to the new movement for a number of reasons. It is a reasonable assumption that more schools will employ ubiquitous computing programs in the years ahead (Lei, 2010). On the other hand, as many researchers have pointed out, additional access to technology for students does not ultimately transfer into better use of technology as a whole (Dunleavy & Heinecke, 2007; Hur & Oh, 2012; Lei, 2010). It is vital for educators to learn from other districts that have already undertaken ubiquitous computing environments. Educators can learn from their peers' experiences and model their program success to match the overall learning capabilities in their district.

With the new high-profile and high-stake investment into classroom technology, it has attracted the attention of many educators and researchers across the United States (Dawson et al., 2008; Gulek & Demirtas, 2005; Lei, 2010; Penuel, 2006; Rosen & Beck-Hill, 2012; Siegle & Foster, 2001). Both researchers and educators have examined many different aspects associated with a one-to-one computing environment. Vital components to examine with one-to-one computing include looking at student achievement in education, educational concerns associated with one-to-one computing environments, learning management systems (LMS), blended learning, professional development, and 21st-century skills. School districts need to assess each of these topics if they want to consider implementing a successful one-to-one computing environment for every student in their district.

Rogers' (2003) diffusion of innovation theory provides a conventional framework to analyze both the benefits and the concerns associated with implementing a one-to-one computing

environment. The use of Rogers' theory provides a useful lens for researchers to understand the implementation of ubiquitous one-to-one computing environments. One major component of Rogers' theory is the rate in which an innovation is adopted. Rogers' (2003) adopter categories have five parts, which include (a) innovators, (b) early adopters, (c) early majority, (d) late majority, and (e) laggards. There have been a number of studies that have used Rogers' (2003) diffusion of innovation theory successfully as their theoretical framework within the field of technology (Berger, 2005; Crompton & Keane, 2012; Sahin & Thompson, 2006; Siegle & Foster, 2001; Swan, 2009).

Statement of the Problem

Students in schools across the United States are now provided with an opportunity not only to learn basic curriculum, but also enhance their overall academic journey with the availability of technology resources (Rosen & Beck-Hill, 2012; Russell, Bebell, & Higgins, 2004; Smith, 2009). Many schools have allocated funds to implement a one-to-one computing environment for their district (Dawson et al., 2008; Rosen & Beck-Hill, 2012; Stephens, 2012). The verdict is not yet apparent on the effectiveness of these newly transformed classrooms. Nonetheless, classroom dynamics will never be the same while venturing into the classrooms of the 21st-century. Research is lacking regarding the perceived benefits and concerns associated with a one-to-one computing environment (Dawson et al., 2008; Howard et al., 2014; Lei & Zhao, 2008; Lowther, Inan, Ross, & Strahl, 2012; Mouza, 2008; Penuel, 2006). Many educators believe the evidence available is inconclusive due to the rapid expansion of one-to-one initiatives (Donovan et al., 2007; Lei & Zhao, 2008; Maninger & Holden, 2009; Penuel, 2006). School leaders, educators, and policy makers are still uncertain about the effectiveness of this new classroom dynamic. With many schools now considering implementing a one-to-one computing

environment, the research is a vital component that is missing. Educators across the United States want to have a firm grasp of the outcomes associated with a one-to-one computing environment (Dawson et al., 2008; Grimes & Warschauer, 2008; Penuel, 2006). Research-based evidence is needed and additional exploration will help guide policy makers with decisions on whether to allot funds to support one-to-one computing in classrooms.

The onset of a new technology-driven classroom represents a significant monetary investment by schools across the United States (Donovan et al., 2007; Grant, Ross, Wang, & Potter, 2005; Russell et al., 2004). There are still concerns about the effectiveness of one-to-one computing environments and the high costs associated with employing such programs in this new classroom dynamic. There have been an increasing number of parents and taxpayers who are hesitant about the idea of providing personal devices to students for educational purposes (Grimes & Warschauer, 2008; Lei & Zhao, 2008). The mixed reactions about one-to-one computing can be attributed to the lack of empirical evidence accompanying these new types of programs (Grimes & Warschauer, 2008; Lei & Zhao, 2008; Penuel, 2006).

This research study examined one-to-one computing in the educational field. The first area examined how traditional teaching and learning have changed in a one-to-one computing environment. The next segment examined the perceived benefits that are associated with one-to-one computing environments. The last part of the research focused on the perceived concerns that are associated with one-to-one computing environments.

Background

Schools around the globe have been actively promoting the use of technology in K–12 educational settings (Hur & Oh, 2012). One underlining reason behind this new movement is the high number of students who have displayed low student engagement in the classroom

setting (Hur & Oh, 2012). Students have become bored with the same academic instructional methods that have been employed for years (Hur & Oh, 2012; Lowther et al., 2012; Rosen & Beck-Hill, 2012). This has resulted in students not paying attention in school because of the traditional instructional methods used by educators for years. Policy makers across the United States have been exploring new ways for educators to present instructional material in a manner that will increase students' active participation in school. One solution to this problem is the creation of ubiquitous one-to-one computing environments for students (Hur & Oh, 2012). Many believe that this new movement will not only engage students in their classwork, but also raise their academic achievement and make education a more attractive endeavor for students (Gulek & Demirtas, 2005; Hur & Oh, 2012; Lei, 2010; Lowther et al., 2012). Educators believe this new generation of students has a close identity to technology due to social media websites, video games, and the use of wireless technology (Donovan et al., 2011).

For school districts to be successful in this new learning environment, certain steps must be taken to ensure the successful adoption of a one-to-one computing environment. Districts must align their educational objectives, prepare for the introduction of new curricula that match the technology, train teachers with meaningful professional development, and create an overall atmosphere that is conducive to educational technology (Donovan et al., 2007; Klieger, Ben-Hur, & Bar-Yossef, 2010; Parr & Ward, 2011; Rosen & Beck-Hill, 2012). This undertaking is not going to be an easy task, but by taking these pivotal steps, schools can create a learning environment that allows educators to individualize instruction for students (Rosen & Beck-Hill, 2012). With the implementation of a one-to-one computing environment, educators are able to implement a blended learning approach to help reinforce the content material with

the use of the Internet (Vernadakis, Giannousi, Tsitskari, Antoniou, & Kioumourtzoglou, 2012; Yapici & Akbayin, 2012).

With any new movement in education, there will often be educational concerns (Dawson et al., 2008; Rosen & Beck-Hill, 2012; Stephens, 2012). The idea behind one-to-one computing brings some of the same questions to the table. One major concern raised when a school district decides to invest money into a one-to-one computing environment is the high costs associated with providing laptops for every student (Donovan et al., 2007; Grant et al., 2005; Russell et al., 2004). Educators also have concerns about the practically of having laptops in classrooms and the difficulty of implementing one-to-one devices in the classroom (Donovan et al., 2007; Grant et al., 2005; Russell et al., 2004). These are all viable concerns many school leaders must consider before they employ a one-to-one computing environment for every student in their district.

Research Questions

A mixed-methods design allowed the researcher to combine both qualitative and quantitative data (Creswell, 2013; Creswell & Clark, 2007; Yin, 2009). This study utilized a mixed-methods design to allow the use of multiple data points. Creswell (2013) described mixed-methods research as an "approach to inquiry involving collecting both quantitative and qualitative data, integrating the two forms of data, and using distinct designs that may involve philosophical assumptions and theoretical framework" (p. 4). This study looked to employ a mixed-methods study that examined one-to-one computing environments in three rural high schools. The primary research question introduced by this study was "What were the perceived effects of a one-to-one computing environment on the overall classroom atmosphere?" The subquestions that were also addressed included the following:

1. How did traditional teaching and learning change in a one-to-one computing environment?
    a. How did the one-to-one computing environment change traditional teaching and learning in a beginner teacher's and in a veteran a teacher's classroom?
    b. How did the one-to-one computing environment change traditional teaching and learning in a male teacher's and in a female teacher's classroom?
2. What were the perceived benefits associated with one-to-one computing environments?
3. What were the perceived concerns associated with one-to-one computing environments?

Description of Terms

The following list is a set of terms that will be utilized in this dissertation. The description of terms is presented to alleviate any confusion that might arise from the terminology used in this research study.

Adequate yearly progress. A federal term that measures the progress of all public schools and school districts toward enabling all students to meet the state's academic achievement standards.

Blended learning. The combination of learning methods, including face-to-face instruction coupled with asynchronous or synchronous computer technology (Vernadakis et al., 2012).

Learning management system (LMS). An online tool that organizes and regulates classroom tasks and supports both the teaching and learning process (Papadakis, Dovros, Paschalis, & Rossiou, 2012).

No Child Left Behind Act. A 2001 federal legislation that was instituted to foster improvements in academic achievement for all students (Carr, 2012).

One-to-one computing environment. An environment where schools provide students with portable laptop computers during class, enable students to access the Internet at school, and focus on utilizing laptops for academic tasks such as homework, tests, and presentations (Penuel, 2006).

Project-based learning. An educational approach to both classroom teaching and learning that is centered on the learner and affords learners the opportunity for in-depth investigations of worthy topics (Grant, 2002).

Significance of the Study

There are still several unanswered questions about implementing a ubiquitous one-to-one computing environment. The educational community firmly believes that research is lacking related to the perceived benefits and concerns associated with a one-to-one computing environment (Dawson et al., 2008; Lei & Zhao, 2008; Mouza, 2008; Penuel, 2006; Rosen & Beck-Hill, 2012; Stephens, 2012; Warschauer, Zheng, Niiya, Cotten, & Farkas, 2014). With the prevalence of one-to-one computing environments in schools across the United States, the research from this study will help fill in the gaps of the perceived effects of a one-to-one computing environment on the overall classroom atmosphere. This study provided vital information about how traditional teaching and learning change in a one-to-one computing setting. This specific question has yet to be answered in the academic setting. With the addition of a ubiquitous one-to-one computing environment in schools, has this affected traditional instructional practice in the classroom setting? What benefits and concerns are commonly

related to a ubiquitous one-to-one computing environment? The preceding questions brought forth in this study cannot be answered with any certainty.

The first part of this study examined how traditional teaching and learning changes in a one-to-one computing environment. The next part examined was the perceived benefits associated with implementing a one-to-one computing environment. The last part of this study sought to uncover the perceived concerns associated with implementing a one-to-one computing environment. The information compiled from this study provided the needed guidance for K–12 academic communities that are researching the possibility of employing a ubiquitous one-to-one computing environment for their students. Not only will this study be a great starting point, but it will also fill in the gaps in the research associated with one-to-one computing environments.

This mixed-methods study examined one-to-one computing in three high schools in the midwestern United States regarding the perceived effects of a one-to-one computing environment on the overall classroom atmosphere. The insight gained from this study will have a profound impact on not only educators, but also policy makers across the United States. Academic consumers will have the ability to take an in-depth look at how a one-to-one computing environment could transform their overall school district. This study was designed to make a pivotal contribution to both policy makers and practitioners across the United States by creating a practical framework to help guide decisions when they relate to instructional methods, curriculum choices, and school budgets.

Overview of Research Methods

Creswell (2013) stated that “mixed methods involve combining or integration of qualitative and quantitative research and data in a research study” (p. 14). Three high schools in the midwestern United States that had just adopted a one-to-one computing environment were

invited to participate in the study. Each school had implemented a one-to-one computing environment for at least three years and utilized a Mac- or a PC-based program for learning.

The researcher collected both qualitative and quantitative data. For the qualitative portion of this study, nine participants took part in the interview portion. The quantitative portion of the study consisted of an online survey, which was sent through Qualtrics survey software to 57 participants. Both the qualitative and quantitative sections of this study were intended to find the perceived effects of a one-to-one computing environment on the overall classroom atmosphere. The interviews were conducted with both administrators and teachers. Before the study took place, approval was gained from the three different schools. When it came to the interview portion of the research, the interviews were transcribed, audio recorded, and triangulation took place (Creswell, 2013; Creswell & Clark, 2007; Yin, 2009). Dr. Robert Maninger's survey, "Teacher Survey: One-to-One Computing in Educational Research," was utilized and distributed to teachers in the three different high schools to gather their perceptions on the effects a one-to-one computing environment has on the overall classroom atmosphere. The survey questions also underwent a rigorous content validity process.

Administrators at each school filled out a participant criteria form and the researcher made the final decision about which participants would take part in the study based upon the ratings given by the three school administrators. The participant criteria form was intended to identify educators who were considered novice teachers or master teachers in their respective districts. For the interview section of this study, weaknesses identified on the participant criteria form categorized teachers as novice teachers and strengths on the participant criteria form categorized teachers as master teachers. The researcher selected both a novice teacher and a master teacher from each district school to participate in the study. The teachers were asked

questions associated with any changes that had occurred in regards to student learning and teaching methodologies in a one-to-one computing environment. Administrators were asked questions that related to the function of their position in this new learning environment. Prior to conducting the interviews, the researcher conducted reliability and validity tests on the interview questions, and nine experts in the field of technology piloted the questions.

The survey data were collected after the interviews were complete. Within the survey portion of the research, teachers were categorized as beginner teachers or as veteran teachers based upon their years of experience in the classroom setting. Teachers with less than 10 years of teaching experience were categorized as beginner teachers, and teachers with 11 years or more of teaching experience were categorized as veteran teachers. The online survey was sent to all high school teachers in the three school districts. Data collection for this study followed a formal plan, and the data were analyzed to determine certain themes and patterns that related to ubiquitous one-to-one computing environments. This systematic approach ensured the entire data collection process would produce reliable results.

While conducting this study, particular care was given to running this research in an ethical manner. Before data were collected, approval for this study was gained from Northwest Nazarene University's human research review committee, and the researcher completed the National Institutes of Health certification requirements (see Appendix A). Participation in both the interviews and survey was completely voluntary. All of the participants were informed of the research and were given the opportunity to withdraw from the study at any point without affecting their standing in any way. To protect the confidentiality of both the participants and the school districts, pseudonyms were used.

Chapter II

Review of the Literature

Introduction

During a time when the nation is focused on standardized assessment results, No Child Left Behind mandates, and adequate yearly progress, the function of educational technology has become a much debated topic among patrons across the United States (Donovan et al., 2007). The onset of new computing devices has changed the overall makeup of the traditional classroom (Donovan et al., 2011; Penuel, 2006; Soffer, Nachmias, & Ram, 2010). Some educators argue that many of the activities have stayed the same in the classroom, although others point out the 21st-century classroom has allowed students to accomplish many new undertakings with access to one laptop per student (Donovan et al., 2007). The traditional makeup of a school system has changed rapidly across the United States. This holds true especially when analyzing how technology is changing the conventional norms with which many educators have been accustomed. Technology is increasingly being implemented into school curriculums across the United States (Donovan et al., 2007; Maninger & Holden, 2009; Penuel, 2006).

With the arrival of widespread availability of the Internet, school districts have been taking advantage of implementing new computing devices into both their classrooms and their curriculum. The traditional classroom has been transformed with the advent of one-to-one computing in America (Klieger et al., 2010; Parr & Ward, 2011; Soffer et al., 2010). One-to-one programs have been implemented with greater frequency over the past 10 years in the United States (Beaudry, 2011; Donovan et al., 2007; Stephens, 2012). Many districts are making sizable monetary investments into new classroom technology with little regard to the perceived academic outcomes associated with such an investment (Dawson et al., 2008; Rosen & Beck-

Hill, 2012; Stephens, 2012). One of the most important items educators point to is student achievement and how it relates to educational technology. The ruling is still not apparent if ubiquitous access to computers will, in fact, improve student achievement across the board.

This current study was grounded in Rogers' (2003) diffusion of innovation theory. Rogers' theory provided a conventional framework to analyze the benefits and the concerns associated with implementing a one-to-one computing environment in school districts. The use of Rogers' diffusion of innovation theory provides a useful lens for researchers to understand the implementation process that follows the introduction of a one-to-one computing environment. A useful part of Rogers' theory is the ability to measure the rate at which an innovation is adopted. Rogers' (2003) diffusion of innovation theory has five adopter categories, which include (a) innovators, (b) early adopters, (c) early majority, (d) late majority, and (e) laggards. Each category designates where individuals will fall when a new innovation is adopted.

The literature review that follows is broken down into seven parts:

- Student achievement in education
- Educational concerns across the board
- Learning management systems
- Blended learning (where online and face-to-face instruction meet)
- Professional development in K–12 education
- 21st-century skills
- A theoretical framework (diffusion of innovation).

Each of the seven components provides further insight into the dynamics associated with implementing a one-to-one computing environment and items to consider when adopting a one-to-one computing environment for a school district.

Student Achievement in Education

As with any high-stakes endeavor in education, it is going to attract the attention of the public when exploring the different factors that affect one-to-one computing as it relates to student achievement. It is important to consider taxpayers' thoughts about a return on their investment in classroom technology. Some studies conducted in one-to-one computing have examined different aspects associated with the new phenomena, such as student achievement. Researchers have examined how professional development can play a key role in increasing student achievement as it supports one-to-one computing (Beaudry, 2011; Cavanaugh, Dawson, & Ritzhaupt, 2011; Gulek & Demirtas, 2005).

Beaudry (2011) conducted a mixed-methods study to determine the relationship between teachers' use of technology and their technology professional development experience and how the relationship relates to student achievement. The study was conducted over a yearlong period in a Florida public school district. The participants in the study included 80 fifth-grade teachers. During the yearlong study, data was collected through online surveys and interviews. Of the 80 fifth-grade teachers who took the online survey, seven participated in a 30-minute interview. Beaudry's (2011) study indicated there was a relationship between how teachers utilized technology and how their students used technology when it came to professional development. The research supported the notion that informal peer support provided by teachers can help enhance teachers' abilities to integrate technology into classroom practices. Ongoing peer support had a substantial impact when it was coupled with meaningful professional development, which promoted technology application in the classroom setting and increased student achievement (Beaudry, 2011).

The main purpose of implementing laptops in schools across the United State varies from school to school and from district to district (Carr, 2012; Dunleavy & Heinecke, 2007; Hur & Oh, 2012). Some studies have focused on the immersion of laptops and the effects it has on student learning. One of the common themes among districts is to raise student achievement. Gulek and Demirtas's (2005) research indicated a positive correlation between laptop immersion and student achievement. There was evidence that "students who did participate in the program tended to earn significantly higher test scores and grades for writing, English-language arts, mathematics, and overall grade point averages" (Gulek & Demirtas, 2005, p. 29). From this study, the researchers found the laptop immersion program had positive effects on their writing skills as well (Gulek & Demirtas, 2005).

Other studies have evaluated the relationship between technology use and student outcomes by comparing the quantity of technology. Lei's (2010) mixed-methods study provided evidence of a significant positive association between the use of communication technology and student developmental outcomes and student achievement. The results were not as promising between the use of technology and student achievement. Lei (2010) found that technology did not have significant effects on student grade point averages. The teachers who participated in the study believed the one-to-one laptop environment allowed the students to explore beyond the walls of the classroom and added value to their overall lessons. As one of the teachers stated, the learning associated with technology was a hidden item because learning with technology was hard to measure at times in the classroom setting (Lei, 2010, p. 467). Lei's (2010) mixed-methods study embraced both the benefits and the concerns associated with a one-to-one laptop environment in the educational settings.

Research conducted to analyze student achievement has been completed on a broader platform (Gulek & Demirtas, 2005; Lei, 2010; Lowther et al., 2012). Penuel's (2006) research synthesized 30 articles from research and evaluation studies that analyzed implementation and the effects of one-to-one initiatives from a range of countries. The outcome of Penuel's (2006) study provided an understanding of how students use laptops during one-to-one initiatives, and there was preliminary evidence that when school districts provide students with 24/7 access to computers, it reinforces their technology skills. The students who took part in one-to-one initiatives improved their technology literacy and skill by using word processing tools to improve their writing skills. On the other hand, there was still evidence lacking in certain areas. Penuel (2006) suggested there was not enough evidence to support the notion that one-to-one computing environments improve student achievement in core subjects. However, one-to-one initiatives have a positive impact in K–12 schools on technology use, technology literacy, and writing skills.

Technology-rich learning environments are becoming more prevalent in the United States (Dawson et al., 2008; Gulek & Demirtas, 2005; Lei, 2010; Penuel, 2006; Rosen & Beck-Hill, 2012; Siegle & Foster, 2001). Researchers are utilizing different mediums to process data and results associated with student achievement. The participants in the Rosen and Beck-Hill (2012) study consisted of 476 fourth- and fifth-grade students and their teachers. During the yearlong study, the researchers used standardized assessment scores, school records on attendance and discipline, student questionnaires, and observations in experimental and control classes. This study provided a comprehensive look at the role that a constructivist, one-to-one computing program has on teaching and learning practices, as well as student achievement. The results of their yearlong study indicated an increase in students' achievement, reduced students' unexcused

absences, and improved students' discipline as a whole. The use of technology also promoted differentiated teaching and learning in the classrooms. A constructivist, technology-enriched approach validated the technology practices. One important item to note was how the change in student attendance had a direct impact on students' achievement scores and the students' attitudes towards learning. Rosen and Beck-Hill's (2012) research helped shed some light on the educational benefits that can be achieved through an effective one-to-one laptop initiative.

Over the years, research has shown that one-to-one initiatives have demonstrated the ability to decrease the achievement gaps in schools (Penuel, 2006; Rosen & Beck-Hill, 2012; Young, 2012). Smith (2012) conducted a longitudinal quantitative study to determine how a one-to-one initiative affects student achievement gaps for students in a single high school. The results of the study compiled four years' worth of Algebra I and English end-of-course test scores. The outcome of the study provided evidence that the achievement gaps narrowed based upon English I and Algebra I end-of-course assessments between male scores and female scores. It should also be noted there was still a gap in achievement scores. Another intriguing finding from the survey data suggested that the one-to-one laptop initiative was the single most influential initiative the school implemented during the four year study. Smith (2012) documented evidence that "technology staff development is a crucial factor for the implementation and sustainability of a one-to-one initiative" (Smith, 2012, p. 105). The results from this study pointed to the positive impact that one-to-one laptop initiatives can have on student achievement when they are coupled with strong teacher–student rapport (Rosen & Beck-Hill, 2012; Smith, 2012).

One-to-One Computing Concerns

With any new movement in education, there will often be concerns associated with implementing something new in education. The concerns surrounding one-to-one computing are

no different. Some educators are concerned about the effectiveness of one-to-one laptop initiatives when it relates to the high costs of the equipment, and others have concerns about the practicality of laptops in the classrooms (Donovan et al., 2007; Grant et al., 2005; Russell et al., 2004).

Carr (2012) conducted a quantitative study to determine the effects of iPad use as a one-to-one computing device on fifth-grade students' mathematic achievement in two rural Virginia elementary schools. The study was conducted over one academic quarter, or nine weeks. The participants of the study included 104 fifth-grade students. During the nine-week study, the researcher collected data based on both pretests and posttests. Carr's research (2012) indicated the use of iPads in the classroom was not meaningful enough to significantly influence students' mathematics achievement. Carr (2012) continued by stating, "This finding indicates that instruction with the supplemental use of the iPad was not an effective intervention for fifth-grade students' mathematics achievement according to the manner in which the current investigation was conducted" (p. 278). Another concern identified in the study was the interventions of the iPads did not impact students' mathematics achievement. This can be attributed to the overall duration of the interventions, which led to the lack of a significant impact.

Teacher education programs. Others studies in the educational field have focused more on the concerns associated with teacher education programs (Donovan et al., 2011; Esterhuizen, Ellis, & Els, 2012; Lei, 2010). Donovan and Green (2010) conducted a qualitative study on the impact of a changing educational context, prompted by the addition of student laptops into the teaching and learning environment, on faculty concerns of their role as teachers–educators. The study was conducted in the fall of 2007 in a large state public university in Southern California. The participants in the study included 29 teacher candidates, eight instructional faculty, and two

supervisory faculty. During the yearlong study, the researchers collected data based off of the Stages of Concern Questionnaire and one-legged interviews.

The research Donovan and Green (2010) conducted established three different areas of concerns that could occur when faculty members at a teachers' college employ one-to-one programs into their teaching regiment. The region where faculty concerns were confirmed existed in the areas of faculty readiness, faculty preparation, and faculty differences (Donovan & Green, 2010). As most educators might expect, the faculty members were concerned about being proficient in the use of the laptops. The second faculty concern was faculty preparation. Preparation, in terms of training and professional development, was a crucial step to take before implementing a one-to-one laptop program. The last concern brought up by this study was faculty differences related to technology use. Faculty members were going to utilize technology in a different way to meet their needs, and this was apparent in the study.

Academic achievement. Dunleavy and Heinecke (2007) conducted a quantitative study to determine the effect of one-to-one laptop use to student ratios on math and science achievement in at-risk middle school students. The two-year study was conducted in a middle school in an urban school district located in a mid-Atlantic state. Dunleavy and Heinecke (2007) described the outcome of their study, which provided evidence that

> 1:1 access to laptops at the school in the study did have a positive effect on science learning, but not one experienced equally by girls and boys. In the current study, girls had similar physical access to computer resources but did not show similar results in terms of science content mastery (p. 19).

In this particular study, the use of a one-to-one computing environment appeared to be more effective for boys than girls in science instruction. It is also important to note that no significant

achievement differences in math between boys and girls were obtained. Dunleavy and Heinecke's (2007) research highlighted some of the perceived concerns associated with one-to-one computing environments.

Hur and Oh (2012) discussed a longitudinal mixed-methods study to determine the impact of a pervasive laptop environment on student academic achievement and learning engagement. The study was conducted over a three-year period in an all-male school in the western part of Korea. During the three-year study, researchers collected data based on test scores, laptop surveys, teacher reflections, and student interviews. Their findings revealed the use of laptops was not beneficial for achieving high test scores due to the fact the tests utilized mainly measured memorization skills (Hur & Oh, 2012). Another concern with laptop use was that students tended to misuse the Internet, which in turn negatively affected the students' engagement in learning (Hur & Oh, 2012). When the students took their laptops home, they spent increasing amounts of time playing online games and watching movies (Hur & Oh, 2012). The findings of this study pointed out some of the consequences associated with a one-to-one laptop initiative.

Siegle and Foster (2001) analyzed the effect of laptop computers, multimedia, and presentation software on student achievement in anatomy and physiology classes. The study was conducted over the course of one school year. The authors used a control-and-experimental group counterbalanced design. Group A utilized laptop computers with multimedia software and PowerPoint presentation software. The controlled group, Group B, did not have access to any laptop computers. The students were both taught the same curriculum by the same teacher. Classroom instruction was based on lectures, lab activities, and open-ended projects. Group A reviewed the course materials with their laptops and used PowerPoints to make presentations.

The outcome of the study demonstrated that students in high school benefited from full-time access to laptop computers. The research indicated that laptop computers and software had a positive effect on students' grades. It was important to note that one-to-one initiatives can help bridge gaps by allowing students access to technology at both home and school.

Technology implementation. Several research studies have examined higher education and concerns associated with technology implementation (Lawrence & Lentle-Keenan, 2013; Rossing, Miller, Cecil, & Stamper, 2012; Venter, Van Rensburg, & Davis, 2012). Lawrence and Lentle-Keenan (2013) conducted a qualitative study to determine the relationship between teaching beliefs and practices, institutional constraints, and the uptake of web-based technology for teaching in higher education. The study was conducted at Open Polytechnic of New Zealand, and the researchers collected data based on a semistructured interview that lasted approximately one hour. The research confirmed there were concerns about time constraints when implementing technology and managing workloads. These were all very common themes among teachers who utilized online technology minimally in their current teaching techniques. The results of this study indicated these barriers must be analyzed before a district decides to invest money in a one-to-one computing environment.

Learning Management Systems

Advances in technology have had a profound impact on how instruction is delivered (Beaudry, 2011; Rosen & Beck-Hill, 2012; Subramaniam & Kandasamy, 2011). The adoption of online classes has led to greater collaboration and interactions between students and teachers (Venter et al., 2012). This holds especially true when analyzing an learning management system (LMS). The integration of LMSs in education has opened the door to numerous possibilities for online interaction between students, teachers, and parents (Blau & Hameiri, 2010). LMSs have

played a part in the creation of distance learning classrooms across the globe (Venter et al., 2012). LMSs have been pivotal when administering learning programs and supporting online communications. The increased number of LMSs have replaced common face-to-face teaching methods with a more convenient approach that allows students to access their overall learning environment at just the touch of a button. This change has undoubtedly reduced the physical presence of many classroom environments (Subramaniam & Kandasamy, 2011). When examining LMSs, the use of Rogers' (2003) diffusion of innovation theory is a useful framework to understand the rate in which a new innovation is adopted.

Some recent studies have focused on the online interactions among educators (Berger, 2005; Donovan & Green, 2010; Klieger et al., 2010; Parr & Ward, 2011). Blau and Hameiri (2010) conducted a longitudinal quantitative study to determine the different forms of online interactions among educators during the implementation of a new LMS. The researchers collected data from the LMS called Mashov. The three forms of teacher online activity collected were the number of teacher logins into the system, the percentage of daily data entered by teachers into the system, and the number of messages sent by teachers to their colleagues through the system. The research provided evidence that the school successfully implemented the Mashov LMS into their school culture. The results were consistent with Rogers' (2003) diffusion of innovation theory, which showed the implementation time was related to the three different measures of online activity: (a) logging into the system, (b) sending messages, and (c) reporting data. Schools in this study were successful when they aligned the school's vision to match the online learning management platform.

Green, Inan, and Denton (2012) conducted a qualitative study to determine what factors influence student satisfaction with a new LMS. The study was conducted at a research institution

in the southwestern United States. The participants of the study included 390 students ranging from freshmen to seniors. The students came from different academic disciplines and were enrolled in courses designed and taught by faculty members who participated in a pilot group test of a new LMS. During the study, researchers collected data based on a 19-question online survey (Green, Inan, & Denton, 2012). Evidence revealed the students recognized that the LMS was useable, and the use of the LMS resulted in a higher satisfaction rate. Additionally, if an LMS took more time to learn or utilize, or if it was difficult in some way or another, students would be less likely satisfied with the overall system as a whole (Green et al., 2012). When it came to student satisfaction, it was important to consider the usability of online programs to ensure an environment that was conducive to learning. It was also important for educators to establish a one-to-one computing environment that was usable and would ultimately ensure students' success throughout the entire learning process.

The following study demonstrated how LMSs can play an essential role in supporting a viable one-to-one computing environment in schools across the United States. Kim and Lee (2008) conducted a qualitative study to determine what model can be validated for evaluating LMSs in e-learning fields. This particular study was conducted in universities that were utilizing e-learning programs. The participants of this study included 133 e-learning experts consisting of education technology faculty, e-learning education managers, e-learning planners, e-learning consultants, programmers, web designers, and other faculty members. All of the e-learning experts had more than one year of experience with e-learning in universities. The researchers collected data based on a survey, and the survey was collected by visitations, mail, and e-mail. The outcome of the study provided evidence that there were seven factors that can benefit the participants of e-learning. The seven factors are "easiness of course procedure, interoperability of

system and suitability of academy administration, easiness of instruction management and appropriateness of multimedia use, flexibility of interaction and test and learner control, variety of communication, test types, and user accessibility" (Kim & Lee, 2008, p. 291). The overall evaluation model can play a vital role in assessing the effectiveness of LMSs.

The Subramaniam and Kandasamy (2011) conducted a quantitative study to determine the students' perceptions of the virtual classroom based on their learning experiences. The study was conducted at the Open University in Malaysia. The participants in the study included 23 students who utilized the LMS known as *my*VLE. The LMS called *my*VLE was an asynchronous-based online learning environment that delivered course materials to learners and provided collaboration and interaction using an asynchronous-based forum as the main platform to support the learners' independent study.

The Subramaniam and Kandasamy (2011) study suggested there were areas for improvement in the dynamics of the virtual classroom. Students in the study preferred face-to-face tutorials when compared to the virtual classroom. This can be attributed to the Asian culture, which holds the expectation that attendance in the classroom is considered a necessity in the teaching dynamic. Many of the students in the study viewed the virtual classroom as supplementary learning and believed learning should be completed in the traditional setting. The evaluation completed by the students indicated the virtual classroom had very little impact on their overall learning. Their responses revealed some of the obstacles educators must overcome when they look at implementing an LMS.

Some studies have analyzed the performance of LMSs (Kim & Lee, 2008; Subramaniam & Kandasamy, 2011; Yapici & Akbayin, 2012). Venter, Van Rensburg, and Davis (2012) conducted a quantitative study to establish the determinants of using an online LMS by 4th-level

business students at a South African university. The university in South Africa was both an open learning and distance learning university. The participants of the study included 213 advanced business students enrolled in a strategic management course. The researchers used an extension of the widely used technology acceptance model as a theoretical basis. During the study, researchers collected data from a questionnaire, which was distributed to students at the start of the class and was completed during academic breaks. The study provided evidence that suggested the use of an online LMS was rated high in study relevance and performance enhancement (Venter et al., 2012). The areas of facilitating conditions and the available support for students using the LMS, were two areas that could be improved, and once improved, it could lead to increased usage and better overall control (Venter et al., 2012). The finding of the study demonstrated the need for research associated with one-to-one computing devices across the globe.

Blended Learning: Where Online and Face-to-Face Instruction Meet

The widespread availability of the Internet and one-to-one computing devices has sparked a variety of new movements in education. One new approach that has occurred with the overall changes in the traditional classroom is the new method known as blended learning. The term blended learning means the combination of learning methods, including face-to-face instruction coupled with asynchronous or synchronous computer technology (Vernadakis et al., 2012). In recent years, there has been an increase in the number of blended learning environments in both the United States and Europe (Gecer & Dag, 2012; Vernadakis et al., 2012; Yapici & Akbayin, 2012). Proponents of blended learning point out this new trend is a flexible approach to a course design that supports both different times and places of learning (Gecer & Dag, 2012; Papadakis et al., 2012; Yapici & Akbayin, 2012). Blended learning also offers

learners the convenience of an online course that encompasses the traditional practice of face-to-face learning (Yapici & Akbayin, 2012).

Gecer and Dag (2012) conducted a qualitative study to determine students' perceptions towards the Computer II course, which blended face-to-face and e-learning methods. The research was conducted in Kocaeli University in the departments of mathematics teaching and primary education. The participants included 67 freshmen students enrolled in the Computer II course from both regular and evening classes. Gecer and Dag (2012) collected data based on a seven-question, open-ended online survey and interviews with the 67 freshmen students. The research results indicated that when the Computer II course was compared to other courses, it had a positive impact, especially regarding the application and activities involved in evaluation and learning (Gecer & Dag, 2012). An additional theme of this study was the students thought the overall learning environment of a blended learning approach enabled them to have necessary information about the course conducted online and allowed for the exchanging of both ideas and opinions between students and teachers (Gecer & Dag, 2012). The research revealed that students believed they could control their learning and skills in a blended learning approach as opposed to the traditional learning methods (Gecer & Dag, 2012). The research suggested the potential that students had over their learning in a blended learning approach has when it is coupled with a one-to-one computing environment (Papadakis et al., 2012; Vernadakis et al., 2012; Yapici & Akbayin, 2012).

In a similar study, Papadakis, Dovros, Paschalis, and Rossiou (2012) discussed a mixed-methods study to determine the initial perceptions of Greek teachers regarding the integration of a learning activity management system (LAMS) in the educational praxis. The participants in the study included 46 Greek teachers from K–12 tertiary schools. The research team attempted to

investigate the preconditions required to integrate LAMS in everyday lessons, and two workshops were also organized with the participants. The collection of data was based on both observations and interviews. The results suggested the blended learning environment has the potential to produce students with a quality education that allows for a student-centered learning approach that expands time and space limitations accustomed with everyday lesson application (Papadakis et al., 2012). It is important to note that both teaching and learning in Greek schools were predominantly book-centered, and little concern was given to a student's creativity and problem-solving skills. The LAMS did show a lot of potential in an educational setting. This research proliferated the potential that an LAMS holds when it is utilized in the educational settings with a blended learning approach.

In recent years, other researchers have looked at blended learning as it relates to student satisfaction. Some research has pointed out that students are more satisfied with their learning in blended learning environments (Gecer & Dag, 2012; Papadakis et al., 2012; Vernadakis et al., 2012). Vernadakis, Giannouis, Tsitskari, Antoniou, and Kioumourtzoglou (2012) conducted a quantitative study to determine students' satisfaction with a blended learning course delivery when compared to a traditional face-to-face class format in a general multimedia course in physical education. The research was conducted in the fall semester of 2008 in the Department of Physical Education and Sports Sciences at the Democritus University of Trace. The participants of the study included 46 third-year undergraduate students taking the elective course titled Information and Communication Application–Multimedia Systems. The data were collected through the use of online surveys. For this study, the students were randomly assigned into two teaching groups. The first group's instruction was based on classroom lecture instruction, and the second group's instruction was based on blended lecture instruction.

This particular study provided evidence that there was significantly more satisfaction with blended learning for the students (Vernadakis et al., 2012). The findings of this study also indicated the use of the blended learning format can be a viable option to increase students' satisfaction altogether. By supplementing traditional teaching methods with a blended learning approach, it made the whole course more accessible and interactive to the students' interests and especially their self-exploration (Vernadakis et al., 2012).

The literature base has focused on high school students' views on blended learning (Penuel, 2006; Siegle & Foster, 2001; Smith, 2012). There are endless options associated with the use of a blended learning environment in schools (Vernadakis et al., 2012; Yapici & Akbayin, 2012). Yapici and Akbayin (2012) conducted a qualitative study to determine high school students' views on blended learning. The study was conducted in the spring term of the 2009–2010 academic year at Nevzat Ayaz Anatolian High School in Turkey. The participants of the study included 47 ninth-grade students. During the study, researchers collected data based on student interviews. The lessons for this research study were taught using a combination of the Internet and face-to-face instruction. For the Internet component of learning, the LMS called *Moodle* was utilized. The research provided evidence regarding the students' views on blended learning was at an overall high level (Yapici & Akbayin, 2012). The students interviews also revealed that blended learning models offered students the opportunity to review their lessons, reach course materials without any constraints associated with time and place, and communicate with teachers and other students outside of classroom time. There were also various problems when it came to a lack of Internet connection at home for students and problems that students experienced while trying to play instructional videos. Yapici and Akbayin's (2012) research

indicated the perceived benefits and concerns associated with implementing a blended learning model.

Professional Development in K–12 Education

The infusion of technology into the classroom setting has transformed the traditional functions of classroom practices. In order for modern-day educators to be successful, it is crucial to support new practices with professional development (Donovan et al., 2007; Klieger et al., 2010; Parr & Ward, 2011). Professional development should help support teachers' skills, knowledge, and confidence (Parr & Ward, 2011). Effective professional development for educators needs to take a comprehensive approach that includes both technical and pedagogical support along with effective leadership, curricula, and assessment resources (Allan et al., 2010; Beaudry, 2011; Nelson, 2011; Parr & Ward, 2011; Raulston, 2009). In order to sustain one-to-one computing environments, it is vital for school leaders to acknowledge teachers' concerns (Carr, 2012; Cowie, Jones, & Harlow, 2011; Donovan et al., 2007).

In a mixed-methods study, Cavanaugh, Dawson, and Ritzhaupt (2011) determined the changes in tool-based, student-centered teaching, which happened as a result of the infusion of laptop technology, professional development, and systematic support in classrooms. The research was conducted over a school year in 11 Florida school districts. The participants in the study included 440 teachers across all subject areas in 47 K–12 schools. Each district that participated in the study had access to laptop computers in some capacity during the school year. During the yearlong study, the researchers collected data based on multiple observations, document analyses, interviews, and teacher inquiries. The overall outcome of the study revealed increases in project-based learning, student attention and motivation, and academically focused class time (Cavanaugh et al., 2011). There was also data from the study that showed increases in

student achievement for some classrooms (Cavanaugh et al., 2011). Three classrooms demonstrated negative effects when it came to student achievement, and this was attributed to the students' lack of experience with technology while they were learning the class lessons. The outcome of this study demonstrated how one-to-one computing environments can change the overall classroom dynamic in a positive way by increasing student attention and motivation and raising student achievement.

Other studies have focused on the overall possibilities that one-to-one computing environments offer. Cowie, Jones, and Harlow (2011) conducted a longitudinal mixed-methods study to determine the impact of laptops on secondary teachers' work in New Zealand schools. The 147 participants consisted of both secondary teachers and administrators. During the 3-year study, researchers collected data based on both questionnaires and focus groups. The information from the questionnaires provided insight on how teachers utilized their laptops, the support they experienced, and availability of items they needed to support their laptop use. The focus groups allowed for in-depth information about teachers' use of laptops. This research indicated teachers' perceived concerns about utilizing laptops as an educational tool in the classroom setting. The study found that to enhance teachers' use of laptops required professional development, technical support, and organizational and administrative systems to support teachers' laptop use overall. Cowie et al. (2011) found that teachers' perceptions about implementing laptops would have been different if there had been more of an emphasis on professional development. Another important factor was how professional learning communities can have a profound impact on collaboration amongst staff members.

In a related study, Dawson, Cavanaugh, and Ritzhaupt (2008) analyzed the changes that occurred in teaching practices with the infusion of laptop technology and professional

development. The Florida Department of Education funded 11 districts through Enhancing Education Through Technology funds to implement laptop initiatives. Their study was conducted during the 2006–2007 school year in Florida. The participants in the study included 447 classrooms in 11 different districts. During the yearlong study, around 400 hours of classroom observations were conducted. The observations consisted of a series of unscheduled three-hour visits to schools. The two data collection instruments utilized were the School Observation Measure and Survey of Computer Use. The outcome of the study showed increased student-centered teaching and increased amounts of meaningful uses of technology within educational contexts when combined with professional development (Dawson et al., 2008). Another interesting finding from the study suggested the implementation of laptops along with professional development may have an impact on the instructional practices at the school (Dawson et al., 2008). This study implied the importance large-scale laptop initiatives can have when impacting instructional practices associated with technology and professional development.

Donovan, Hartley, and Strudler (2007) study discussed teacher concerns during the implementation of a one-to-one laptop program at the middle school level. The study was conducted in an urban middle school in the southwestern United States. The participants in this study included 17 seventh-grade teachers and two building-level administrators. Concerns were identified through informal interviews, open-ended concern statements, and stages of concern questionnaires. The outcome of the study provided insight that indicated teachers struggled with implementing a teacher-centered classroom that utilized student-centered tools. Another important factor was the significance that professional development plays before school districts decide to undertake a one-to-one laptop initiative. The researchers suggested that focusing on

teachers' concerns will lead to a more effective professional development environment and support changes in teachers' practices overall. Donovan et al.'s (2007) findings revealed the positive impact that focusing on individual teacher concerns has when implementing effective professional development programs.

Klieger, Ben-Hur, and Bar-Yossef (2010) conducted a qualitative study to determine teachers' attitudes towards integrating laptop computers into the classroom, teachers' professional development, and teachers' personal empowerment. The study was conducted three years after the "Katom" program (computers for every class, student, and teacher) was first implemented in Israel (Klieger et al., 2010). A 3-cycle, support-training model was developed for professional development. The first cycle was for all teachers, the second cycle was centered at individual schools, and the last cycle was based on specific disciplines. The participants of the study included eight science teachers from four different schools in Israel. During the yearlong study, researchers collected data based on semistructured interviews. The outcome of this study showed disciplinary training was the most relevant to teachers. Some of the major problems the teachers experienced in the classroom with one-to-one implementation were the control of student computers, technical problems, and computer integration related to laboratory work (Klieger et al., 2010). It is also important to consider the infusion of laptops in this case led to a shift from teacher-centered to student-centered teaching.

In a similar study, Stephens (2012) discussed a mixed-methods study to determine how communication patterns in one-to-one classrooms evolve over time. The study was conducted during the spring of 2010 in seven different Milwaukee public schools. The outcome of the study revealed that teachers who have taught two or more years in a one-to-one environment relied less on textbooks, utilized technology with greater frequency, and encouraged students to take more

responsibility when it came to their overall learning. One item noted was the importance of ongoing collaborative professional development to change their teaching practices overtime (Stephens, 2012). Another component that emerged in this study was when students had access to their assessment data, it empowered them to take more control over their overall educational process. This study supported the positive impact ubiquitous access to laptops can have on transforming the overall teaching and learning techniques in school districts.

21st-Century Skills

Traditional educational designs have shifted in recent years to more technology-driven platforms (Gunn & Hollingsworth, 2013). The popularity of technology and the Internet in the classroom has increased the availability of information to students and improved how students communicate. Traditional educational methods that were once largely based on lower order skills, such as memorization and repetition, are no longer as essential as people believed they once were. Today's students are being asked not only to know the information, but also apply the information into real-life settings, think critically about the material, and evaluate the overall effectiveness of the information. This new form of digital learning has promoted the importance of students acquiring 21st-century skills in schools. Learners today need innovative teaching that leads to 21st-century skills such as critical thinking, problem solving, communication, collaboration, and creativity (Gunn & Hollingsworth, 2013; Kong et al., 2014; Lowther et al., 2012). These 21st-century skills play a vital role in enabling students to decipher information that can be easily accessed on the Internet. Using Rogers' (2003) diffusion of innovation theory provided the researcher with the ability to see how an innovation, such as acquiring 21st-century skills, occurs over time, and it let the researcher decide the degree to which an innovation was adopted.

Implementing laptops into schools has changed traditional instructional methods. This new dynamic has allowed educators to implement project-based learning activities into their classrooms. In a recent study related to this new dynamic, Lowther, Inan, Ross, and Strahl (2012) conducted a mixed-methods study to determine the overall effectiveness of the Michigan Freedom to Learn program (2005–2006) on teaching practices and student learning. Their study provided evidence that teachers implemented more student-centered strategies such as project-based learning and independent inquiry. The teachers in the study also believed by incorporating laptops into their lessons, it directly impacted student development of 21st-century skills. Another important outcome was the students believed the laptop computers improved their learning and study skills. This study outlined the overall importance of implementing laptops, not only to try and raise student achievement, but also to develop 21st-century skills and knowledge (Lowther et al., 2012).

The formation of 21st-century skills has not only transformed how students learn, but it has also transformed teacher education programs. Donovan, Green, and Hansen (2011) study discussed the differences in student technology outcomes between a one-to-one teacher education program and a more traditional teacher education program. The study's findings indicated there was statistical evidence supporting the notion that providing a one-to-one computing environment promotes 21st-century skills in teacher candidates better than traditional methods do (Donovan et al., 2011). In this study, they also found their skill levels significantly increased. Teacher candidates who did not have access to computers did not improve their technological skill level, and their beliefs about technology in the educational setting did not change (Donovan et al., 2011). The findings demonstrated the importance that one-to-one

learning initiatives can have in promoting 21st-century skills in elementary preparatory programs across the United States.

Other studies have examined promoting 21st-century skills by implementing laptops for educators. Raulston (2009) conducted a longitudinal mixed-methods study on the perceptions and attitudes of teachers following the implementation of a teacher laptop initiative. This particular study provided evidence that if educators are given proper technology coupled with proper training, their overall attitudes and classroom pedagogy change (Raulston, 2009). The integration of technology into classrooms by educators can help prepare students for the 21st-century. Quality professional development and training play a crucial role when implementing a one-to-one laptop initiative for teachers. School leaders need to spend time up front laying down the foundation if they want to see teachers implement technology to enhance the overall atmosphere of their classrooms. Raulston's (2009) study displayed the positive impact that teacher laptop initiatives can have in changing teachers' overall perceptions of implementing technology into their classrooms and promoting 21st-century skills.

In an effort to address the ever-changing classroom, schools have looked to transform their teaching to match the shift towards 21st-century skills. Gunn and Hollingsworth (2013) discussed a longitudinal quantitative study to sustain professional development in a single school district that empowered teachers to successfully adopt 21st-century teaching methods, strategies, and pedagogies. The findings from this study suggested the implementation of 21st-century techniques occurred more frequently when the hours of professional development increased. This study demonstrated the importance that professional development plays in transforming veteran teachers' strategies and methods for the 21st-century teaching and learning.

Theoretical Framework: Diffusion of Innovation

Providing every student with ubiquitous access to laptops is a new phenomenon in education. This new inclination presents many new challenges that need to be addressed. Rogers' (2003) diffusion of innovation theory provides a useful framework to analyze both the perceived benefits and concerns associated with ubiquitous access to one-to-one computing environments. The four main elements in the diffusion of innovations process are innovation, communication channels, time, and social system. The first item, innovation, is the idea or practice that is perceived as new. The next element is communication channels. This area is where individuals share information to reach a mutual understanding. Time refers to the period that it takes to adopt a new innovation. The last component is social system. This relates to both the interrelated units striving to achieve a common goal and the social structure of the social system (Rogers, 2003).

An additional area examined by Rogers (2003) was the innovation–decision process in which people adopt new innovations. For Rogers (2003), the innovation–decision process utilizes five distinct steps: (a) knowledge, (b) persuasion, (c) decision, (d) implementation, and (e) confirmation. Each of these phases occurs in a time-ordered manner. The knowledge stage is where the individual learns about innovation and seeks information about the overall innovation. According to Rogers (2003), this is where a number of questions are asked and the answers provide three types of knowledge: (a) awareness knowledge, (b) how-to knowledge, and (c) principles knowledge. The awareness knowledge provides knowledge of the innovation's existence. The how-to knowledge is how to use the innovation, and the principles knowledge is how and why the innovation works.

The next step, the persuasion stage, is where the individual has a negative or a positive attitude towards the innovation. During this stage, individuals form their opinions about the

innovation and beliefs start to form based on social reinforcements (Rogers, 2003). The next phase is the decision stage and this is where the individual decides to adopt or reject the innovation. If the innovation is adopted, then that leads to the implementation stage. At this stage, the innovation is put into practice. Reinvention is a theme that usually occurs at this stage. This is when the innovation is changed or modified to meet the needs of the adopter. The last stage is the confirmation stage. This is the stage where the individual looks to support their decision and confirmation is sought from other individuals (Rogers, 2003).

One of the last components of Rogers' (2003) diffusion of innovation theory is the rate in which an innovation is adopted. Rogers' (2003) adopter categories have five parts, which include (a) innovators, (b) early adopters, (c) early majority, (d) late majority, and (e) laggards:

- Innovators are willing to try new ideas and are considered to be risk takers when implementing a new innovation.
- Early adopters are individuals who hold leadership roles in the social system, and members of the social system come to them for advice and information about the new innovation. Early adopters are willing to try new innovations and support other individuals in their social system.
- Early majority are individuals who do not hold leadership roles in the social system, but they are willing to adopt the innovation before half of their peers are willing.
- Late majority are individuals who wait for their peers to adopt the innovation and are skeptical about the innovation until it becomes common for everyday usage.
- Laggards are the last individuals to adopt the new innovation. They are the most skeptical of change agents and often oppose leadership.

The use of Rogers' (2003) diffusion of innovation theory provides a useful lens for researchers to understand the implementation of ubiquitous one-to-one computing environments. There have been a number of studies that have used Rogers' (2003) diffusion of innovation theory as their theoretical framework within the field of technology (Berger, 2005; Crompton & Keane, 2012; Sahin & Thompson, 2006; Siegle & Foster, 2001; Swan, 2009). Rogers' (2003) diffusion of innovation theory will help explore the perceived effects of a one-to-one computing environment on the overall classroom atmosphere.

Other studies have used Rogers' theory to guide their overall research. Berger (2005) discussed a qualitative study to determine the adult literacy providers' perceptions of the consequences of adopting the Internet into the classroom. During the study, the researcher collected data through telephone interviews. The participants were asked to describe changes in their students, their classroom environment, and themselves as teachers. Berger's (2005) study provided evidence the instructors' perceptions of many of the consequences were positive. One of the major criticisms the researcher faced was the inability of the diffusion of innovation theory to predict consequences. The use of the Internet in the classroom allowed for a better approach to bring learners together in a more collaborative environment.

Crompton and Keane (2012) conducted a qualitative study to examine the initial phase of the implementation of a one-to-one iPod Touch program. The study was conducted in a middle school in the southeastern United States. The participants of the study included nine core teachers (science, math, language arts, and social studies) and 341 students in grades 6–8. During the study, the researchers collected data based on observations, focus groups, and interviews. For the theoretical framework, Rogers' (2003) diffusion of innovation theory was utilized as the lens of the research. The outcome of the study brought forth the advantages in assessing students, and

providing immediate access to the Internet (Crompton & Keane, 2012). When students used iPod Touches in teachers' classrooms that were characterized as early adopters, these students were enthusiastic about using the devices and their teachers linked the use of iPod Touches to match their instructional activities. The opposite results occurred when students used iPod Touches in teachers' classrooms that were characterized as late adopters or laggards. These students were frustrated with the devices and no instructional benefits were seen during the classroom lessons. Crompton and Keane (2012) documented that "Rogers' [2003] adopter categories were useful in describing how teachers approached the use of the iPod Touch in their instruction and could contribute to a differentiated approach that would meet the specific needs of particular teachers" (Crompton & Keane, 2012, p. 12). A primary example of this would be to send a teacher who resented using technology to attend a workshop on different apps that would fit into his or her classroom instruction methods.

Sahin and Thompson (2006) conducted a quantitative study to examine what theory-based methodology could be utilized to better understand specific instructional computer use by the college of education faculty at Anatolian University in Turkey. For the theoretical framework, Rogers' (2003) diffusion of innovation theory was utilized in the process of instrument development, data collection, and interpretation of the results. During the study, the researchers collected data based on a questionnaire. The outcome of the study provided evidence that Rogers' (2003) theory was helpful to categorize and understand the faculty members' understanding of technology (Sahin & Thompson, 2006). The study promoted faculty-training programs that should be utilized to minimize barriers associated with technology (Sahin & Thompson, 2006).

Swan (2009) discussed a longitudinal qualitative study conducted to determine the replication evidence in the adoption process of an online portfolio system at a teachers college in the southeastern United States. The study was conducted over a five-year period in a teacher education program. The participants of this study included faculty members and teacher candidates participating in field experience programs. The study was framed by concepts related to the implementation of management information systems adapted from business and the diffusion of innovation theory promulgated by Rogers (2003). During the five-year study, Swan (2009) collected data from the portfolio system, faculty interviews, and faculty surveys. Swan (2009) provided evidence that supported the emergent perspective was the most useful framework when considering potential management information system implementations. This study documented that

> A portfolio by definition has multiple purposes and a myriad of ways to implement, so a tool that is designed to facilitate portfolio assessment, in addition to meeting accreditation and managing paperwork associated with field placements, is very likely to be perceived in different ways by faculty—all of whom have their own way of doing things. (p. 447)

This study indicates how the overall learning environment changes when computers are added to the equation.

Conclusion

For decades, it has been a priority to create effective learning environments for all students (Hakverdi-Can & Sonmez, 2012). One way to possibly accomplish this goal is by adopting a one-to-one computing environment for students. One-to-one computing environments are a recent trend that is being adopted in K–12 school districts across the United States (Lei & Zhao, 2008). This new trend can be attributed to the availability of wireless

Internet and the drop in prices of computer equipment (Maninger & Holden, 2009). The introduction of the digital age has had an impact on schools across the United States (Lei & Zhao, 2008). Advances in the use of technology have made a profound impact on how instruction is delivered in new mediums (Subramaniam & Kandasamy, 2011). The ways that instructional laptops are utilized in the classroom vary from district to district (Dawson et al., 2008). Many studies have indicated that there are both positive and negative aspects when technology is added to the classroom environment. Other educators are concerned about the effectiveness of one-to-one computing environments as it relates to the high costs of the equipment and all of the add-ons that must be purchased to run all of the technology properly (Donovan et al., 2007; Grant et al., 2005; Russell et al., 2004).

The mixed reactions to one-to-one computing environments can be attributed to the lack of empirical evidence surrounding these new programs (Dawson et al., 2008; Lei & Zhao, 2008; Mouza, 2008; Penuel, 2006). Educators across the United States believe the available evidence is inconclusive due to the rapid increase of one-to-one computing environments and the lack of research-based evidence available to analyze this new trend in education (Lawrence & Lentle-Keenan, 2013; Penuel, 2006). Others argue that providing students with access to computers will create more equitable learning opportunities and up-to-date learning environments through the use of the Internet in both the school and the home setting (Penuel, 2006). This is one of the many benefits that are associated with adopting a one-to-one computing environment. Along those same lines, ubiquitous access to computers allows students the opportunities to communicate with both their peers and their teachers, gain access to a wide array of resources at the touch of a button, and learn 21st-century skills such as critical-thinking skills, creativity, problem solving-skills, and collaborative skills with peers that are vital in the workplace

(Penuel, 2006). Students' perceptions of the use of computers at school are generally more positive when compared to teachers' perceptions, primarily because many students have already had extensive computer experience before they enter a classroom with a one-to-one computing environment (Maninger & Holden, 2009). When a one-to-one computing environment is employed, students tend to demonstrate increased curiosity, excitement, and collaboration in the classroom (Maninger & Holden, 2009). To understand the impact of one-to-one computing environments on students, educators must first understand how these devices are being utilized in the K-12 educational setting. It is apparent the traditional classroom is changing with the implementation of one-to-one computing environments (Donovan et al., 2011).

Changes in technology have altered the possibilities for learning and at the same time created new challenges in the classroom (Rossing et al., 2012). With current legislative mandates such as the No Child Left Behind Act, the demand has increased for schools across the United State to close the achievement gap and provide every student with access to a high-quality education (Mouza, 2008). New research will allow an in-depth analysis of challenges and issues that arise when a one-to-one computing environment is employed (Lei & Zhao, 2008). Not only is the research a vital component for districts across the United States, but one-to-one computing environments are an important new phenomenon that could have a profound impact on students in many different regards. One of the most important aspects that educators point to is student achievement and how it could possibly relate to educational technology in the classroom setting. The verdict is still not out on the success of this new classroom dynamic. As with any new endeavor, time and research will hold the ultimate key to the overall success of one-to-one computing in both teaching and learning.

Rogers' (2003) diffusion of innovation theory provided a practical framework to analyze the benefits and the concerns associated with one-to-one computing environments. Rogers' (2003) theory also offered a foundation of knowledge to understand the classroom dynamics that change in one-to-one computing classrooms. This framework works very well for analyzing technology because it outlines the rate in which an innovation is adopted. By using Rogers' (2003) diffusion of innovation theory, it provided the researcher the ability to understand the adoption process associated with the implementation of a one-to-one computing environment.

Chapter III

Design and Methodology

Introduction

The primary purpose of this study was to uncover the perceived effects of a one-to-one computing environment on the overall classroom atmosphere. A mixed-methods study design was employed to examine one-to-one computing environments in three schools in rural midwestern communities. Each of the three schools had implemented a one-to-one computing environment for at least three years and utilized a Mac- or a PC-based program for online learning. The term one-to-one computing environments, when it applies to this study, will be defined as where schools provide students with portable laptop computers during class, enable students to access the Internet at school, and focus on utilizing laptops for academic tasks such as homework, tests, and presentations (Penuel, 2006). The methods of this study will include (a) the research design of the study, (b) the participants who were selected for the study, (c) the data collection procedures and methods, (d) analytical methods, (e) the limitations brought on by this study, (f) the roles of the researcher, and (g) protection of human rights and approval. In addition, this chapter will describe the interviews and survey instrument that were used for this study.

Research Design

For this study, a mixed-methods study design was employed to examine one-to-one computing environments. A mixed-methods design allowed the research to combine both qualitative and quantitative data, and this study utilized a mixed-methods design to allow for the use of multiple data points (Creswell, 2013; Creswell & Clark, 2007; Yin, 2009). Creswell (2013) described mixed-methods research as an “approach to inquiry involving collecting both quantitative and qualitative data, integrating the two forms of data, and using distinct designs

that may involve philosophical assumptions and theoretical framework" (p. 4). The three underlying questions that will be answered in this study are the following:

1. How did traditional teaching and learning change in a one-to-one computing environment?
    a. How did the one-to-one computing environment change traditional teaching and learning in a beginner teacher's and in a veteran teacher's classroom?
    b. How did the one-to-one computing environment change traditional teaching and learning in a male teacher's and in a female teacher's classroom?
2. What were the perceived benefits associated with one-to-one computing environments?
3. What were the perceived concerns associated with one-to-one computing environments?

In this research design, three high schools across the Midwest that have implemented a one-to-one computing environment for at least three years were examined. This study utilized online surveys and interviews, which provided a rich and in-depth study of one-to-one computing environments in three schools in rural midwestern communities.

A total of three administrators and six teachers from three different high schools completed two face-to-face interviews. Each interview took 20–25 minutes to complete. Informed consent was obtained before the interviews took place (see Appendix C). The three administrators and six teachers were interviewed twice, and 18 interviews took place. The researcher followed an interview script to set up each interview with the nine participants (see Appendix D). During the initial phase of the interview the researcher gave verbatim instructions for every interview (see Appendix E). Administrators were asked questions that related to the

function of their position in this new learning environment in the fall of 2014. The six teachers selected were asked questions associated with any changes that had occurred to student learning and teaching methods in a one-to-one computing environment. The online survey was administered through Qualtrics survey software to all the high school teachers in the three different buildings. Before any teacher started the online survey, each participant gave consent by agreeing to take the survey (see Appendix J).

Participants

For the interview portion of the research, the participants were recruited based upon the predetermined participant criteria the three school administrators filled out during the months of July and August, 2014. The predetermined criteria aligned with 21st-century skills that are pertinent in schools today (Gunn & Hollingsworth, 2013; Kong et al., 2014; Lowther et al., 2012). The researcher selected a novice teacher and a master teacher from each district school to participate in the study based upon the predetermined criteria the researcher established. Teachers were rated on the following items: (a) collaboration, (b) communication, (c) creativity, (d) critical thinking, (e) flexibility, (f) problem solving, (g) teamwork, and (h) technology proficiency. Teachers who were rated high on the participant criteria form by their administrators were classified as master teachers, and teachers who were rated low on the participant criteria form by their administrators were classified as novice teachers.

For this study, weaknesses on the participant criteria form categorized teachers as novice teachers and strengths on the participant criteria form categorized teachers as master teachers. Master teachers selected for this study exhibited expertise in demonstrating 21st-century skills that are pertinent in the classroom setting. The years of experience teachers

possessed did not categorize them as either novice teachers or master teachers for the interview section of this study. The main factor in categorizing novice teachers or master teachers was the expertise teachers demonstrated of 21st-century skills that were evident in the classroom setting. All high school teachers took the survey. A mixture of male teachers and female teachers participated in the survey. Teachers were classified as either beginner teachers or veteran teachers based upon their years of experience in the classroom setting.

For this particular study, three rural midwestern schools were selected that had implemented a one-to-one laptop environment for at least three years. There were 56 students who attended the first high school, Jefferson High School. Jefferson High School had a graduation rate of 88%, their free and reduced lunch rate was 39%, and their mobility rate was 10%. At the second school, Lincoln High School, there were 113 students who attended. Lincoln High School had a graduation rate of 93%, their free and reduced lunch rate was 33%, and their mobility rate was 9%. The last high school included in this study was Washington High School. This high school had 128 students. Washington High School had a graduation rate of 100%, their free and reduced lunch rate was 41%, and their mobility rate was 6%. The initial contact was made with the school superintendents at each school to gain their approval for the research project. The three different superintendents, in districts varying in size and location, agreed and signed off for the research to be conducted in their district (see Appendix B).

Table 1

School Demographics

School	Enrollment	Free/Reduced Lunch	Graduation Rate	Mobility Rate
Jefferson HS	56	39%	88%	10%
Lincoln HS	113	33%	93%	9%
Washington HS	128	41%	100%	6%

Each school administrator was contacted and asked to sign a consent form to volunteer to take part in the study (see Appendix C). Once the school administrators agreed to participate in the study, the administrators were asked to complete a participant criteria form, established by the researcher, for every high school teacher in their district. The participant criteria form was intended to find educators who were considered either novice teachers or master teachers in their respective districts. For this study, weaknesses on the participant criteria form categorized teachers as novice teachers, and strengths on the participant criteria form categorized teachers as master teachers. Table 2 illustrates the predetermined criteria form utilized to select participants for interviews by the researcher. The participant criteria focused on 21st-century skills that are essential in a one-to-one computing environment. The building administrator used the participant criteria form to rate each teacher on the following skills: (a) collaboration, (b) communication, (c) creativity, (d) critical thinking, (e) flexibility, (f) problem solving, (g) teamwork, and (h) technology proficiency (Gunn & Hollingsworth, 2013; Kong et al., 2014; Lowther et al., 2012).

Table 2

Participant Criteria Form

Skills	Weak	Fair	Neutral	Good	Strong
Collaboration					
Communication					
Creativity					
Critical Thinking					
Flexibility					
Problem Solving					
Teamwork					
Technology Proficiency					

Once the researcher selected the two teachers based upon the participant criteria form that each building administrator filled out, these individuals were invited to participate in the interview portion of this study. The researcher identified two teachers in each of the three districts, one being a novice teacher and the other being a master teacher. When the teachers were selected, each teacher was asked to sign a consent form volunteering to take part in the study (see Appendix C). For this particular study, three school administrators and six teachers participated in face-to-face interviews. The three administrators and six teachers were interviewed twice, and 18 interviews took place. A professional transcriptionist transcribed each of the 18 interviews that were conducted. There were no direct benefits to the participants for participating in this study and each participant was aware of these parameters during the initial phase of the study. The online survey was sent to all the

teachers in each of the three high schools. Each high school teacher was asked to fill out the online survey (see Appendix K).

Data Collection

For this study, both administrators and teachers in each of the three rural midwestern high schools were invited to take part in two interviews regarding the perceived effects of a one-to-one computing environment on the overall classroom atmosphere. Each of the three building administrators was asked to complete a participant criteria form established by the researcher for all of their teachers. The participants were recruited based upon their rating on the participant criteria form that each of the three school administrators filled out during the months of July and August, 2014. Based upon the following data, the researcher selected a novice teacher and a master teacher from each school to participate in the study.

The data were compiled throughout the fall semester of 2014. The first step taken was to contact the nine participants to conduct interviews. Creswell (2013) stated, “qualitative interviews means that the researcher conducts face-to-face interviews with participants, by telephone, or on the Internet” (p. 246). Three administrators and six teachers from each school completed face-to-face interviews. Once the first round of interviews was completed, a second follow-up interview was completed with the nine participants. The three administrators and six teachers were interviewed twice, and a total of 18 interviews took place. Administrators were asked questions that related to the function of their position in this new learning environment in the fall of 2014. The six teachers who were selected were asked questions associated with any changes that have occurred to student learning and teaching methods in a one-to-one computing environment. The interview questions asked the participants about the positives and negatives of employing a one-to-one computing

environment and how teachers' overall classrooms had changed in this new technology-based learning environment (see Appendix F).

The interviews were all audio recorded, transcribed, and verified for accuracy. A professional transcriptionist typed all of the information gained from the interviews. When each interview was complete, a debrief statement was sent to each participant (see Appendix G). At the end of all of the interviews, a member-checking e-mail was sent to each participant to review the final themes established by the researcher (see Appendix H). The information gained from the interviews answered the second and third research questions regarding the perceived benefits and concerns associated with a one-to-one computing environment.

The next portion of this mixed-methods study was to administer the online survey to all the high school teachers in the three different buildings (see Appendix K). Among the three districts, a total of 33 teachers took the survey, which resulted in a 58% response rate. The data were collected during the fall semester of 2014 to ensure that all of the participants would be back to their normal working hours. This time frame also allowed the researcher to conduct research directly related to the participants' one-to-one classroom environment assignments. The researcher was granted permission from Dr. Robert Maninger to use his survey, "Teacher Survey: One-to-One Computing in Educational Research."

The questions on the survey asked the participants a wide range of questions related to a one-to-one computing classroom environment. "Teacher Survey: One-to-One Computing in Educational Research" asked technology questions related to the frequency that laptops were being utilized, the changes that had occurred since the implementation of a one-to-one computing environment, and the changes in classroom management practices since the introduction of laptops. The results from the survey answered the first research question. The

use of Dr. Robert Maninger's survey helped answer how traditional teaching and learning changes in a one-to-one computing environment.

The researcher validated the survey instrument utilized in this study. Prior to administering the online survey through Qualtrics survey software, each of the survey questions went through an item content validity index review (see Appendix I). Six experts composed of technology integration specialists piloted the survey questions. The six technology integration specialists were asked to rate each survey question on a scale of 1 to 4: *not relevant*, *somewhat relevant*, *quite relevant*, and *highly relevant*. Once this process was complete, the researcher calculated the scale content validity index on the entire survey. Questions on the survey that were deemed to be weak and unrelated to the topic were eliminated to strengthen Dr. Robert Maninger's survey, "Teacher Survey: One-to-One Computing in Educational Research."

The researcher spent nine months conducting the interviews, sending and distributing the survey, compiling the data, and ensuring the reliability and validity of the collected data. The external and internal validity of the entire study was of utmost importance during the entire research portion of the study. Particular focus was given to running this research in an ethical manner. The ethical principles of respect for persons, beneficence, and justice were followed at all times during this study. Each participant who took part in this study was provided with confidentiality and anonymity at all times.

Table 3 is a breakdown of the participants from each school. Pseudonyms were used to protect the identity of each high school.

Table 3

Total Interviews Conducted

School	Administrators	Teachers
Jefferson HS	1	2
Lincoln HS	1	2
Washington HS	1	2

Table 4 is a breakdown of the following schools' demographics based upon the students' race and ethnicity at the three different midwestern high schools.

Table 4

Race/Ethnicity

School	White	African American	Hispanic	Other
Jefferson HS	88%	2%	10%	0%
Lincoln HS	95%	3%	1%	1%
Washington HS	94%	1%	3%	2%
National Average	51%	16%	24%	9%

Note. Adapted from *ED data express: Data about elementary and secondary schools in the U.S.*, by the U.S. Department of Education, (2012). Retrieved from http://eddataexpress.ed.gov/state-report.cfm/tab/sd/state/US/

The American College Testing (ACT) is a college readiness assessment that high school students take for college admission requirements in the United States. The ACT is used extensively in the midwestern part of the United States. The following is a breakdown of the ACT scores in the three high schools.

Table 5

American College Testing (ACT) Performance

School	English	Mathematics	Reading	Science	Composite Score
Jefferson HS	23.6	22.8	23.8	22.8	23.4
Lincoln HS	21.8	24.0	23.9	23.8	23.6
Washington HS	21.0	21.8	21.5	22.5	21.8
National Average	20.2	20.9	21.1	20.7	20.9

Note. Adapted from *2013 ACT national and state scores*, from ACT, 2013. Retrieved from http://www.act.org/newsroom/data/2013/pdf/profile/Section1.pdf

Analytical Methods

For this research study, different sources of data were utilized to ensure that triangulation took place. Seven distinct themes, which were all related to one-to-one computing, were identified in the literature review. The seven themes were as follows:

- Student achievement in K–12 education
- One-to-one computing concerns
- Learning management systems
- Blended learning (where online and face-to-face instruction meet)
- Professional development in K–12 education
- 21st-century skills
- A theoretical framework (diffusion of innovation)

The seven themes helped shed light on how the following research study proceeded. The first step in this study was to conduct the interviews with the nine interviewees. Yin (2009)

claimed that interviews are one of the most valuable methods in data collection. Prior to conducting the interviews, the researcher conducted reliability and validity tests on the interview questions. The interview questions were distributed to nine experts composed of technology integration specialists to review the questions. The experts were asked if the questions were relevant and to offer suggestions on how to improve the reliability and validity of the questions.

The researcher was granted permission to use Dr. Robert Maninger's survey, "Teacher Survey: One-to-One Computing in Educational Research." The survey asked questions related to the one-to-one computing classroom environment and the advantages and disadvantages of implementing a one-to-one computing environment. The survey underwent a rigorous content validity process. The survey questions were piloted and distributed to six experts composed of technology integration specialists. The six technology integration specialists completed an item content validity index review of all of the survey questions (see Appendix I). The content validity of the instrument was put through a rigorous process outlined by Polit and Beck (2006). All of the questions had to pass an item content validity index beyond the 0.05 level of significance for this survey (Lynn, 1986; Polit & Beck, 2006). Once the survey was validated, the researcher calculated the scale content validity index on the entire survey. Questions on the survey that were deemed to be weak and unrelated to the topic were eliminated to strengthen Dr. Robert Maninger's survey, "Teacher Survey: One-to-One Computing in Educational Research."

Eighteen interviews were conducted. There were two interviews conducted with each of the three administrators and six teachers who participated in the study. The second and third research questions were answered from the results of the interviews that were

conducted. During the interviews, field notes were collected to keep a detailed audit trail (Creswell, 2013; Marshall & Rossman, 2011; Yin, 2009). The researcher dismissed any bias and was as impartial as possible during the interviews. In order to achieve this goal, the researcher disclosed any potential areas of bias and outlined any assumptions and views the researcher held. Once the interviews were completed, the researcher, to ensure the accuracy of the information, recorded all initial thoughts. A professional transcriptionist transcribed each of the 18 interviews. All of the transcripts were reviewed multiple times to ensure the accuracy of the findings and to establish themes (Creswell, 2013; Marshall & Rossman, 2011; Yin, 2009). To guarantee both dependability and reliability of this study, a detailed audit trail was kept to ensure that all interpretations were supported by the findings. To enhance credibility and validity in this study, triangulation was used (Creswell, 2013; Marshall & Rossman, 2011; Yin, 2009). A member-checking e-mail was sent to the nine participants to ensure the themes established by the researcher matched the participants' views and sentiments (Creswell, 2013). The responses from both administrator and teacher interviews were analyzed and coded based on themes identified by the literature review portion of the study. As transcripts were reviewed, highlighting and underlining were used effectively to code the material.

The teacher survey data were analyzed and crosschecked for reliability. The information gained from the survey was analyzed using IBM SPSS Statistical Software Version 20. The researcher analyzed the data using a Mann-Whitney *U* test (Tanner, 2012). A Mann-Whitney *U* test was utilized to see if there were differences between the beginner teachers' and the veteran teachers' responses on the survey. For the survey portion of the research, teachers were categorized as either a beginner teacher or a veteran teacher based

upon their years of experience in the classroom setting. To determine the statistical significance between the two groups, $p = 0.05$ was utilized. All of the data were analyzed to determine any correlations between the two different groups related to the teachers' aptitude to implement technology into their classroom. The researcher also analyzed the responses between both males and females to determine if there were any gender correlations related to technology use in the classroom. Each response was coded based upon the trends that resulted from the survey data. The use of both an IBM SPSS spreadsheet and Word document helped organize the data portion of the research. The results from the survey and interviews were analyzed based on the themes and patterns identified from the data.

Limitations

The main limitation of this study was the homogenous nature of the sample and the reliance of data from three high schools in the midwestern United States. This particular study was conducted in a unique setting in three rural midwestern high schools where they had adopted a one-to-one computing environment over the past three years. The information was also based upon the participants' perceptions going into the study as it related to the interviews and the survey. The sample that was utilized lacked ethnic distribution. Lastly, the data were collected through only one academic semester, which might not allow significant changes to emerge during this short timeframe.

Roles of the Researcher

The role of the researcher was to act as the instrument of data collection. The role of the researcher was not without bias. The researcher has been a school administrator for the past three years, and before that the researcher served in a teaching capacity. The researcher's experience in education has led to the belief that there are positive aspects associated with implementing a one-

to-one computing environment for students. The researcher strongly believes that technology alone does not hold the key, but there are many benefits connected to implementing technology in the classroom setting for students. As a school administrator, there was bias in the role as an instructional leader who wanted to see all students get the best quality education that will prepare them for the 21st-century. In order to dismiss bias, the researcher disclosed any potential areas of bias and outlined any views held. The researcher's role in this study was to seek information from both the experts in the field and the participants of this study and synthesize the results to help make a profound impact on the educational community in which the researcher was currently employed.

Protection of Human Rights and Approval

For this study, there was particular importance given to running this research in an ethical manner (Creswell, 2013; Marshall & Rossman, 2011; Yin, 2009). The researcher adhered to all ethical principles. The Northwest Nazarene University's human research review committee approved this research study. Participation in both the interviews and the survey was voluntary. All of the participants were informed of the research and were given the opportunity to withdraw from the study at any point without affecting their standing in any way. The informed consent form was obtained from all of the participants and an interview protocol was developed based upon the experts in the field (Creswell, 2013; Marshall & Rossman, 2011).

To protect the confidentiality of both the participants and the school districts, pseudonyms were used. Before any interview took place, each participant filled out a consent form (see Appendix C). Each of the nine participants who were interviewed was given an information sheet that explained the study in its full capacity (see Appendix D). All of the information pertaining to the research was written in plain English for the intended audience.

The data collected were kept in a locked cabinet, and the researcher utilized password protection on the researcher's computer to ensure that all of the research material was secure.

Chapter IV

Results

Introduction

The introduction of one-to-one computing devices into classrooms across the United States has changed traditional teaching and learning methods (Donovan et al., 2011; Penuel, 2006; Soffer et al., 2010). This new dynamic has brought forth many questions regarding the effectiveness of these new programs. It is apparent that more research regarding one-to-one computing is necessary to determine the perceived benefits and concerns associated with this new learning environment (Dawson et al., 2008; Lei & Zhao, 2008; Lowther et al., 2012; Mouza, 2008; Penuel, 2006; Warschauer et al., 2014). With a growing number of districts implementing one-to-one computing environments, there are gaps in the research that needs to be examined by both educators and policy makers (Dawson et al., 2008; Rosen & Beck-Hill, 2012; Stephens, 2012). This research study provides pertinent information regarding the perceived benefits and concerns associated with one-to-one computing environments. This study was designed as a mixed-methods study to determine "What were the perceived effects of a one-to-one computing environment on the overall classroom atmosphere?" The research questions guiding this study were as follows:

1. How did traditional teaching and learning change in a one-to-one computing environment?
    a. How did the one-to-one computing environment change traditional teaching and learning in a beginner teacher's and in a veteran teacher's classroom?

   b. How did the one-to-one computing environment change traditional teaching and learning in a male teacher's and in a female teacher's classroom?
2. What were the perceived benefits associated with one-to-one computing environments?
3. What were the perceived concerns associated with one-to-one computing environments?

The results from this study are discussed in more detail throughout this chapter. Each research question guiding this study was analyzed to determine the perceived effects of a one-to-one computing environment on the overall classroom atmosphere in three rural high schools in the midwestern United States.

Results

Research question 1. Adding one-to-one computing devices in classrooms has transformed the traditional learning environment in schools (Klieger et al., 2010; Parr & Ward, 2011; Soffer et al., 2010). In this research study, a one-to-one computing environment allowed all students to take their laptops home during the school year for educational purposes. The first research question brought forth by this study asked, "How did traditional teaching and learning change in a one-to-one computing environment?" The two subquestions associated with this question were (a) How did the one-to-one computing environment change traditional teaching and learning in a beginner teacher's and in a veteran teacher's classroom? and (b) How did the one-to-one computing environment change traditional teaching and learning in a male teacher's and in a female teacher's classroom?

In September 2014, 57 high school teachers in three rural high schools in the midwestern United States were invited to take part in an online survey through Qualtrics survey software.

The questions on the survey asked the participants a wide range of questions related to the one-to-one computing classroom environment. “Teacher Survey: One-to-One Computing in Educational Research” asked technology questions related to the frequency that laptops were being utilized, the changes that had occurred since the implementation of one-to-one computing environment, and the changes in classroom management practices since the introduction of laptops. The responses from Dr. Robert Maninger’s survey, “Teacher Survey: One-to-One Computing in Educational Research,” answered the first research question. Dr. Robert Maninger’s survey helped answer how traditional teaching and learning changed in a one-to-one computing environment. There were nine sections of the online survey, and it consisted of 83 questions. At the end of the survey, there were three open-ended questions.

The survey window opened in September 2014 and ran for two weeks. Along with sending the survey to the 57 teachers, additional e-mails were sent during this timeframe to remind and encourage the high school teachers to participate in this study. At the end of the survey window, 33 high school teachers completed the online survey, which resulted in a response rate of 58%. The use of online surveys for research does not typically achieve as high of response rates as surveys that are administered on paper (Nulty, 2008). Nulty (2008) found the average response rates for online surveys were 33% and the average response rate for surveys administered on paper were 56%. The response rate achieved through this study was higher than Nulty’s (2008) findings. Table 6 provides a breakdown of the response rate that was achieved through Dr. Robert Maninger’s survey, “Teacher Survey: One-to-One Computing in Educational Research.”

Table 6

Percentage of Participants That Completed the Online Survey

Participants	Surveys Sent	Surveys Completed	Response Rate
9–12 Teachers	57	33	58%

Note: Composed using SPSS (2014).

For this study, the independent variables (gender and experience) were analyzed to determine if there was a significant difference between the responses of males and female teachers and between beginner teachers and veteran teachers on the online survey. Teachers were categorized as beginner or veteran teachers in the survey portion of the research based upon their years of experience in the classroom setting. Teachers with less than 10 years of teaching experience were categorized as beginner teachers, and teachers with 11 years or more of teaching experience were categorized as veteran teachers. All of the data were analyzed to determine any correlations between the two different groups. The researcher also analyzed the responses between both males and females to determine if there were any gender correlations related to technology use in the classroom. Table 7 shows a breakdown of the two subgroups that were examined in this study.

Table 7

Breakdown of Participants' Gender and Experience

Gender	*N*	Experience	*N*
Male	13	0–10	14
Female	20	11–20+	19
Total	33	Total	33

Note: Composed using SPSS (2014).

The survey was composed of eight sections over one-to-one computing: (a) student use, (b) classroom tasks, (c) perception of impact, (d) advantages of 1:1, (e) support, (f) classroom management issues (CMI), (g) teacher use, and (h) work environment. Each of the eight constructs was analyzed using a Mann-Whitney *U* test. A Mann-Whitney *U* test was employed to compare the dependent variable (the questions) and the two independent variables (gender and experience) to determine if there was a significant difference between these two groups. Again, teachers with less than 10 years of teaching experience were categorized as beginner teachers, and teachers with 11 years or more of teaching experience were categorized as veteran teachers. Both the beginner teachers' and the veteran teachers' responses to the eight constructs were analyzed based upon the Mann-Whitney *U* test and *p*-values of less than 0.05 were utilized for statistical significance.

The overall results yielded no significant difference between beginner teachers and veteran teachers based upon the first eight sections of the survey (see Table 8). The mean ranks for the eight constructs were also analyzed to see if there were any differences between the two groups.

Table 8

Mann-Whitney U *Results (Beginner Teachers and Veteran Teachers)*

Construct	Mann-Whitney *U*	*p* value
Student Use	115.0	0.936
Classroom Tasks	91.5	0.425
Perception of Impact	92.5	0.613
Advantages of 1:1	92.0	0.316
Support	89.5	0.377
Classroom Management Issues (CMI)	111.0	0.809
Teacher Use	85.5	0.463
Work Environment	114.5	0.920

Note: Composed using SPSS (2014).

One of the assumptions from this study was that beginner teachers would excel with implementing technology into their classrooms and that veteran teachers would struggle when it came to implementing technology into their classrooms (Thomas, 2011). The responses from both beginner teachers and veteran teachers were very similar when evaluating the mean ranks based on the eight constructs from the online survey (see Table 9). These findings went against the common perception that veteran teachers were lacking both the skills and the knowledge to implement one-to-one computing environments into their classroom discipline.

Table 9

Mean Rank Results (Beginner Teachers and Veteran Teachers)

Construct	Experience	*N*	Mean Rank
Student Use	Beginner	14	16.64
	Veteran	19	17.26
Classroom Tasks	Beginner	14	18.43
	Veteran	18	15.00
Perception of Impact	Beginner	14	16.25
	Veteran	17	15.79
Advantages of 1:1	Beginner	14	18.61
	Veteran	19	15.82
Support	Beginner	14	18.86
	Veteran	18	14.67
Classroom Management Issues	Beginner	14	15.61
	Veteran	19	18.03
Teacher Use	Beginner	13	17.65
	Veteran	18	14.81
Work Environment	Beginner	14	17.00
	Veteran	19	17.00

Note: Composed using SPSS (2014).

The first eight sections of the survey were also analyzed based upon the responses from high school male teachers and female teachers. There was a significant difference in the section of the survey regarding questions over their work environment ($p = 0.045$). This was the only statistical significance that was found. Table 10 shows a breakdown of the results based upon both high school male teachers' and female teachers' responses.

Table 10

Mann-Whitney U *Results (Male Teachers and Female Teachers)*

Construct	Mann-Whitney *U*	*p* value
Student Use	117.0	0.632
Classroom Tasks	116.0	0.876
Perception of Impact	89.0	0.310
Advantages of 1:1	96.0	0.210
Support	81.5	0.133
Classroom Management Issues	114.0	0.554
Teacher Use	86.0	0.320
Work Environment	76.0	0.045

Note: Composed using SPSS (2014).

The mean ranks for the eight constructs were also analyzed to see if there were any differences between the two groups. The responses from both males and females were very different when evaluating the mean ranks for the areas of perception of impact, advantages of 1:1, support, teacher use, and work environment (see Table 11).

Table 11

Mean Rank Results (Male Teachers and Female Teachers)

Construct	Gender	*N*	Mean Rank
Student Use	Males	13	16.00
	Females	20	17.65
Classroom Tasks	Males	12	16.17
	Females	20	16.70
Perception of Impact	Males	12	13.92
	Females	19	17.32
Advantages of 1:1	Males	13	14.38
	Females	20	18.70
Support	Males	12	19.71
	Females	20	14.58
Classroom Management Issues	Males	13	15.77
	Females	20	17.80
Teacher Use	Males	11	13.82
	Females	20	17.20
Work Environment	Males	13	12.85
	Females	20	19.70

Note: Composed using SPSS (2014).

Based on the first three constructs, females felt more positive about areas that have been impacted in their classrooms (Mean Rank $M = 13.92$; $F = 17.32$), female teachers completed more tasks using technology than their male counterparts (Mean Rank $M = 13.82$; $F = 17.20$), and female teachers shared more ideas with their colleagues (Mean Rank $M = 12.85$; $F = 19.70$). The results were similar for both males and females when it came to the questions over student use (Mean Rank $M = 16.00$; $F = 17.65$), classroom tasks (Mean Rank $M = 16.17$; $F = 16.70$), and classroom management issues (Mean Rank $M = 15.77$; $F = 17.80$).

Under the construct work environment, the eight questions asked were analyzed in more detail to see if any particular questions under the work environment section were significant when comparing high school male teachers and female teachers (see Table 12).

Table 12

Mann-Whitney U *Results Work Environment (Male Teachers and Female Teachers)*

Question Number	Question	Mann-Whitney *U*	*p* value
69	Discussion of school goals and how to achieve them is a regular part of our faculty meetings.	101.0	0.253
70	Other teachers encourage me to try new ideas.	122.5	0.765
71	The people who give me the best ideas for improving my teaching also tend to know a lot about using computers.	101.0	0.259
72	My headmaster's values and philosophy of education are similar to my own.	100.0	0.232
73	New ideas presented at in-services are discussed by teachers in this school.	107.0	0.360
74	Teachers in this school are continually learning and seeking new ideas.	101.0	0.172
75	It is common for us to share samples of student work.	69.5	0.019
76	Teachers play an important role in defining staff development activities.	124.0	0.814

Note: Composed using SPSS (2014).

The eight questions under the construct work environment all pertain to the sharing of information by colleagues and the discussion of school-related items in the educational setting. When examining other questions in the survey, there was a difference on question number 74 between learning and seeking new ideas ($p = 0.172$). There was also some variation between

male and female responses on question 69 regarding discussion of school goals ($p = 0.253$) and question number 72 regarding similar values as their headmaster ($p = 0.232$).

Table 13 displays the results of both male teachers' and female teachers' responses to the eight questions under the construct work environment. A Likert scale was utilized for this section. Questions that were answered with *strongly disagree* were given a value of 1, and questions that were answered as *strongly agree* were given a value of 5.

Table 13

Mean Rank Results Work Environment (Male Teachers and Female Teachers)

Question Number	Gender	*N*	Mean Rank
69	Males	13	14.77
	Females	20	18.45
70	Males	13	16.42
	Females	20	17.38
71	Males	13	14.77
	Females	20	18.45
72	Males	13	14.69
	Females	20	18.50
73	Males	13	15.23
	Females	20	18.15
74	Males	13	14.77
	Females	20	18.45
75	Males	13	12.35
	Females	20	20.03
76	Males	13	16.54
	Females	20	17.30

Note: Composed using SPSS (2014).

These results indicate that females believed the overall work environment was more conducive in a one-to-one environment than males (Mean Rank $M = 12.85$; $F = 19.70$). This was

apparent when examining question 75, where a significant difference occurred. Based on question 75, females were more apt to share samples of student work than males were. Question 74 found females, unlike males, believed that teachers were continually learning and seeking new ideas (Mean Rank M = 14.77; F = 18.45). Females also responded higher than males on questions 69 relating to discussion and achievement of school goals (Mean Rank M = 14.77; F = 18.45), question 71 relating to technology proficiency and sharing best ideas to improve teachers (Mean Rank M = 14.77; F = 18.45), and question 72 relating to the headmasters' values and philosophy as similar to educators' (Mean Rank M = 14.69; F = 18.50).

Research question 2. There has been a steady increase of school districts employing one-to-one computing environments over the years (Donovan et al., 2007; Lei & Zhao, 2008; Maninger & Holden, 2009; Penuel, 2006). The benefits associated with this new teaching and learning environment are still not apparent in the academic world (Grimes & Warschauer, 2008). This research study examined a one-to-one computing environment that allowed all students to take their laptops home during the school year for educational purposes. The second research question guiding this study was "What were the perceived benefits associated with one-to-one computing environments?" For this particular study, three school administrators and six teachers participated in face-to-face interviews. For the teacher interview portion of the research, the participants were recruited based upon the predetermined participant criteria the three school administrators filled out during the months of July and August, 2014. The predetermined criteria aligned with 21st -century skills that are pertinent in schools today (Gunn & Hollingsworth, 2013; Kong et al., 2014; Lowther et al., 2012). The researcher selected a novice teacher and a master teacher from each high school to participate in the study based upon the predetermined criteria mentioned earlier. Teachers who were rated high on the participant criteria form by their

administrator were classified as master teachers, and teachers who were rated low on the participant criteria form by their administrators were classified as novice teachers. For this study, weaknesses on the participant criteria form categorized teachers as novice teachers, and strengths on the participant criteria form categorized teachers as master teachers. Master teachers selected for this study exhibited expertise in demonstrating 21st-century skills that are pertinent in the classroom setting. The years of experience teachers possessed did not categorize teachers as either a novice teacher or a master teacher for the interview section of this study (see Table 14).

Table 14

Teaching Experience for Novice Teachers and Master Teachers

Novice Teacher	Teaching Experience	Master Teacher	Teaching Experience
Teacher 1	6 Years	Teacher 1	16 Years
Teacher 2	7 Years	Teacher 2	22 Years
Teacher 3	11 Years	Teacher 3	29 Years

The interview section of this study answered the second research question because it allowed both administrators and teachers to express their explicit thoughts over the advantages of one-to-one computing. The three administrators and six teachers were interviewed twice, and 18 interviews took place. Administrators were asked questions that related to the function of their position in this new learning environment, and teachers were asked questions associated with any changes that have occurred to student learning and teaching methods in a one-to-one computing environment. The same question “What benefits are associated with the one-to-one computing environment in your classroom?” was also displayed as an open-ended question on the survey the 33 high school teachers completed. After completing the interviews, the recordings were transcribed, reviewed multiple times, and coded for themes (see Appendix L).

There were three administrators who responded to the benefits associated with one-to-one computing during the interviews. In reviewing the responses to Research Question #2, there were 12 themes that emerged from the administrators' interviews (see Table 15).

Table 15

Administrators Qualitative Question 2–Themes and Frequency

Themes	Frequency	Mentioning Theme
Helped faculty members (accomplish tasks)	14	100%
Increased student engagement	11	100%
Increased access to learning resources	8	100%
Teachers were confident utilizing technology	5	33%
Promoted project-based learning	5	67%
Created opportunities for learning beyond traditional classroom	5	67%
Facilitated online research	4	33%
Created easier avenue to share items and ideas with colleagues	4	67%
Provided supplemental instructional tool	3	67%
Provided ability to go paperless and save money	3	67%
Allowed students to watch lectures at home because of flipped classroom instruction	3	33%
Was not the driving force in guiding instructional decisions	1	33%

When examining the tables in this chapter, the frequency refers to the number of times a participant mentioned the theme. In the next column, mentioning theme, refers to the percentage of the three participants who mentioned that theme. The most frequent response associated with

the benefits of one-to-one computing was focused on helping faculty members accomplish tasks with technology. Throughout the three interviews, the three different administrators continually stated that technology could help faculty members complete an array of tasks from an efficiency standpoint in the field of education. The second most common theme of the perceived benefits of one-to-one computing was increased student engagement. One administrator participant summed it up by stating,

> It's hard to prove student learning. That's given. No matter how many studies you show, I think the way you have to look at it, and the way we are trying to look at it, is through engagement. If we can get kids engaged by using laptops, then hopefully that engagement then gets them to where they're learning the material.

The three administrators who participated in the interviews believed that this new learning environment provided students with access to learning materials anytime during the day and allowed teachers to go paperless, which saved the district money. The next benefit that administrators brought up was staff members being comfortable utilizing technology in their classrooms. Initially, administrators felt that teachers were hesitant to employ a one-to-one computing environment in their classrooms because of their lack of knowledge, but after three years of implementation, most teachers were both comfortable and confident with utilizing technology in their classrooms. Another advantage that emerged during the interviews was the ability for teachers to flip their instructional methods in their classrooms. This new technique had been valuable when personalizing learning and motivating students (Enfield, 2013; Hawks, 2014). In this new learning environment, students were watching recorded lectures at home and class time was now being devoted to different projects and discussion items. In addition, one administrator believed that technology was not a driving force when it came to items such as

selecting curriculum and learning different instructional methods. In the same sense, technology in the eyes of administrators was a supplemental tool and not a change agent for good instructional practices implemented by teachers in the classroom. Administrators also believed that technology gave students opportunities for learning the traditional classroom did not offer, like conducting online research and creating different classroom projects. In a one-to-one computing environment, all students have the capability to conduct research and share items and ideas with their fellow classmates.

There were three novice teachers, teachers who struggled with technology implementation, who were interviewed regarding Research Question 2. This particular group did not elicit an extensive list when it came to the benefits associated with one-to-one computing. Only eight themes emerged when reviewing the responses to the second research question (see Table 16).

Table 16

Novice Teachers Qualitative Question 2–Themes and Frequency

Themes	Frequency	Mentioning Theme
Provided e-mail as a valuable communication tool for parents and students	13	100%
Provided access to online research	5	100%
Improved communication between teachers	4	100%
Allowed teachers to share and obtain information	3	100%
Promoted collaboration through Google Docs	3	67%
Helped students complete tasks through practical application	2	67%
Enhanced student learning	2	67%
Created opportunities for teacher to disperse comments and feedback in a timely manner	2	33%

The most frequent response was focused on e-mail and the ability to communicate with both parents and students. Novice teachers believed that e-mail was one of the best features of the benefits of technology in education because teachers could contact students at home when they were sick or on the weekend to clarify different assignments that might be confusing to students. The second most common theme regarding Research Question 2 was the benefit of research that a one-to-one computing environment offered students in the classroom setting. Without laptops, conducting extensive research online was not possible.

The group of novice teachers thought there was practical application with one-to-one computing environments when typing papers, conducting research, and using Google Docs. Another important aspect of the benefits was the ability to communicate and receive feedback

from both students and parents. The last two advantages mentioned by novice teachers were the ability to disseminate information and enhance student learning. There were three master teachers, teachers who excelled with technology use and integration, who were interviewed regarding Research Question 2. During the interviews, 15 themes were identified. The most frequent response over the benefits of one-to-one computing was focused on obtaining and sharing information. One participant responded, “I would say that you are not handcuffed to a textbook that might be 10 to 12 years old.” Another participant stated,

> Their devices, whether it’s the device we give them or a cell phone, is an appendage for them. That’s their way of life; that’s what they have grown up with. I just think it really changes the game in the classroom from the old [teaching style] where I stand up in the front and talk to them. It’s not that way anymore and it’s just not effective, so I think technology makes it easier for you to relate to them [students].

Other themes that were identified from the interviews with master teachers regarding Research Question 2 are listed in Table 17.

Table 17

Master Teachers Qualitative Question 2–Themes and Frequency

Themes	Frequency	Mentioning Theme
Allowed communication with stakeholders any time of the day without any barriers to share and obtain information	15	100%
Increased student engagement	10	100%
Provided a valuable communication tool through e-mail to students and parents	10	100%
Promoted collaboration through Google/Google Drive	10	100%
Became a supplemental learning tool that did not replace exemplary teachers	9	67%
Supported classroom methods through Chromebooks	8	67%
Promoted creating projects and implementing though project-based learning	8	67%
Provided opportunities for learning not possible in the traditional classroom setting	5	33%
Enhanced both teaching and learning	4	67%
Improved communication	4	100%
Utilized LMSs for students to submit assignments	4	67%
Increased access to learning resources and information	3	100%
Created ease of access to information on the Internet when conducting research	2	67%
Provided more interactive lessons	2	33%
Supplemented great instructional practices by teachers	1	33%

Master teachers like the benefits of Internet access and research because students had easy access to information for research projects, and the Internet allowed students to create different projects for class that utilized online websites. Another important aspect of one-to-one computing was that it allowed teachers to communicate with both students and parents through e-mail. Before, in the traditional classroom setting, students were not allowed the opportunity to e-mail teachers when they were gone or had a question about an assignment on the weekend. Along the same lines, one-to-one computing environments allowed teachers opportunities to enhance their lessons, which resulted in more engaged learners using different items such as Google and Google Docs and it allowed students the opportunity to collaborate with their peers. The use of laptops in the classroom was also a supplementary interactive learning tool for instructional practices and laptops should not be the key focus of the lesson. This group of teachers liked utilizing an LMS in their classrooms to conduct polls and to send out and receive assignments. Another frequent item mentioned by master teachers was that they enjoyed using Chromebooks in their classrooms to support their classroom instruction, and it allowed students to bring out their creative side in class. The last group to be asked about the benefits associated with one-to-one computing were 33 high school teachers in three different school districts who completed the online survey. At the end of the survey, there were three open-ended questions: (a) What benefits are associated with the one-to-one computing environment in your classroom?, (b) What concerns are associated with the one-to-one computing environment in your classroom?, and (c) Is there anything else you want to add that I may not have covered? These three questions were fundamental in answering the second and third research questions presented by this research study.

There were seven distinct themes that emerged from the first open-ended question. As transcripts were reviewed, highlighting and underlining were used to code the material, and the researcher established themes based on the codes. After the survey was complete, a member-checking e-mail was sent to all of the participants to review the final themes established by the researcher (see Appendix H). Of the 33 high school teachers who responded to the first question, the most common theme was access to academic information through the Internet where 24% of those interviewed indicated that access to the Internet for students conducting research was a vital component in a one-to-one computing environment. When answering the first opened-ended question, one participant summed it up best by stating, “Students have immediate access to the Internet and other materials that are posted by me.” The second most common theme that surfaced from the first opened-ended question was communication. For this particular theme, 15% of those interviewed indicated that communication and the ability for both students and teachers to communicate increased in a one-to-one computing environment. In one-to-one computing environments, students now have the opportunity to communicate with their teachers at home and this was not possible in the traditional learning environment. One participant stated,

> Each student having access to the real world is important. This is how they will communicate, work, and everything in between and in their future lives. So teaching them how to use core subjects within those parameters is important and useful.

The other themes that surfaced from the open-ended question were (a) allowed teachers to share and obtain information, (b) utilized LMS to submit homework and disseminate assignments, (c) motivated students to complete their work, (d) provided different opportunities for learning, and (e) created projects and implemented project-based learning into the classroom setting. The 33 teachers thought that having access to information at one’s fingertips and sharing and obtaining

information were major benefits of a one-to-one computing environment. Another benefit was the increased opportunities that were available for students when accessing the Internet at both school and at home. In addition, the 33 teachers believed that a one-to-one computing environment increased student motivation to complete assignments because the lessons were more interactive when laptops were added, and it allowed students to complete different projects on their laptops. Some of the 33 teachers also thought the use of an LMS was very beneficial. The use of an LMS allowed students to complete homework online and turn it in at home as opposed to always having to wait for class to start. This in turn enabled teachers to provide quicker and more meaningful feedback. Table 18 displays a breakdown of the themes that emerged from the first open-ended question, "What benefits are associated with the one-to-one computing environment in your classroom?"

Table 18

Thirty-three Certified Staff Question 2–Themes and Frequency

Themes	Frequency	Mentioning Theme
Accessed information through the Internet	8	24%
Improved communication	5	15%
Allowed teachers to share and obtain information	4	12%
Increased student motivation	2	6%
Created opportunity (for learning)	2	6%
Promoted projects (project-based learning)	2	6%
Utilized an LMS for students to submit homework	1	3%

Research question 3. As teachers venture into classrooms of the 21st-century, the rapid increase of classroom technology has brought forth many concerns from the general public. The

educational community believes solid research is lacking when it comes to the concerns associated with one-to-one computing environments (Dawson et al., 2008; Lei & Zhao, 2008; Mouza, 2008; Penuel, 2006; Rosen & Beck-Hill, 2012; Stephens, 2012; Warschauer et al., 2014). In order to provide solid research for the academic community, the third research question guiding this study asked, "What were the perceived concerns associated with one-to-one computing environments?"

For the third research question guiding this study, the same protocol was followed as for second research question. Three school administrators and six teachers participated in face-to-face interviews. The three administrators and six teachers were interviewed twice, and 18 interviews took place. The third research question, "What concerns are associated with one-to-one computing environment in your classroom?" was also included as an open-ended question on the survey the 33 high school teachers completed. After completing the interviews, the transcripts were reviewed multiple times and coded for themes (see Appendix L). After the interviews were complete, a member-checking e-mail was sent to all of the participants to review the final themes established by the researcher (see Appendix H).

There were three administrators who responded to the concerns associated with one-to-one computing during the interview. In reviewing the responses to Research Question 3, there were eight themes that emerged from the administrators' interviews (see Table 19). When examining the tables in this chapter, the frequency represents the number of times that a participant mentioned the theme. In the next column, mentioning theme, indicates the percentage of the three participants who mentioned that theme.

Table 19

Administrators Qualitative Question 3–Themes and Frequency

Themes	Frequency	Mentioning Theme
Students taking care of their devices	8	100%
Preparing laptops over the summer	7	67%
Students playing online games during class	5	100%
Sustaining the program over the years	3	67%
Finding the funds to pay for the program	3	33%
Making sure the laptops are operational	2	33%
Ensuring the devices are user friendly	2	33%
Replacing laptops if students damaged them	1	33%

The most frequent response when analyzing the concerns associated with one-to-one computing environment from the three administrators' perspective was the care of the devices by students and the need to replace laptops if students damaged their devices. The second most prevalent theme that emerged was preparing the devices for the school year. Tasks like imaging computers and making sure every computer was ready for the school year was very time consuming in the administrators' eyes. For instance, one administrator said,

> Just rolling the laptops out at the beginning of the year, and getting the machines updated over the summer [was a real challenge]. We've got our tech people on board, but they're getting ready for their own classes too, and the time commitment getting them prepared every year is a bit of a challenge, and then just getting them rolled out, making sure we covered everything is also a challenge.

The other common themes that were identified based on Research Question 3 were the possibility of students damaging their computing devices, the challenge of finding the funding to support the one-to-one computing environment, the distraction of students playing online games, ensuring that all of the devices are operational, the sustainability of the one-to-one computing program, and making sure the devices are user friendly. The three administrators believed that a lack of funding to sustain this new learning environment was a major concern associated with a one-to-one computing environment. Being able to find the dollars for performing upkeep, replacing devices, and making sure the laptops are operational were all concerns that dealt with funding. Another concern in the eyes of administrators was the possibility of students damaging their devices and students playing online games as opposed to working on school-related items. One of the last concerns brought up was that their one-to-one computing devices needed to be easier to use for both teachers and students.

The next group who was interviewed regarding Research Question 3 was three novice teachers, the teachers who struggled with technology use and integration. Based upon the two interviews with the three novice teachers, 10 themes emerged. The most common theme from the interviews was Google and students using Google to find answers but not acquiring the knowledge needed to learn the overall concepts. The novice teachers' major concern in utilizing Google in the classroom was the students' inability to function without this resource. They believed that students needed to google everything and accept the Google answer rather than the answers that were geared to what they were talking about in class. The second most common theme that emerged dealt with online games and off-task behavior. In the teachers' view, students were always trying to play online games in their classes. The students' access to online games in school was a major off-task behavior and a distraction to the learning process. Another

common theme from the novice teachers was their lack of knowledge when it came to using laptops effectively in the classroom setting and how technology can be a revolving door to the constant change. One participant said,

> My lack of knowledge is probably my biggest challenge. I know that technology changes all the time and I just start to learn one app, and then this one's better than another one. I can't keep up myself. My biggest challenge is my knowledge base is not where it should be.

Some of the other common themes that were identified based on Research Question 3 were students' access to social media websites disrupts the instructional process, the cost associated with employing a one-to-one program could be utilized for other instructional items, laptops limit interaction between students, limited time to learn the different aspects of technology integration, the need for more technology support, and technology problems that occurred in the classroom setting (see Table 20).

Table 20

Novice Teachers Qualitative Question 3–Themes and Frequency

Themes	Frequency	Mentioning Theme
Student dependence on Google without learning the material	10	100%
Students' access to online games	7	67%
Students' access to social media websites	5	67%
Quickly changing technology in education	5	67%
Technology problems in the classroom	5	100%
Need for weighing cost/benefit of the devices	4	67%
Lack of knowledge (how to utilize technology)	4	67%
Limited interaction between students	2	67%
Need for increased technology support for teachers	2	33%
Limited time to learn about technology	1	33%

The group of novice teachers believed there was a lack of technology support in their buildings to fix technology problems. Another concern that was brought up was there was not enough time to learn how to implement laptops effectively into their classrooms to benefit every student. The group of novice teachers who were interviewed thought that access to social media was distracting and limited their social interactions with other students and staff members. One of the last concerns mentioned was the high cost associated with employing a one-to-one computing environment. For Research Question 3, there were three master teachers, teachers who excelled with technology use and integration, who were interviewed. The three different master teachers identified eight themes of concerns associated with one-to-one computing. The three master

teachers' main concerns with a one-to-one computing environment were technology issues that occurred when they planned to use laptops with their lesson and not having enough training on how to implement technology effectively into the classroom setting to improve student learning. Unlike the novice teachers, gaming was not a central issue with master teachers. One participant stated,

> It's very easy to blame the students for playing games, but what do you expect them to do? I think it's important to give them time to explore a little bit. Free time on a device is not bad. Are they going to play games? Yes, but they also might find some stuff that could be valuable.

Some of the other common themes identified based on Research Question 3 were management of the devices, students' access to social media websites that disrupted the instructional process, not enough technology support throughout the school year, lack of training on how to implement one-to-one computing devices into their classrooms, and two different platforms to learn for both Mac computers and PC computers (see Table 21).

Table 21

Master Teachers Qualitative Question 3–Themes and Frequency

Themes	Frequency	Mentioning Theme
Technology problems in the classroom	6	100%
Lack of trainings over technology integration	5	67%
Management of the devices	4	67%
Cost associated with this program	2	33%
Two platforms/software (Macs and PCs)	2	67%
Lack of technology support	2	33%
Students distracted by social media websites	1	33%
Students' access to online games	1	33%

The group of master teachers who were interviewed believed that management of a one-to-one computing environment was an issue to students getting off-task and being distracted by their laptops. This group of teachers also believed they had to constantly manage what students were doing and what they were viewing on their laptops. Another issue was there was not enough training on how to effectively implement laptops into their lessons, and there was a need for greater technology support in their buildings. The group of master teachers also believed that access to social media was distracting in their classrooms to both completing homework in school and paying attention to teachers. One of the last concerns mentioned was having two different platforms they needed to learn was an obstacle for teachers. Regarding this instance, the district decided to buy both Macs and PCs for both students and teachers to use. In their opinion, it was hard when students and teachers had both Macs and PCs in the classroom. By utilizing two different platforms, it was difficult for both novice teachers and master teachers to learn each

platform and find ways to implement it in their classroom setting. The last group that was asked about the concerns associated with the one-to-one computing environment was the 33 high school teachers in three different school districts who completed the online survey. At the end of the survey, the second open-ended question asked, “What concerns are associated with the one-to-one computing environment in your classroom?” From the responses of the 33 high school teachers, six themes emerged (see Table 22).

Table 22

Thirty-Three Certified Staff Question 3–Themes and Frequency

Themes	Frequency	Mentioning Theme
Technology issues interrupted teaching	8	24%
Students monitored to keep on task	6	18%
Students played online games	5	15%
Students were distracted when using laptops	3	9%
Social media websites distracted students	1	3%
Technology did not fit into every discipline	1	3%

The most common theme brought forth from the 33 certified teachers was technology issues. There were a number of technology problems that were brought up from computers needing updates all the way to students forgetting to bring their devices to class. Two other common themes dealt with students getting off task and student becoming distracted when using one-to-one computing devices. One participant said, “It can be distracting for some students to have the world at their fingertips.” Other themes that emerged from the second question on the online survey were online games distracted students, students’ access to social media websites that disrupted the instructional process, and technology did not fit into every subject matter.

When it came to the concerns, the 33 teachers who filled out the survey believed that access to social media was distracting in their classrooms. In their opinion, students may have looked like they were on task, but they were really watching online movies or playing online games. One of the last concerns the 33 teachers mentioned was it was hard to implement technology into every discipline. Subject areas like mathematics and physical education presented implementation barriers that teachers thought were hard to overcome.

Conclusion

Chapter 4 presented an overview of both the quantitative and the qualitative findings from this study. The guiding question leading this study was "What were the perceived effects of a one-to-one computing environment on the overall classroom atmosphere?" The data acquired through the online survey, by utilizing a Mann-Whitney *U* test and mean rank analysis, revealed a statistical significance when it came to females who believed the overall work environment was more conducive in a one-to-one work environment than males. The female participants were also more apt to share samples of students' work than male participants. Based on the qualitative finding, themes emerged that were centered on both the benefits and the concerns associated with one-to-one computing environments. The themes that emerged regarding the benefits associated with one-to-one computing environments were

- increased access to learning resources,
- improved communication,
- provided e-mail as a valuable communication tool,
- increased student engagement,
- enhanced teaching and learning,
- promoted collaboration through Google and Google Docs,

- allowed teachers to share and obtain information,
- provided LMS for students to submit assignments,
- provided opportunities for learning, and
- afforded opportunities to conduct online research.

The themes list regarding the concerns associated with one-to-one computing environments were

- the cost associated with implementing a one-to-one program,
- students' access to online games during class,
- lack of training opportunities throughout the year,
- distractions of social media websites in and out of the classroom,
- technology problems during the school day, and
- lack of technology support.

The findings presented in this chapter will be discussed in more detail in Chapter 5.

Chapter V

Discussion

Introduction

The implementation of one-to-one computing devices in school districts across the United States has been one of the fastest growing trends in education (Donovan et al., 2007; Lei & Zhao, 2008; Maninger & Holden, 2009; Penuel, 2006). These new technology-rich learning environments have been met with mixed reviews from both policymakers and educators (Donovan et al., 2011; Rosen & Beck-Hill, 2012; Siegle & Foster, 2001; Stephens, 2012). The mixed reaction can be attributed to the lack of empirical evidence that is currently available with one-to-one computing environments. Nonetheless, school districts across the United States are implementing one-to-one computing environments in an attempt to close the achievement gap and provide every student with access to a high-quality education that will meet the needs of all 21st-century learners (Mouza, 2008).

The introduction of one-to-one computing environments has added a number of new variables that has transformed both teaching and learning in the United States (Donovan et al., 2011; Hur & Oh, 2012). Educators and policy makers want to have a firm grasp of the outcomes associated with implementing a one-to-one computing environment in school districts (Dawson et al., 2008; Grimes & Warschauer, 2008; Penuel, 2006). There is still a need for solid research-based evidence to help guide policy makers' decisions over whether to implement one-to-one computing environments in their school districts (Dawson et al., 2008; Howard et al., 2014; Lei & Zhao, 2008; Lowther et al., 2012; Mouza, 2008; Penuel, 2006).

The following questions were investigated in this study:

1. How did traditional teaching and learning change in a one-to-one computing environment?
    a. How did the one-to-one computing environment change traditional teaching and learning in a beginner teacher's and in a veteran teacher's classroom?
    b. How did the one-to-one computing environment change traditional teaching and learning in a male teacher's and in a female teacher's classroom?
2. What were the perceived benefits associated with one-to-one computing environments?
3. What were the perceived concerns associated with one-to-one computing environments?

Along with answering the preceding research questions, Chapter 5 presents the results as they relate to Rogers' (2003) diffusion of innovation theory, provides recommendations for future research, and presents information over future implementations for professional practices.

Summary of the Results

This study investigated the perceived effects of a one-to-one computing environment on the overall classroom environment. A mixed-methods study design was employed to examine one-to-one computing environments in three rural midwestern schools. Mixed-methods research is defined as "research in which the investigator collects and analyzes data, integrates the findings, and draws inferences using both quantitative and qualitative approaches in a single program of inquiry" (Tashakkori & Creswell, 2007, p. 4). For this study, 57 high school teachers in three rural high schools in the midwestern United States were invited to take part in an online survey through Qualtrics survey software. In addition to the online survey, three school

administrators and six teachers participated in face-to-face interviews. The three administrators and six teachers were interviewed twice, and 18 interviews took place. After completing the interviews, the transcripts were reviewed multiple times and coded for themes (see Appendix L). After the interviews were complete, a member-checking e-mail was sent to all of the participants to review the final themes established by the researcher (see Appendix H).

Research question 1. For this study, the first research question examined asked, "How did traditional teaching and learning change in a one-to-one computing environment?" The two subquestions associated with this question were (a) How did the one-to-one computing environment change traditional teaching and learning in a beginner teacher's and in a veteran teacher's classroom? and (b) How did the one-to-one computing environment change traditional teaching and learning in a male teacher's and in a female teacher's classroom? An online survey was employed to answer the first research question. In September of 2014, 57 high school teachers in three rural high schools in the midwestern United States were invited to take part in an online survey through Qualtrics survey software. At the end of the survey window, 33 high school teachers completed the online survey, which resulted in a 58% response rate. The researcher was granted permission from Dr. Robert Maninger to use his survey, "Teacher Survey: One-to-One Computing in Educational Research."

The survey was composed of eight sections over one-to-one computing: (a) student use, (b) classroom tasks, (c) perception of impact, (d) advantages of 1:1, (e) support, (f) classroom management issues, (g) teacher use, and (h) work environment. Each of the eight constructs was analyzed using a Mann-Whitney *U* test. A Mann-Whitney *U* test was employed to compare the dependent variable (the questions) and the two independent variables (gender and experience) to determine if there was a significant difference between these two groups. For the survey portion

of this study, teachers with less than 10 years of teaching experience were categorized as beginner teachers, and teachers with 11 years or more of teaching experience were categorized as veteran teachers. The overall results yielded minimal differences between beginner teachers and veteran teachers based upon the eight constructs that emerged from the survey as described below and evident in Tables 8 and 9. One possible reason for the minimal differences between beginner teachers and veteran teachers can be attributed to the small sample size and the reliance of data from only three midwestern schools from across the United States. The results from this study go against customary stereotypes that assert veteran teachers' perceptions regarding technology are negative (Thomas, 2011).

In a similar study that contradicted the findings of this research study, Wepner and Tao (2002) found that veteran teachers began to view themselves differently because they lacked the new body of knowledge and skills when it came to technology integration. In addition, Hazzan (2002) found that veteran mathematics teachers did not see the value in implementing technology into their classroom discipline, and this could have a negative impact on new teachers who are just starting in the profession. The results from this study indicate that veteran teachers are equally able to implement technology on a frequent basis like their younger predecessors, the beginner teachers. There were some areas that were different between the beginner teachers and veteran teachers, but not enough to be regarded as statistically significant (see Table 8 and Table 9). The areas of the advantages of 1:1 ($p = 0.316$) and the support ($p = 0.377$) were the only two constructs on the survey where there were differences between both beginner teachers' and veteran teachers' responses. The fact that there were not any significant differences from the survey results between both beginner teachers and veteran teachers implies that their overall

perceptions regarding classroom technology were not very different and both groups' responses were favorable toward utilizing technology in the classroom setting.

The first eight sections of the survey were also analyzed based upon the responses from both high school male and female teachers. The eight constructs examined were (a) student use, (b) classroom tasks, (c) perception of impact, (d) advantages of 1:1, (e) support, (f) classroom management issues, (g) teacher use, and (h) work environment. The responses from both males and females were very different when evaluating the mean ranks for the areas of perception of impact, teacher use, and work environment (see Table 11). For three of the eight constructs, females teachers were more positive about areas that have been impacted in their classrooms since the introduction of classroom technology (Mean Rank $M = 13.92$; $F = 17.32$), female teachers completed more tasks using technology than their male counterparts (Mean Rank $M = 13.82$; $F = 17.20$), and female teachers shared more ideas with their colleagues (Mean Rank $M = 12.85$; $F = 19.70$). There was a significant difference when it came to the section of the survey, work environment ($p = 0.045$).

Under the construct, work environment, the eight questions that were asked were analyzed in more detail to see if any particular questions under the work environment section was significant when comparing high school male teachers and female teachers. From the results, it indicated that females believed the overall work environment was more conducive in a one-to-one work environment than males (Mean Rank $M = 12.85$; $F = 19.7$; $p = 0.045$). This can be attributed to the fact that women tend to work as team players and are very honest in the work setting when compared to their male counterparts (Sikula & Costa, 1994). Sikula and Costa's (1994) previous research gave further insight into the differences between males and females. Based upon the results from the survey, female teachers are more apt to share samples of students

work than male teachers. The results from the survey indicated that female high school teachers, in general, are more willing to share their thoughts and ideas in the high school educational setting. This has a significant impact on collaboration, where educators learn from their peers. Along these same lines, educators who collaborate on a regular basis will not only benefit from this practice, but the entire school will benefit in the long run (Goddard, Goddard, & Tschannen-Moran, 2007). This could also be an avenue to increase student engagement and achievement (Goddard et al., 2007).

Based upon these results, school leaders should try and establish an environment where all teachers are willing to share best practices on a continual basis to enhance the overall school environment. The results from the online survey indicated that female teachers are more willing to collaborate when compared to male teachers. Instilling the need for collaboration among educators is hard work, and it can be a constant struggle at times to get all educators involved in the process. Teachers need to be willing to share ideas and have open minds when discussing new innovative teaching strategies. One way to establish this new environment is by allowing teachers to meet regularly throughout the school year to discuss items such as technology integration, project-based learning initiatives, and online research projects. In a similar study, Snow-Gerono (2005) found that when teachers met regularly in professional learning communities, it created opportunities for dialogue in a safe community environment.

When examining professional development, Beaudry (2011) found there was a substantial impact that ongoing peer support had when it was coupled with meaningful professional development, and it increased the frequency of technology application in the classroom setting. By implementing ongoing, collaborative professional development opportunities for all staff members, 21st-century instruction and student learning will improve

(Donovan et al., 2007; Klieger et al., 2010; Parr & Ward, 2011; Rosen & Beck-Hill, 2012). Providing extended learning opportunities for all educators will establish an environment where both teaching and learning can flourish for everyone involved. In a similar study, Cavanaugh et al. (2011) found increases in tool-based, student-centered teaching, which happened as a result of the infusion of laptop technology, professional development, and systematic support in classrooms. The overall outcome of this current study revealed increases in project-based learning, student attention and motivation, and increased academically focused class time because of exposure to a one-to-one computing environment.

The fact that all three administrators interviewed indicated that a common vision needs to be established suggests that administrators need to define a strong sense of purpose for all educators and encourage teachers to take risks in their classrooms. One way to accomplish this task is by allowing teachers autonomy in their classrooms when implementing new technology strategies and approaches. When an environment is established where teachers feel comfortable taking risks, teachers will be more willing to let their students take risks in their classrooms as well. This can also lead to unforeseen educational opportunities that can arise from this new culture and lead teachers down a new path in lesson formation (Blase & Blase, 1999)

Research question 2. The second research question guiding this study asked, "What were the perceived benefits associated with one-to-one computing environments?" In order to answer the second research question, interviews took place with both administrators and teachers. For the qualitative portion of this study, three school administrators and six teachers participated in face-to-face interviews. The same question, "What benefits are associated with the one-to-one computing environment in your classroom?" was also included as an open-ended question on the survey that 33 high school teachers completed.

To select two teachers in three different districts, the teachers were recruited based upon the predetermined participant criteria the three school administrators filled out during the months of July and August, 2014. The predetermined criteria aligned with 21st-century skills that are pertinent in schools today (Gunn & Hollingsworth, 2013; Kong et al., 2014; Lowther et al., 2012) and included the following items: (a) collaboration, (b) communication, (c) creativity, (d) critical thinking, (e) flexibility, (f) problem solving, (g) teamwork, and (h) technology proficiency. The researcher selected a novice teacher and a master teacher from each of the three district schools to participate in the study based upon the predetermined criteria the researcher established. Teachers who were rated high by their administrators on the participant criteria form were classified as master teachers, and teachers who were rated low by their administrators on the participant criteria form were classified as novice teachers.

Rogers' (2003) diffusion of innovation theory provided a useful framework to analyze both the benefits and the concerns associated with ubiquitous access to one-to-one computing (Berger, 2005; Crompton & Keane, 2012; Sahin & Thompson, 2006; Siegle & Foster, 2001; Swan, 2009). One major component of Rogers' Theory is the rate in which an innovation is adopted. Rogers' (2003) adopter categories have five parts, which include (a) innovators, (b) early adopters, (c) early majority, (d) late majority, and (e) laggards. For this research study, master teachers were classified as early adopters and novice teachers were classified as laggards. The classification of both novice teachers and master teachers helped the researcher draw themes from the face-to-face interviews. Based upon the interviews, the following themes emerged from both the novice teachers and master teachers when it came to the benefits associated with one-to-one computing:

- Improved communication

- Provided e-mail as valuable communication tool
- Increased student engagement
- Enhanced teaching and learning
- Promoted collaboration through Google and Google Docs
- Allowed teachers to share and obtain information
- Conducted online research

The teachers who were classified as early adopters and the teachers who were classified as laggards brought up many of the same ideas when it came to the benefits associated with one-to-one computing environments. The lack of major differences between the early adopters and laggards contradicted Rogers' theory.

There were differences between the two groups, novice teachers and master teachers, regarding their lists of benefits. The novice teachers included application and feedback as other items they viewed as benefits in a one-to-one computing environment (see Table 15). When it came to the master teachers, they also viewed the following items as benefits:

- Increased access to learning resources and information,
- Supported classroom methods through use of Chromebooks,
- Increased student engagement,
- Served as an interactive learning tool,
- Provided an LMS to help students submit assignments,
- Provided supplemental learning tool,
- Increased opportunities for learning,
- Implemented project-based learning, and
- Supplemented good instruction by teachers. (see Table 16).

The reason for these differences can be attributed to the teachers' aptitude of each group regarding technology integration. From the novice teachers' perspective, their list of benefits can mainly be classified as technology items they were substituting in the classroom. The novice teachers were using the same basic teaching philosophy and approaches as before, but now items were digital instead of paper-based. For novice teachers, instead of completing an assignment on paper, now they were completing it on a Google Docs. On the other hand, the master teachers' list of benefits included items that were redefining their classroom practices. These items included project-based learning and using an LMS in their classrooms. These findings support the notion that when gearing professional development towards classroom technology, the school district or the administration will need to implement sessions that cater to the needs of both novice teachers and master teachers. During these sessions, novice teachers should have professional development covering the basic functions of technology integration and classroom management skills that are pertinent in a one-to-one computing environment. On the other hand, master teachers' professional development should be geared towards new tasks that are otherwise not possible without the use of laptops in the classroom setting. Along these same lines, master teachers could act as mentors to the novice teachers throughout the school year in both technology integration and classroom management skills.

In addition to the interviews with novice teachers and master teachers, 33 high school teachers in three different school districts completed an online survey related to the frequency that these devices were being utilized, the changes that had occurred since the implementation of one-to-one computing environment, and the changes in classroom management practices since the introduction of laptops. At the end of the survey, an open-ended question asked, "What benefits are associated with the one-to-one computing environment in your classroom?" There

were seven themes that emerged based upon the 33 responses. This particular group also believed that communication was a key component when it came to the benefits associated with a one-to-one computing environment. This was a similar theme that also emerged from both the novice teachers' and the master teachers' interviews. Another theme that emerged from the open-ended question that 33 high school teachers filled out was greater access to information that one-to-one computing environments offered students in the classroom setting (Donovan et al., 2007; Siegle & Foster, 2001; Subramaniam & Kandasamy, 2011). This response aligned with the master teachers' responses, but this theme was not present in the novice teachers' interviews.

Additionally, Siegle and Foster (2001) found that students in high school benefited from full-time access to laptop computers. Their findings were similar to the 33 high school teachers' and master teachers' responses. One of the most significant aspects that a one-to-one computing environment offers school districts is the ability for teachers to communicate with both students and parents through e-mail. One-to-one computing environments allow both students and parents to be on the same page with instructional items and it allows teachers to contact parents if there are any issues throughout the school year. In this new learning environment, teachers also have the means to send out homework assignments when students are absent from school and students are able to check their e-mail on their school-issued laptops.

When examining the three groups of teachers who participated in this research study, the main theme that emerged based on the qualitative data was communication. The novice teachers, the master teachers, and most of the 33 high school teachers believed that communication was a major benefit when it came to one-to-one computing in schools. The use of e-mail helped teachers reach both students and parents without any barriers. Teachers now were able to e-mail students their assignments when they were absent from class. Communication, especially e-mail,

was also beneficial when trying to connect with both students and parents. One novice teacher noted that,

> Being able to e-mail so quickly improves the communication when it comes down to the time of making a phone call, and it has to be within a specific time of this or that. A lot of times that phone call will not get made where e-mails can get sent and addressed whenever.

For this research study, there were three administrators who were interviewed twice regarding benefits associated with one-to-one computing. This particular group believed the same as the novice groups and master groups concerning the benefits that research could provide and the ability to share ideas in this new environment. These findings were similar to Gecer and Dag's (2012) findings regarding their study over students' perceptions towards a Computer II course. Both of these aspects, conducting research and sharing ideas, were important features that were enhanced in a one-to-one computing environment. One administrator stated,

> Well, one example I can give specifically is with our American government class. The teacher is gearing [his classroom] more toward project-based [learning] and providing opportunities for the kids to use their laptops for research and to create some examples of showing their understanding.

When the differences were examined based on the benefits of one-to-one computing between the administrators and both the novice teachers and master teachers, administrators pointed out numerous times that providing laptops for classroom use helped students and teachers accomplish tasks. From the administrators' perspective, this was one of the most important benefits of this new learning environment.

When the results from the administrators' interviews were compared with the 33 high school teachers who completed the open-ended question over the benefits of one-to-one computing, three themes emerged that were similar in both groups: (a) access, (b) project-based learning, and (c) opportunities (for learning). In this new learning environment, students watched recorded lectures at home and class time was devoted to different projects in the classroom. Students also had opportunities for independent inquiry online as well. Access was a major theme that both groups felt was beneficial in the high school setting. The ability for students to have access to a wide range of information was a major benefit of implementing a one-to-one computing environment. One administrator noted,

> I think it puts something in their hands that is tangible and that could be used in an environment beyond the school. I think staff members are starting to move in that direction of going paperless, where kids can actually have access to something 24/7.

When comparing the four groups that participated in this study, there were 10 themes that emerged with benefits associated with one-to-one computing. The 10 themes that were present in this study were

- increased access to learning resources,
- improved communication,
- provided e-mail as a valuable communication tool,
- increased student engagement,
- enhanced both teaching and learning,
- promoted collaboration through Google and Google Docs,
- allowed teachers to share and obtain information,
- provided an LMS for students to submit assignments,

- provided opportunities for learning, and
- promoted online research.

Both educators and policy makers can use these themes to weigh the positives and the negatives of implementing a one-to-one computing environment. These themes can also serve as a reliable framework to help inform the general public about the benefits associated with one-to-one computing. With the implementation of a one-to-one computing environment, the traditional practices of teaching and learning do not create the atmosphere that educators desire for their 21st-century learners (Gunn & Hollingsworth, 2013; Kong et al., 2014; Lowther et al., 2012). By implementing one-to-one computing devices, students have the opportunity to expand their overall learning beyond the walls of the traditional classroom. Items such as the Internet and Google provide students with a wealth of knowledge that is not limited to traditional textbooks. In a one-to-one computing environment, all parties in the school setting will increase communication, and students will be more engaged in the new learning environment because teachers are able to enhance their overall lessons with technology. All of these skills are essential for students to learn if school districts want to create college- and career-ready 21st-century learners (Kong et al., 2014; Lowther et al., 2012).

Research question 3. The third research question guiding this study asked, "What were the perceived concerns associated with one-to-one computing environments?" In order to answer the third research question, interviews took place with both administrators and teachers. For the qualitative portion of this study, three school administrators and six teachers participated in face-to-face interviews. The question "What concerns are associated with the one-to-one computing environment in your classroom?" was also included as an open-ended question on the survey that 33 high school teachers completed.

When it came to selecting two teachers in three different districts, the teachers were recruited based upon the predetermined participant criteria the three school administrators filled out during the months of July and August, 2014. The predetermined criteria aligned with 21st-century skills that are pertinent in schools today (Gunn & Hollingsworth, 2013; Kong et al., 2014; Lowther et al., 2012) and included the following items: (a) collaboration, (b) communication, (c) creativity, (d) critical thinking, (e) flexibility, (f) problem solving teamwork, and (g) technology proficiency. The researcher selected a novice teacher and a master teacher from each of the three district schools to participate in the study, based upon the predetermined criteria the researcher established. Teachers who were rated high by their administrators on the participant criteria form were classified as master teachers, and teachers who were rated low by their administrators on the participant criteria form were classified as novice teachers.

The classification of teachers was the same as in previous research questions, and it followed Rogers' (2003) diffusion of innovation theory. The classification of both novice teachers and master teachers helped the researcher draw themes from the face-to-face interviews. Based upon the interviews, the following themes emerged from both the novice teachers and master teachers addressing concerns associated with one-to-one computing: (a) cost, (b) online games, (c) lack of training opportunities, (d) technology issues, and (e) technology support. When it came to the concerns associated with both novice teachers and master teachers, there were five themes that emerged from the face-to-face interviews. The first concern dealt with the cost associated with implementing a one-to-one computing environment (Donovan et al., 2007; Grant et al., 2005; Russell et al., 2004). Both the novice teachers and the master teachers felt it was important to weigh both the cost and the benefits associated with this new learning environment. This was one area that novice teachers and master teachers believed was

overlooked during the initial implementation process. Initially, both groups thought the cost outweighed the benefits, but as time passed, their views changed. After implementing a one-to-one computing environment for three years, the teachers saw having a one-to-one computing program as an important element of preparing students for the 21st-century. The next theme that emerged from this study was the lack of training that occurred in each of the three buildings (Allan et al., 2010; Beaudry, 2011; Nelson, 2011; Parr & Ward, 2011; Raulston, 2009). One master teacher stated

> I think in years past I would have changed our training, just adding more time. I've alluded to it several times…. I think looking back, everybody would probably agree to do it a little bit differently in terms of timing, maybe doing more trainings beforehand or trainings for staff and students, instead of just here you go, everybody's off.

Not only were there not enough trainings, but both novice teachers and master teachers stated time was another barrier that was hard to overcome in this new learning environment. The teachers believed there was not enough time to learn about the devices and how they can be used successfully in the classroom setting. When examining barriers such as time, Lawrence and Lentle-Keenan's (2013) research confirmed that there were concerns about time constraints when implementing technology and managing workload in a one-to-one computing environment paralleling the findings of this study. The last concerns that appeared during the interviews were technology issues and the need for support when these issues arise. Teachers became frustrated when they spent a great deal of time getting a lesson together that utilized technology, and for some reason, when students had issues with their laptops, there was no one available to support them. Both the novice teachers and master teachers believed that districts needed to have a solid

technology support system in place in order to achieve a lasting and sustainable one-to-one computing system.

The results from the 33 high school teachers' open-ended question regarding the concerns associated with one-to-one computing environments were very similar to both the novice teachers' and the master teachers' responses. The group of 33 high school teachers brought up both technology issues and online games as barriers that occurred in their current one-to-one computing environment. The different technology issues that frustrated the 33 high school teachers were continuous updates that needed to run, students coming to class with their computers not charged, and students forgetting their laptop for class in either their locker or at home. Another major concern the 33 high school teachers had was students playing online games during class. This group of teachers was frustrated that they did not have reliable monitoring programs to monitor their students' laptops. They believed it was easy for students to switch in and out of games without anyone knowing about it. In a similar study, Hur and Oh (2012) also noted concern related to this theme finding in their study that when some students took their laptops home, they spent increasing amounts of time on online games and watching movies.

In addition to the teacher interviews that took place and the one open-ended question at the end of the survey that 33 teachers filled out, there were three administrators who were interviewed regarding the concerns associated with one-to-one computing. Unlike the responses from the three groups of teachers, the main concern from the administrators' perspective was ensuring the students took care of the devices and the districts' task of preparing the devices at the beginning of each school year. The two major concerns that emerged from the administrator interviews were mainly managerial items. From the teachers' perspective, their concerns were directly related to the instructional items that occurred within their classroom setting. Both the

teachers' and the administrators' concerns were valid, but their concerns originated from the functions of their individual positions. Throughout the interviews, online gaming was a common concern between the administrators, novice teachers, master teachers, and the 33 teachers that filled out the open-ended question. The students playing online games were not nearly as much of an issue when it came to the master teachers' perspective.

When examining the four groups that participated in this research study, there were seven themes that emerged related to the concerns associated with one-to-one computing. The seven themes that surfaced in this study were

- cost associated with implementing a one-to-one program,
- students' access to online games during class,
- lack of training opportunities throughout the year,
- distraction of social media websites for students in and out of the classroom,
- technology problems during the school day, and
- lack of technology support.

One of the first items that novice teachers mentioned was the cost associated with employing a one-to-one computing environment. They wanted the administration and school board to weigh both the cost and the benefits of this new learning environment. The next concerns that emerged were online games and social media. The students using their time on nonacademic items like online games and social media websites was a prevalent issue. Before implementing a one-to-one computing environment, it would be beneficial to have trainings over classroom management skills that are essential in this new learning environment (Allan et al., 2010; Beaudry, 2011; Nelson, 2011; Parr & Ward, 2011; Raulston, 2009). Along the same lines, the need for more training opportunities was also seen as a must.

By employing frequent trainings for staff members, this will not only make them more comfortable in the classroom setting, but it will also allow them to fix certain low-priority technology issues. The trainings may also help deter the need for more technology support. By implementing annual monthly technology trainings, it can help both novice teachers and veteran teachers acquire the tools necessary to support their own classroom computing environment. Along the same lines, school districts need to also realize the necessity of providing technology support for their teachers in the classroom. By providing teachers with technology support in the form of hiring technology specialists, it will allow educators to execute their lessons without minor technology disruptions.

Conclusion

The following questions guided this mixed-methods study:

1. How did traditional teaching and learning change in a one-to-one computing environment?
    a. How did the one-to-one computing environment change traditional teaching and learning in a beginner teacher's and in a veteran teacher's classroom?
    b. How did the one-to-one computing environment change traditional teaching and learning in a male teacher's and in a female teacher's classroom?
2. What were the perceived benefits associated with one-to-one computing environments?
3. What were the perceived concerns associated with one-to-one computing environments?

The purpose of this study was to examine one-to-one computing environments based upon the perceived effects on the overall classroom environment. A mixed-methods study

design was used to examine one-to-one computing environments in three schools in rural midwestern communities from the perspective of both administrators and teachers. Each of the three high schools had implemented a one-to-one computing environment for at least three years and utilized a Mac- or a PC-based program for online learning. This study utilized both online surveys and interviews to answer the three research questions posed by this study.

Rogers' (2003) diffusion of innovation theory provided a useful framework to analyze both the benefits and the concerns associated with ubiquitous access to one-to-one computing (Berger, 2005; Crompton & Keane, 2012; Sahin & Thompson, 2006; Siegle & Foster, 2001; Swan, 2009). One major component of Rogers' theory is the rate in which an innovation is adopted. Rogers' (2003) adopter categories have five parts, which include (a) innovators, (b) early adopters, (c) early majority, (d) late majority, and (e) laggards. For this research study, master teachers were classified as early adopters and novice teachers were classified as laggards. The classification of both novice teachers and master teachers helped the researcher draw themes from the two face-to-face interviews.

Based on the qualitative findings, themes emerged that were centered on both the benefits and concerns associated with one-to-one computing environments. The themes that emerged regarding the benefits associated with one-to-one computing environments were

- increased access to learning resources,
- improved communication,
- provided e-mail as a valuable communication tool,
- increased student engagement,
- enhanced teaching and learning,
- promoted collaboration through Google and Google Docs,

- allowed teachers to share and obtain information,
- provided an LMS for students to submit assignments,
- provided opportunities for learning, and
- promoted online research.

Concerns associated with one-to-one computing environments emerged with the following themes:

- Cost associated with implementing a one-to-one program
- Students' access to online games during class
- Lack of training opportunities throughout the year
- Social media websites distracted students in and out of the classroom
- Technology problems during the school day
- Lack of technology support

The early adopters' and laggards' responses to the benefits and concerns of one-to-one computing were similar. Based on this research study, the rate in which an innovation is adopted went against Rogers' (2003) diffusion of innovation theory. When examining Rogers' (2003) adopters categories, it was discovered that early adopters were the group willing to try new innovations and laggards were the last individuals to adopt new innovations. The findings from this study found that both novice teachers and master teachers were willing to try and adopt new innovations in their classrooms, such as utilizing Google Docs and an LMS. The use of Rogers' (2003) diffusion of innovation theory failed to apply to this environment.

The next portion of this mixed-methods study was to administer the online survey. A Mann-Whitney *U* test was employed to compare the dependent variable (the questions) and the two independent variables (gender and experience) to determine if there was a significant

difference between those groups. The overall results yielded minimal differences between beginner teachers and veteran teachers based upon the eight constructs that emerged from the survey. The first eight sections of the online survey were also analyzed based upon the responses from both high school male teachers and female teachers. There was a significant difference in the section of the survey that dealt with the work environment ($p = 0.045$). Under the construct, work environment, the eight questions were analyzed in more detail to see if any certain questions under the work environment section were significant when comparing high school male teachers and female teachers. From these results, it indicated that females believed the overall work environment was more conducive in a one-to-one computing environment than males (Mean Rank $M = 12.85$; $F = 19.7$). This was apparent when examining question 75, where females were more apt to share samples of students' work than males.

Recommendation for Further Research

This research study investigated the perceived effects of a one-to-one computing environment on the overall classroom atmosphere in three rural high schools in the midwestern United States. A mixed-methods research study was employed to examine the different components associated with this new learning environment. Providing every student with ubiquitous access to laptops is a relatively new phenomenon in education. Further research is needed to advance the current research that is available for both educators and policy makers. One area that needs further exploration is the long-term effect of implementing a one-to-one computing environment on both students and teachers. The data obtained for this study were collected over only one academic semester, and each of the three schools had implemented a one-to-one computing environment for just three years and utilized a Mac-based or a PC-based program for online learning.

Another avenue that needs further examination is the effect of one-to-one computing environments on larger school districts and school districts that have considerable amounts of ethnic diversification. Both of these elements were not present in the current research study. By expanding the current study, it would provide the research-based evidence that is necessary for school leaders and policy makers to take into consideration before investing funds to support this new learning environment. Furthermore, it is worth it to investigate the differences in attendance rates and discipline referrals associated with implementing a one-to-one computing environment.

The final recommendation for future investigation is the exploration of instructional strategies that are pertinent in one-to-one computing environments. With the implementation of one-to-one computing devices, are there certain instructional strategies that are essential for educators to possess. The question must be asked, “Are colleges across the United States instructing future educators how to implement these new instructional strategies?” In addition, is there an apparent implementation model that districts should follow when deciding to transition to a one-to-one computing environment?

Implications for Professional Practice

There is little research to help guide policy makers and school leaders with decisions associated with implementing one-to-one computing environments (Dawson et al., 2008; Lei & Zhao, 2008; Lowther et al., 2012; Mouza, 2008; Penuel, 2006). The findings from this research study brought forth several implications that can be applied to the educational field. For this study a Mann-Whitney *U* test was employed to compare the dependent variable (the questions) and the two independent variables (gender and experience) to determine if there was a significant difference between these two groups. There were minimal differences between beginner teachers and veteran teachers, but when it came to gender, female high school teachers were more apt to

share students' work than male high school teachers were. Before implementing a one-to-one computing environment, it is important to establish an environment where ideas and strategies are regularly shared in common, in-service times or at annual staff meetings. Other potential ways to accomplish this task are by having the administration define a strong sense of purpose for all educators, encourage teachers to take risks, and allow teachers to work in small groups to discuss classroom technology integration. The sharing of ideas and best practices when implementing a one-to-one computing environment will help enhance the overall quality of any one-to-one computing program.

It is also vital for policy makers and school leaders to examine the benefits and the concerns associated with a one-to-one computing environment before they decide to make financial investments into this new learning environment. The findings from this study point to a number of benefits associated with employing a one-to-one computing environment. This new learning environment allows students the opportunities to expand their learning experience beyond the walls of the traditional classroom. The use of the Internet provides students with a wealth of knowledge that is not limited like traditional textbooks. This also allows students to conduct research for class projects, complete research papers, and have time for independent inquiry on their laptops. In a one-to-one computing environment, there is increased communication and students are more engaged in the lessons. In this new learning environment, both teachers and students have the capability to implement project-based learning in the classroom setting. Based upon the findings of this study, the overall benefits of implementing a one-to-one computing environment outweigh the costs associated with this new learning environment.

This research study also brought forth some of the concerns associated with employing a one-to-one computing environment. Before school districts decide to implement a one-to-one computing environment, districts need to be aware of the substantial cost that is associated with implementing and maintaining this new learning environment. If districts decide to take this route, they will need to ensure that teachers are trained in classroom management skills necessary in a one-to-one environment. Along these same lines, it is important to provide training on how to plan lessons that include laptops as a learning component. This training will help limit the amount of off-task behavior that was so commonly indicated as a concern by the participants of this study in relation to one-to-one computing. Throughout this study, the novice teachers who were interviewed believed they lacked the ability to monitor students' computers. It would also be prudent for districts to provide teachers with software that allows them the ability to view the students' laptop screens throughout the school day.

In addition, districts will need to invest and provide proper support for teachers if they want to see an efficient and effective one-to-one computing environment. Proper support can take on many different forms, from implementing regular trainings to hiring staff members who can fix technology problems when they occur. Districts could also decide to hire full-time technology specialists to fix different problems that might arise throughout the school year. It is also beneficial to only employ one platform, either a Mac- or a PC-based program, for learning, as this was a problem with one-to-one device use identified by teachers in this study. This will take away the burden put on teachers to learn two different platforms and eliminate the process of trying to find instructional items that fit both platforms. One of the last recommendations is to ensure that both online games and social media websites are blocked on the students' devices.

This will limit off-task behavior by students in a one-to-one computing setting that was commonly mentioned as a concern by the participants of this study.

References

ACT. (2013). *2013 ACT national and state scores*. Retrieved from http://www.act.org/newsroom/data/2013/pdf/profile/Section1.pdf

Allan, W. C., Erickson, J. L., Brookhouse, P., & Johnson, J. L. (2010). Teacher professional development through a collaborative curriculum project—an example of TPACK in Maine. *TechTrends: Linking Research and Practice to Improve Learning*, *54*(6), 36–43. doi:10.1007/s11528-010-0452-x

Beaudry, D. (2011). *Technology and fifth-grade teaching: A study of teacher reported-classroom practice, professional development, access, and support* (Doctoral dissertation). Retrieved from PQDT Open. (UMI No. 3496474)

Berger, J. I. (2005). Perceived consequences of adopting the Internet into adult literacy and basic education classrooms. *Adult Basic Education: An Interdisciplinary Journal for Adult Literacy Educational Planning*, *15*(2), 103–121.

Blase, J., & Blase, J. (1999). Principals' instructional leadership and teacher development: Teachers' perspectives. *Educational Administration Quarterly*, *35*(3), 349–78.

Blau, I., & Hameiri, M. (2010). Implementing technological change at schools: The impact of online communication with families on teacher interactions through learning management system. *Interdisciplinary Journal of E-Learning and Learning Objects, 6*, 245–257.

Carr, J. M. (2012). Does math achievement "h'APP'en" when iPads and game-based learning are incorporated into fifth-grade mathematics instruction? *Journal of Information Technology Education: Research, 11*, 269–286.

Cavanaugh, C., Dawson, K., & Ritzhaupt, A. (2011). An evaluation of the conditions, processes, and consequences of laptop computing in K–12 classrooms. *Journal of Educational Computing Research, 45*(3), 359-378.

Cowie, B., Jones, A., & Harlow, A. (2011). Laptops for teachers: Practices and possibilities. *Teacher Development, 15*(2), 241–255.

Creswell, J. W. (2013). *Research design: Qualitative, quantitative, and mixed-methods approaches*. Thousand Oaks, CA: Sage.

Creswell, J. W., & Clark, V. L. P. (2007). *Designing and conducting mixed-methods research*. Thousand Oaks, CA: Sage.

Crompton, H., & Keane, J. (2012). Implementation of a one-to-one iPod touch program in a middle school. *Journal of Interactive Online Learning, 11*(1), 1–18.

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.

Donovan, L., & Green, T. (2010). One-to-one computing in teacher education: Faculty concerns and implications for teacher educators. *Journal of Digital Learning in Teacher Education, 26*(4), 140–148.

Donovan, L., Green, T., & Hansen, L. E. (2011). One-to-one laptop teacher education: Does involvement affect candidate technology skills and dispositions? *Journal of Research on Technology in Education, 44*(2), 121–139.

Donovan, L., Hartley, K., & Strudler, N. (2007). Teacher concerns during initial implementation of a one-to-one laptop initiative at the middle school level. *Journal of Research on Technology in Education, 39*(3), 263–286.

Dunleavy, M., & Heinecke, W. F. (2007). The impact of 1:1 laptop use on middle school math and science standardized test scores. *Computers in the Schools, 24*(3/4), 7–22. doi:10.1300/J025v24n03-02

Eden, S., Shamir, A., & Fershtman, M. (2011). The effect of using laptops on the spelling skills of students with learning disabilities. *Educational Media International, 48*(4), 249–259.

Enfield, J. (2013). Looking at the impact of the flipped classroom model of instruction on undergraduate multimedia students at CSUN. *TechTrends: Linking Research and Practice to Improve Learning*, *57*(6), 14–27. doi:10.1007/s11528-013-0698-1

Esterhuizen, H. D., Ellis, S. M., & Els, C. J. (2012). ODL students' perceived computer literacy competencies, expectations of support intention to use and perseverance. *Turkish Online Journal of Distance Education, 13*(4), 76–94.

Gecer, A., & Dag, F. (2012). A blended learning experience. *Educational Sciences: Theory and Practice, 12*(1), 438–442.

Goddard, Y., Goddard, R., & Tschannen-Moran, M. (2007). A theoretical and empirical investigation of teacher collaboration for school improvement and student achievement in public elementary schools. *The Teachers College Record*, *109*(4), 877–896.

Grant, M. M. (2002). Getting a grip on project-based learning: Theory, cases and recommendations. *Meridian: A Middle School Computer Technologies Journal*, *5*(1), 83.

Grant, M. M., Ross, S. M., Wang, W., & Potter, A. (2005). Computers on wheels: An alternative to “each one has one.” *British Journal of Educational Technology*, *36*(6), 1017–1034.

Green, L., Inan, F. A., & Denton, B. (2012). Examination of factors impacting student satisfaction with a new learning management system. *Turkish Online Journal of Distance Education, 13*(3), 189–197.

Grimes, D., & Warschauer, M. (2008). Learning with laptops: A multi-method case study. *Journal of Educational Computing Research, 38*(3), 305–332.

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

Gunn, T. M., & Hollingsworth, M. (2013). The implementation and assessment of a shared 21st-century learning vision: A district-based approach. *Journal of Research on Technology in Education (International Society for Technology in Education), 45*(3), 201–228.

Hahn, J., & Bussell, H. (2012). Curricular use of the iPad 2 by a first-year undergraduate learning community. *Library Technology Reports, 48*(8), 42–47.

Hakverdi-Can, M., & Sonmez, D. (2012). Learning how to design a technology-supported inquiry-based learning environment. *Science Education International, 23*(4), 338–352.

Hawks, S. J. (2014). The flipped classroom: Now or never? *AANA Journal, 82*(4), 264–269.

Hazzan, O. (2002). Prospective high school mathematics teachers' attitudes toward integrating computers in their future teaching. *Journal of Research on Technology in Education (International Society for Technology in Education), 35*(2), 213.

Howard, S. K., Chan, A., & Caputi, P. (2014). More than beliefs: Subject areas and teachers' integration of laptops in secondary teaching. *British Journal of Educational Technology.*

Hur, J., & Oh, J. (2012). Learning, engagement, and technology: Middle school students' three-year experience in pervasive technology environments in South Korea. *Journal of Educational Computing Research, 46*(3), 295–312.

Kim, S. W., & Lee, M. G. (2008). Validation of an evaluation model for learning management systems. *Journal of Computer Assisted Learning, 24*(4), 284–294.

Klieger, A., Ben-Hur, Y., & Bar-Yossef, N. (2010). Integrating laptop computers into classrooms: Attitudes, needs, and professional development of science teachers—a case study. *Journal of Science Education and Technology, 19*(2), 187–198. doi:10.1007/s10956-009-9191-1

Kong, S. C., Chan, T.W., Griffin, P., Hoppe, U., Huang, R., Kinshuk, Looi, C. K., Milrad, M., Norris, C., Nussbaum, M., Sharples, M., So, W. M. W., Soloway, E., & Yu, S. (2014). E-learning in school education in the coming 10 years for developing 21st-century skills: Critical research issues and policy implications. *Educational Technology and Society, 17(*1), 70–78.

Lawrence, B., & Lentle-Keenan, S. (2013). Teaching beliefs and practice, institutional context, and the uptake of web-based technology. *Distance Education, 34*(1), 4–20.

Lei, J. (2010). Quantity versus quality: A new approach to examine the relationship between technology use and student outcomes. *British Journal of Educational Technology, 41*(3), 455–472.

Lei, J., & Zhao, Y. (2008). One-to-one computing: What does it bring to schools? *Journal of Educational Computing Research, 39*(2), 97–122.

Lowther, D. L., Inan, F. A., Ross, S. M., & Strahl, J. (2012). Do one-to-one initiatives bridge the way to 21st-century knowledge and skills? *Journal of Educational Computing Research, 46*(1), 1–30.

Lynn, M. R. (1986). Determination and quantification of content validity. *Nursing Research, 35*(6), 382–386.

Maninger, R. M., & Holden, M. E. (2009). Put the textbooks away: Preparation and support for a middle school one-to-one laptop initiative. *American Secondary Education, 38*(1), 5–33.

Marshall, C., & Rossman, G. B. (2011). *Designing Qualitative Research* (5th ed.). Newbury Park, CA: Sage.

Mouza, C. (2008). Learning with laptops: Implementation and outcomes in an urban, under-privileged school. *Journal of Research on Technology in Education, 40*(4), 447–472.

Nelson, L. (2011). *Teachers' motivation to integrate technology: A study of expectancy-value, perceived instrumentality, and prosocial goals* (Doctoral Dissertation). Retrieved from PQDT Open. (AAT 3488211)

Nulty, D. D. (2008). The adequacy of response rates to online and paper surveys: What can be done? *Assessment and Evaluation in Higher Education, 33*(3), 301–314.

Papadakis, S., Dovros, N., Paschalis, G., & Rossiou, E. (2012). Integrating LMSs in the educational process: Greek teachers' initial perceptions about LAMS. *Turkish Online Journal of Distance Education, 13*(4), 55–75.

Parr, J. M., & Ward, L. (2011). The teacher's laptop as a hub for learning in the classroom. *Journal of Research on Technology in Education, 44*(1), 53–73.

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), 329–348.

Polit, D. F., & Beck, C.T. (2006). The content validity index: Are you sure you know what's being reported? Critique and recommendations. *Research in Nursing and Health, 29*(5) 489–497.

Raulston, C. G. (2009). *Analyses of teachers' perceptions and attitudes of a teacher laptop Initiative* (Doctoral dissertation). Retrieved from PQDT Open. (AAT 3369782)

Rogers, E.M. (2003). *Diffusion of innovations* (5th ed.). New York, NY: Free Press.

Rosen, Y., & Beck-Hill, D. (2012). Intertwining digital content and a one-to-one laptop environment in teaching and learning: Lessons from the time-to-know program. *Journal of Research on Technology in Education, 44*(3), 225–241.

Rossing, J. P., Miller, W. M., Cecil, A. K., & Stamper, S. E. (2012). ILearning: The future of higher education? Student perceptions on learning with mobile tablets. *Journal of the Scholarship of Teaching and Learning, 12*(2), 1–26.

Russell, M., Bebell, D., & Higgins, J. (2004). Laptop learning: A comparison of teaching and learning in upper elementary classrooms equipped with shared carts of laptops and permanent 1:1 laptops. *Journal of Educational Computing Research, 30*(4), 313–330.

Sahin, I., & Thompson, A. (2006). Using Rogers' theory to interpret instructional computer use by COE faculty. *Journal of Research on Technology in Education, 39*(1), 81–104.

Siegle, D., & Foster, T. (2001). Laptop computers and multimedia and presentation software: Their effects on student achievement in anatomy and physiology. *Journal of Research on Technology in Education, 34*(1), 29–38.

Sikula, A., & Costa, A. D. (1994). Are women more ethical than men? *Journal of Business Ethics, 13*(11), 859–871.

Smith, L.A. (2012). *Leveling the playing field: Using one-to-one laptop initiative to close the achievement gap*. (Doctoral dissertation). Retrieved from PQDT Open. (UMI No. 3523737)

Smith, R.H. (2009). *Distributed learning in designing curriculum in a one-to-one computing environment* (Doctoral dissertation). Retrieved from PQDT Open. (UMI No. 3350007)

Snow-Gerono, J. L. (2005). Professional development in a culture of inquiry: PDS teachers identify the benefits of professional learning communities. *Teaching and Teacher Education*, *21*(3), 241–256.

Soffer, T., Nachmias, R., & Ram, J. (2010). Diffusion of web-supported instruction in higher education—The case of tel-aviv university. *Journal of Educational Technology and Society, 13*(3), 212–223.

SPSS. (2014). IBM statistical software. Retrieved from http://www01.ibm.com/software/analytics/spss/

Stephens, T. (2012). *The evolution of transformative communication patterns in 1-to-1 computing classrooms* (Doctoral dissertation). Retrieved from PQDT Open. (UMI No. 3499358)

Subramaniam, N., & Kandasamy, M. (2011). The virtual classroom: A catalyst for institutional transformation. *Australasian Journal of Educational Technology*, *27*(8), 1388–1412.

Swan, G. (2009). Information systems in teacher preparation programs: What can we learn from a 5-year longitudinal case study of an electronic portfolio database? *Journal of Educational Computing Research, 41*(4), 431–451.

Tanner, D. (2012). *Using statistics to make education decisions*. Thousand Oaks, California: Sage.

Tashakkori, A., & Creswell, J. W. (2007). The new era of mixed methods. *Journal of Mixed-Methods Research, 1*, 3–7.

Thomas, M. (Ed.). (2011). *Deconstructing digital natives: Young people, technology, and the new literacies*. New York: Routledge.

U.S. Department of Education. (2012). *ED data express: Data about elementary and secondary schools in the U.S.* Retrieved from http://eddataexpress.ed.gov/state-report.cfm/tab/sd/state/US/

Venter, P., Van Rensburg, M., & Davis, A. (2012). Drivers of learning management system use in a South African open and distance learning institution. *Australasian Journal of Educational Technology, 28*(2), 183–198.

Vernadakis, N., Giannousi, M., Tsitskari, E., Antoniou, P., & Kioumourtzoglou, E. (2012). A comparison of student satisfaction between traditional and blended technology course offerings in physical education. *Turkish Online Journal of Distance Education, 13*(1), 137–147.

Warschauer, M., Zheng, B., Niiya, M., Cotten, S., & Farkas, G. (2014). Balancing the one-to-one equation: Equity and access in three laptop programs. *Equity and Excellence in Education*, *47*(1), 46–62. doi:10.1080/10665684.2014.866871

Wepner, S. B., & Tao, L. (2002). From master teacher to master novice: Shifting responsibilities in technology-infused classrooms. *Reading Teacher*, *55*(7), 642.

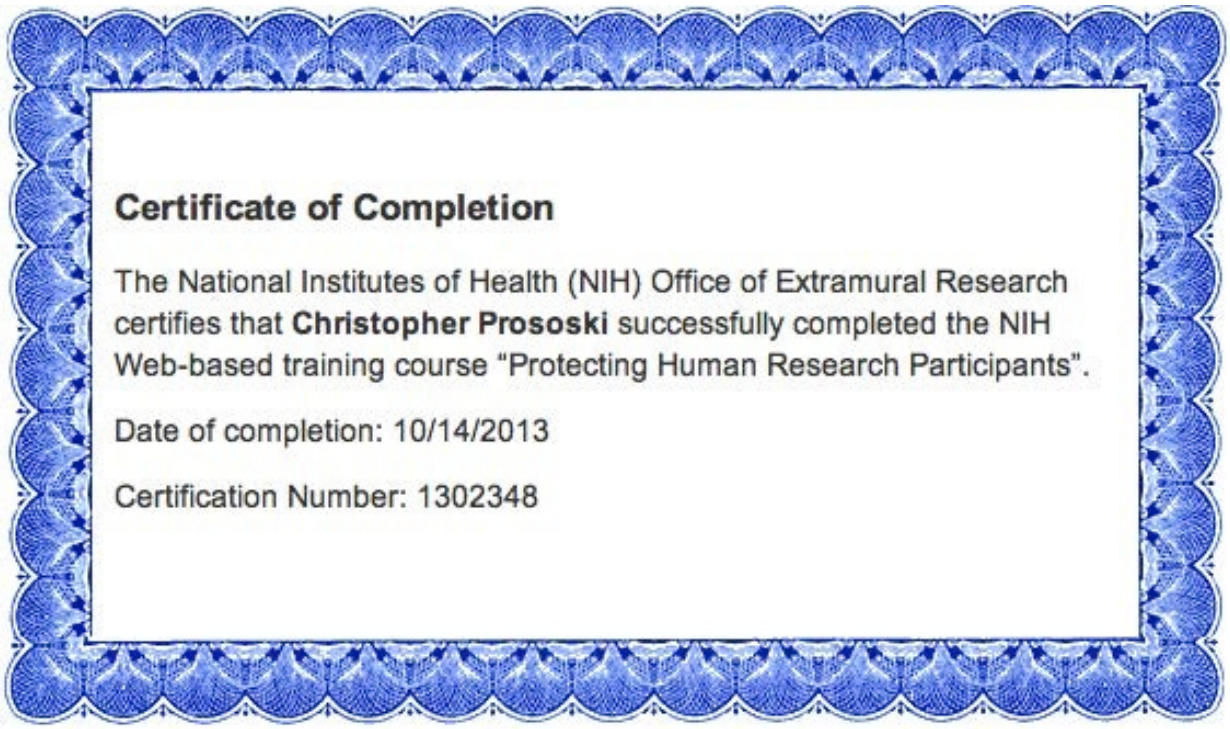
Yapici, I., & Akbayin, H. (2012). High school students' views on blended learning. *Turkish Online Journal of Distance Education, 13*(4), 125–139.

Yin, R. K. (2009). *Case study research: Design and methods* (5th ed,). Thousand Oak, CA: Sage.

Young, D.K. (2012). *Teachers' perceived barriers to technology integration as prescribed by 21st-century learning skills* (Doctoral dissertation). Retrieved from PQDT Open. (AAT 3548993)

Appendix A

NIH Research Certification



Certificate of Completion

The National Institutes of Health (NIH) Office of Extramural Research certifies that **Christopher Prososki** successfully completed the NIH Web-based training course "Protecting Human Research Participants".

Date of completion: 10/14/2013

Certification Number: 1302348

Appendix B

Administrator Approval Form

[redacted]

January 20, 2014

Northwest Nazarene University
Attention: HRRC Committee
Helstrom Business Center 1st floor
623 S University Boulevard
Nampa, Idaho 83686

RE: Research Proposal Site Access for Mr. Christopher R. Prososki

Dear HRRC Members:

This letter is to inform the HRRC that Administration at [redacted] has reviewed the proposed dissertation research plan including subjects, intervention, assessment procedures, proposed data and collection procedures, data analysis, and purpose of the study. Mr. Prososki has permission to conduct his research in the district of and with the high school administrator and the teachers of [redacted]. The authorization dates for this research study are July 2014 to April 2015.

[redacted]

[redacted]

January 13, 2014

Northwest Nazarene University
Attention: HRRC Committee
Helstrom Business Center 1st floor
623 S University Boulevard
Nampa, Idaho 83686

RE: Research Proposal Site Access for Mr. Christopher R. Prososki

Dear HRRC Members:

This letter is to inform the HRRC that Administration at [redacted] has reviewed the proposed dissertation research plan including subjects, intervention, assessment procedures, proposed data and collection procedures, data analysis, and purpose of the study. Mr. Prososki has permission to conduct his research in the district of and with the high school administrator and the teachers of [redacted] The authorization dates for this research study are July 2014 to April 2015.

[redacted]

[redacted]

January 13, 2014

Northwest Nazarene University
Attention: HRRC Committee
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Dear HRRC Members:

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[redacted]

Appendix C

Informed Consent Form

A. PURPOSE AND BACKGROUND

Christopher Prososki, a doctoral student in the Department of Graduate Education at Northwest Nazarene University, is conducting a research study related to ONE-TO-ONE COMPUTING: A MIXED-METHODS STUDY DESIGNED TO UNCOVER THE PERCEIVED EFFECTS ON THE OVERALL CLASSROOM ENVIRONMENT. The study will ask for insight over how traditional teaching and learning changes in a one-to-one environment. We appreciate your involvement in helping us investigate how to better serve and meet the needs of K–12 students across the state. You are being asked to participate in this study because of your particular knowledge of a one-to-one computing environment. Your school superintendent has given permission for this study to be conducted in your district.

B. PROCEDURES

If you agree to be in the study, the following will occur:

1. You will be asked to sign an Informed Consent Form, volunteering to participate in the study.

2. You will also be asked to participate in 2 face-to-face interviews that should last around forty-five minutes total.

3. You will be asked to reply to an e-mail at the conclusion of the study asking you to confirm the data that was gathered during the research process.

C. RISKS/DISCOMFORTS

1. None of the discussion questions should make you uncomfortable or upset, but you are free to decline to answer any questions you do not wish to answer or to stop participation at any time.

2. For this research project, the researchers are requesting demographic information. Due to the make-up of 3 midwestern school district populations, the combined answers to these questions may make an individual person identifiable. The researchers will make every effort to protect your confidentiality. However, if you are uncomfortable answering any of these questions, you may leave them blank.

3. Confidentiality: Participation in research may involve a loss of privacy; however, your records will be handled as confidentially as possible. No individual identities will be used in any reports or publications that may result from this study. All data from notes, audiotapes, and disks will be kept in a locked file cabinet and the key to the cabinet will be kept in a separate location. In compliance with the Federalwide Assurance Code, data from this study will be kept for 3 years, after which all data from the study will be destroyed (45 CFR 46.117).

D. BENEFITS
There will be no direct benefit to you from participating in this study. However, the information you provide may help educators to better understand one-to-one computing environments across the state.

E. PAYMENTS
There are no payments for participating in this study.

F. QUESTIONS
If you have questions or concerns about participation in this study, you should first talk with the investigator. Christopher R. Prososki can be contacted via e-mail at [redacted], via telephone at [redacted] (C) or by writing: [redacted].

Should you feel distressed due to participation in this, you should contact your own health care provider.

G. CONSENT
You will be given a copy of this consent form to keep.

PARTICIPATION IN RESEARCH IS VOLUNTARY. You are free to decline to be in this study, or to withdraw from it at any point. Your decision as to whether or not to participate in this study will have no influence on your present or future status as a school educator.

I give my consent to participate in this study:

_____ _____
Signature of Study Participant **Date**

I give my consent for the interview and discussion to be audiotaped in this study:

_____ _____
Signature of Study Participant **Date**

I give my consent for direct quotes to be used in this study:

_____ _____
Signature of Study Participant **Date**

_____ _____
Signature of Person Obtaining Consent **Date**

THE NORTHWEST NAZARENE UNIVERSITY HUMAN RESEARCH REVIEW COMMITTEE HAS REVIEWED THIS PROJECT FOR THE PROTECTION OF HUMAN PARTICIPANTS IN RESEARCH.

Appendix D

Interview E-mail Script

Teacher 1 & Teacher 2:

Hi, my name is Chris Prososki and I am currently a doctoral student at Northwest Nazarene University in Idaho and PK–12 Principal at [redacted]. I am also in the process of conducting research for my dissertation. Your superintendent and principal gave me permission to conduct my research in your district. Based on the participant criteria form that your principal filled out, you were selected to participate with the interview portion of this study (Two 20-30 minute interviews).

I was wondering if the two of you would be willing to participate in my study, and if so, could I set up an interview with the two of you separately regarding one-to-one computing? I am willing to meet each of you at any time and place that will be the most convenient for you (Plan period, end of the day, etc.). I have also provided you with more information about my research project below.

Research Synopsis

Thanks again for your time and consideration. If it is possible, could you **e-mail me by Friday (8/22)** if you would be willing to be interviewed for my research project.

Sincerely,

Christopher R. Prososki, Ed.S.
Doctoral Candidate
Northwest Nazarene University

Appendix E

Verbatim Instructions for Interviews

Hi _____:

Thank you for participating in this study. I truly appreciate it.

Semistructured, Audio-Recorded Interviews
Two semistructured, audio-recorded, face-to-face interviews will be conducted with each participant. These interviews will be completed during a mutually decided upon time by both the participant and investigator. Each interview will take approximately twenty to twenty-five minutes.

This process is completely voluntary and you can choose to leave the study at any time. If you feel uncomfortable with any question you can select not to answer that question.

Do you have any questions for me?

Thank you for participating.

Appendix F

Interview Questions

Teacher Script—First Interview

1. What is your view of the role of technology in education?
2. What benefits are associated with a one-to-one computing environment in your classroom?
3. How does your school utilize technology to enhance teaching and learning in your district?
4. Why do you feel that students are more involved in learning due to the implementation of a one-to-one computing environment?
5. How has student learning changed in your classroom since the introduction of a one-to-one computing environment?
6. How has your classroom instruction changed since the implementation of a one-to-one computing environment?
7. Have you seen any changes in the teacher-to-student or the teacher-to-parent communication since implementing a one-to-one computing environment?
8. How has the implementation of a one-to-one computing environment changed how time is spent during professional development days?
9. Is there anything else you want to add that I may not have covered? Your insight is appreciated.

Teacher Script—Second Interview

1. What concerns do you have with a one-to-one computing environment in your classroom?
2. What are some of the challenges that you face with implementing a one-to-one computing environment in your classroom?
3. Can you describe any issues that you have had with students spending time on nonacademic items in your classroom?
4. If you were to make any changes to the one-to-one computing program in your district, what would they be?
5. What was the reaction, by both parents and community members, when your district decided to implement a one-to-one computing environment?
6. Has the implementation of a one-to-one computing environment changed the overall climate in your district?
7. Where do you see your one-to-one computing program five years from now?
8. Is there anything else that you would like to add about your district's one-to-one computing environment?
9. Is there anything else you want to add that I may not have covered? Your insight is appreciated.

Administrator Script—First Interview

1. What is your view of the role of technology in education?
2. What goals do you have for your one-to-one computing environment in your district?
3. What benefits are associated with the one-to-one computing environment in your district?
4. How do you get your faculty members interested in implementing a one-to-one computing environment in their classroom?
5. How has student learning changed in your district since the introduction of a one-to-one computing environment?
6. How has classroom instruction changed in your district since the implementation of a one-to-one computing environment?
7. Has there been any parent concerns about implementing a one-to-one computing environment in your district?
8. How has the implementation of a one-to-one computing environment changed how time is spent during professional development days?
9. Is there anything else you want to add that I may not have covered? Your insight is appreciated.

Administrator Script—Second Interview

1. What concerns do you have with a one-to-one computing environment in your district?
2. What are some of the challenges that you face with implementing a one-to-one computing environment in your district?
3. Describe any issues that you have had with students spending time on nonacademic items during instructional time?
4. If you were to make any changes to the one-to-one computing program in your district, what would they be?
5. What was the reaction, by both parents and community members, when your district decided to implement a one-to-one computing environment?
6. Has the implementation of a one-to-one computing environment changed the overall climate in your district?
7. Where do you see your one-to-one computing program five years from now?
8. Is there anything else that you would like to add about your district's one-to-one computing environment?
9. Is there anything else you want to add that I may not have covered? Your insight is appreciated.

Appendix G

Debrief Statement

Thank you for participating in this study. As you know, being an educator is tough work. The goal of this study is to determine the perceived effects of one-to-one computing on the overall classroom environment. Hopefully, this study can provide both administrators and teachers insight on how to implement a successful one-to-one computing environment in their district.

After I analyze the data, I will e-mail you the results and ask for feedback. The purpose of this communication is to ensure that I have captured our discussions accurately and portrayed your thoughts properly.

If you have any questions or concerns, I can be contacted by phone at [redacted]; [redacted]; e-mail [redacted].

Thank you for your participation.

Sincerely,

Christopher R. Prososki, Ed.S.
Doctoral Candidate
Northwest Nazarene University

Appendix H

Member-Checking E-mail

Date

Dear _____:

Thank you for your participation in this study the past semester. I want to let you know some of the themes that resulted from the interviews of all of the participants (see below). Please let me know if these accurately depicted our conversation. If you have any suggestions or modifications, please let me know by Monday, February 2, 2015.

The purpose of this research study was to uncover the perceived effects of a one-to-one computing environment on the overall classroom atmosphere.

The guiding research questions for this study were:

1. How did traditional teaching and learning change in a one-to-one computing environment?
    a. How did the one-to-one computing environment change traditional teaching and learning in a beginner teacher's and in a veteran teacher's classroom?
    b. How did the one-to-one computing environment change traditional teaching and learning in a male teacher's and in a female teacher's classroom?
2. What were the perceived benefits associated with one-to-one computing environments?
3. What were the perceived concerns associated with one-to-one computing environments?

The themes that emerged regarding the benefits associated with one-to-one computing environments were: increased access to learning resources, improved communication, provided e-mail as a valuable communication tool, increased student engagement, enhanced teaching and learning, promoted collaboration through Google and Google Docs, allowed teachers to share and obtain information, provided LMS for students to submit assignments, provided opportunities for learning, and afforded opportunities to conduct online research.

When it came to the concerns associated with one-to-one computing environments, the following themes emerged: the cost associated with implementing a one-to-one program, students' access online games during class, lack of training opportunities throughout the year, distractions of social media websites in and out of the classroom, technology problems during the school day, and lack of technology support.

If these themes do not reflect your views or if you would like to comment further, please respond to this e-mail. Thanks again for your help with this research project.

Sincerely,

Christopher R. Prososki, Ed.S.
Doctoral Candidate
Northwest Nazarene University

Appendix I

Item Content Validity Index Survey Results

Teacher Survey: One-to-One Computing	7/18/14						
Question Number	**Not Relevant**	**Somewhat Relevant**	**Quite Relevant**	**Highly Relevant**	**Total**	**Percentage**	
Q1		1	1	4	6	83.33%	
Q2		1	2	3	6	83.33%	
Q3		1		5	6	83.33%	
Q4			4	2	6	100.00%	
Q5	1		2	3	6	83.33%	
Q6		3	2	1	6		**Removed 7/21/2014**
Q7		1	4	1	6	83.33%	
Q8			5	1	6	100.00%	
Q9		2	3	1	6	66.66%	
Q10	1		1	4	6	83.33%	
Q11		1	2	3	6	83.33%	
Q12	1	2	2	1	6		**Removed 7/21/2014**
Q13		1	2	3	6	83.33%	
Q14		3	2	1	6		**Removed 7/21/2014**
Q15		1	4	1	6	83.33%	
Q16		2	3	1	6	66.66%	
Q17		1	4	1	6	83.33%	
Q18	1	2	2	1	6		**Removed 7/21/2014**
Q19			3	3	6	100.00%	
Q20		1	2	3	6	83.33%	
Q21	1	1	1	3	6	66.66%	
Q22	1		2	3	6	83.33%	
Q23		1	4	1	6	83.33%	
Q24			3	3	6	100.00%	
Q25		1	3	1	6	83.33%	
Q26	1		2	3	6	83.33%	
Q27		1	3	2	6	83.33%	
Q28			2	4	6	100.00%	
Q29		1	2	3	6	83.33%	
Q30				6	6	100.00%	
Q31			1	5	6	100.00%	
Q32			5	1	6	100.00%	

Q33			3	3	6	100.00%	
Q34			3	3	6	100.00%	
Q35		2	3	1	6	66.66%	
Q36		2	2	2	6	66.66%	
Q37		1	3	2	6	83.33%	
Q38		1	2	3	6	83.33%	
Q39			1	5	6	100.00%	
Q40		1	4	1	6	83.33%	
Q41			3	3	6	100.00%	
Q42		1	2	3	6	83.33%	
Q43		1	2	3	6	83.33%	
Q44		2	1	3	6	66.66%	
Q45		4	1	1	6		**Removed 7/21/2014**
Q46		1	4	1	6	83.33%	
Q47		1	4	1	6	83.33%	
Q48		1	4	1	6	83.33%	
Q49		1	4	1	6	83.33%	
Q50		1	4	1	6	83.33%	
Q51		3	2	1	6		**Removed 7/21/2014**
Q52	2	3		1	6		**Removed 7/21/2014**
Q53	1	4		1	6		**Removed 7/21/2014**
Q54	1	2	2	1	6		**Removed 7/21/2014**
Q55		3	1	2	6		**Removed 7/21/2014**
Q56		3	2	1	6		**Removed 7/21/2014**
Q57	4	1		1	6		**Removed 7/21/2014**
Q58	1	4		1	6		**Removed 7/21/2014**
Q59	3		2	1	6		**Removed 7/21/2014**
Q60			2	4	6	100.00%	
Q61			2	4	6	100.00%	
Q62			3	3	6	100.00%	
Q63			1	5	6	100.00%	
Q64			2	4	6	100.00%	
Q65		1	1	4	6	83.33%	
Q66			2	4	6	100.00%	
Q67		1	3	2	6	83.33%	
Q68			2	4	6	100.00%	

Q69			2	4	6	100.00%	
Q70	1		2	3	6	83.33%	
Q71			1	5	6	100.00%	
Q72		1	1	4	6	83.33%	
Q73			2	4	6	100.00%	
Q74		2		4	6	66.66%	
Q75	1		2	3	6	83.33%	
Q76		1	3	2	6	83.33%	
Q77		1	3	2	6	83.33%	
Q78			3	3	6	100.00%	
Q79			5	1	6	100.00%	
Q80			4	2	6	100.00%	
Q81		2	2	2	6	66.66%	
Q82			2	4	6	100.00%	
Q83		1	3	2	6	83.33%	
Q84		1	2	3	6	83.33%	
Q85	1	1	1	3	6	66.66%	
Q86	1		2	3	6	83.33%	
Q87	2	2		2	6		**Removed 7/21/2014**
Q88		2	2	2	6	66.66%	
Q89		1	3	2	6	83.33%	
Q90		2	2	2	6	66.66%	
Q91		1	3	2	6	83.33%	
Q92		1	1	4	6	83.33%	
Q93			2	4	6	100.00%	
Q94		3	1	2	6		**Removed 7/21/2014**
Q95			2	4	6	100.00%	
Q96			3	3	6	100.00%	
Q97		3	1	2	6		**Removed 7/21/2014**
Q98			2	4	6	100.00%	
Q99			3	3	6	100.00%	
Q100		3	1	2	6		**Removed 7/21/2014**
					AVG	87.40%	

Appendix J

Consent Statement for the Electronic Survey

This survey is composed of three Parts. Part 1 will collect your Demographics, Part 2 consists of 83 questions, and Part 3 consists of three open-ended questions.

The following survey should take approximately 25 minutes. Your answers are anonymous. This is a voluntary survey. If you do not feel comfortable answering one or multiple questions, please leave them blank. Your completion of the survey and submitting it is your permission to use the data results for this research project.

Please click yes if you agree to continue with the survey or click no if you do not want to continue on with the survey. Thank you.

- Yes
- No

Appendix K

Technology Survey

Used with Permission from Dr. Robert Maninger

Dear Teachers,

The survey consists of several multiple-choice questions, and should take approximately twenty-five minutes to complete. Your answers are very important to this study. No attempt will be made by the researcher to identify you.

Demographic Information

Gender: M F

Grade level taught: 9 10 11 12

Years of teaching experience: 0-5 6-10 11-20 20+

How many days a week does the typical student in your class use a computer? (Select one)
1 2 3 4 5

Student and Computers (Select one)

Since your district implemented a one-to-one computing environment, how often do students in your class(es) use technology to do the following? **Mark "Not Applicable" ONLY if this use does not apply to your subject area:**	**Daily**	**Weekly**	**Monthly**	**Quarterly**	**Rarely or Never**	**Not Applicable**
a. Communicate with experts, peers, and others (e.g., over e-mail or through discussion boards)	0	0	0	0	0	0
b. Solve real-world problems (i.e., involving situations, issues, and tasks that people actually tackle in the outside world)	0	0	0	0	0	0
c. Produce word-processed documents	0	0	0	0	0	0
d. Create video or audio products to produce a multi-media presentation	0	0	0	0	0	0
e. Conduct online research	0	0	0	0	0	0
f. Use the Internet to collaborate with students in or beyond your school	0	0	0	0	0	0
g. Visually represent or investigate concepts (e.g., through concept mapping, graphing, heading charts)	0	0	0	0	0	0
h. Use digital tools and peripheral devices (e.g., digital cameras, probes, scanners) to enhance their learning or their school work	0	0	0	0	0	0
i. Use electronic information sources like the WEB, ERIC, EBSCO (searching for these efficiently, for example, by using "and" / "or" to narrow/expand a search, identifying	0	0	0	0	0	0
j. Use technologies specific to your field (e.g., probeware in the sciences, geographic information systems in the social sciences)	0	0	0	0	0	0
k. Create electronic portfolios	0	0	0	0	0	0
l. Collect data from people, newspapers, or the environment, enter the results into the computer, and present conclusions using graphic or spread sheet software	0	0	0	0	0	0
m. Collaborate with classes in other schools and compile information for a project directed by teachers or by outside scientists	0	0	0	0	0	0
n. Write a story, then illustrate it with scanned images or digitized pictures, record sounds for the story, and make a multimedia presentation using the computer	0	0	0	0	0	0

Student and Computers (Select one)

Since your district implemented a one-to-one computing environment, about how often do you have your students perform the following tasks using computers?	**Never**	**Less than once a week**	**Once a week**	**More than once a week**	**Every day**
a. Do homework	0	0	0	0	0
b. Take notes for a class	0	0	0	0	0
c. E-mail other students	0	0	0	0	0
d. E-mail their teacher	0	0	0	0	0
e. Take a quiz or a test	0	0	0	0	0
f. Turn in an assignment for class	0	0	0	0	0
g. Other _____					

Student and Computers (Select one)

Listed below are some areas that may have been impacted by the implementation of a one-to-one computing environment. Please describe your experience of the impact the computers have had in each area.	**Very Negative**	**Negative**	**Neutral**	**Positive**	**Very Positive**
a. Your interaction or collaboration with students	0	0	0	0	0
b. Your interaction or collaboration with other teachers	0	0	0	0	0
c. The cohesiveness of your team or campus	0	0	0	0	0
d. Your interaction with parents	0	0	0	0	0
e. Parents' involvement in your students' schoolwork	0	0	0	0	0
f. Classroom management	0	0	0	0	0
g. Your use of high quality instructional tools	0	0	0	0	0
h. Interaction between and among students	0	0	0	0	0
i. What students learn about the subject you teach	0	0	0	0	0
j. Students' engagement, involvement, and interest levels	0	0	0	0	0
k. Students' ability to work independently	0	0	0	0	0
l. Students' attendance	0	0	0	0	0
m. Students' organization	0	0	0	0	0
n. Students' ability to demonstrate metacognition	0	0	0	0	0
o. Students' ability to work cooperatively or collaboratively	0	0	0	0	0
p. Students' grades	0	0	0	0	0
q. Students' level of reasoning, problem solving, and/or thinking skills	0	0	0	0	0
r. Students' quality of school work	0	0	0	0	0
s. Students' self-efficacy	0	0	0	0	0

Student and Computers (Select one)

The following statements describe possible advantages of implementing a one-to-one computing environment. Please indicate how much you think each statement is true or not. ***If you haven't had enough experience, check the "don't know" box.***	**Don't Know**	**Not true, Not an Advantage**	**Somewhat True**	**A Mild Advantage**	**True, a Modest Advantage**	**True, a Strong Advantage**
a. Students create better-looking products than they could do with just writing and other traditional media	0	0	0	0	0	0
c. Students help one another more while doing computer work	0	0	0	0	0	0
d. Students take more initiative outside of class time—doing extra research or polishing their work	0	0	0	0	0	0
e. Students' writing quality is better when they use word processing	0	0	0	0	0	0
f. Students work harder at their assignments when they use computers	0	0	0	0	0	0
g. Students are more willing to do second drafts	0	0	0	0	0	0

Teachers and Computers (Select one)

Rate your access to the following items while at school:	**Non-Existent**	**Poor**	**Adequate**	**Good**	**Excellent**
a. The type of equipment needed for planning lessons or for professional development (e.g., cameras, scanners)	0	0	0	0	0
b. Sufficient numbers of computers and other equipment (e.g., cameras, printers) to implement technology-supported learning opportunities as I want to	0	0	0	0	0
c. Computers and other equipment where they are needed (e.g., in my classroom; in a science lab)	0	0	0	0	0
d. Reliability of computers, printers, projectors, and other equipment (i.e., it works when I need it)	0	0	0	0	0
e. Reliable, high-speed access to the Internet in classrooms, labs, and media centers	0	0	0	0	0
f. Software, appropriate for my content area and the age of my students to use with my class(es)	0	0	0	0	0
g. Technology tools for my own productivity (e.g., electronic grade books, word processing, presentation software)	0	0	0	0	0
h. Distance Learning Opportunities (e.g., online courses or professional development offered through video-conferencing)	0	0	0	0	0
i. Technical support with little or no wait-time	0	0	0	0	0
j. Instructional support that helps me to integrate technology	0	0	0	0	0

Teachers and Computers (Select one)

Which of the following are classroom management issues since the adoption of a one-to-ne computing environment?	**Not Experienced**	**Experienced but Resolved**	**Issue, but will be Resolved**	**Issue that is Unresolved**	**Not Applicable**
a. Power Issues: plugging in, battery life, etc.	0	0	0	0	0
b. Reliability of Access: are the computers all present when and where they are needed	0	0	0	0	0
c. Off-Task Behaviors: students web browsing, e-mailing, not attending to directions, etc.	0	0	0	0	0
d. Technical Difficulties: logging on, viruses, excessive delays, etc.	0	0	0	0	0
e. Efficiency: getting all the machines on, transitioning between activities, learning routines, etc.	0	0	0	0	0
f. Lack of Skills: students needing excessive help	0	0	0	0	0
g. Differentiating: managing for multiple levels and tasks	0	0	0	0	0

Teachers and Computers (Select one)

On average, how frequently do you perform the following tasks since the implementation of a one-to-one computing environment?	**Never**	**Less than once a Week**	**About once a Week**	**More than once a Week**	**Every Day**
a. Conduct research that contributes to instruction (e.g., research for lesson plans and curriculum design)	0	0	0	0	0
b. Develop materials and / or presentations for instruction or homework assignments	0	0	0	0	0
c. Assess student work in or out of class	0	0	0	0	0
d. Manage student information	0	0	0	0	0
e. Communicate with colleagues inside and outside the school	0	0	0	0	0
f. Use a TV or projector to display information from your or your students' laptops	0	0	0	0	0

Teachers and Computers (Select one)

The following statements describe teachers' work environments. Please indicate how much each statement agrees or disagrees with your own work situation.	**Strongly Disagree**	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
a. Discussion of school goals and how to achieve them is a regular part of our faculty meetings	0	0	0	0	0
b. Other teachers encourage me to try out new ideas	0	0	0	0	0
c. The people who give me the best ideas for improving my teaching also tend to know a lot about using computers	0	0	0	0	0
d. My headmaster's values and philosophy of education are similar to my own	0	0	0	0	0
e. New ideas presented at in-services are discussed afterwards by teachers in this school	0	0	0	0	0
f. Teachers in this school are continually learning and seeking new ideas	0	0	0	0	0
g. It is common for us to share samples of student work	0	0	0	0	0
h. Teachers play an important role in defining staff development activities	0	0	0	0	0

Teachers and Computers (Select one)

How often do you need each type of support since the introduction of a one-to-one computing environment?	**Never**	**Seldom**	**Monthly**	**Weekly**	**Daily**
a. Technical Support (e.g., computer and software fixes)	0	0	0	0	0
b. Instructional Support (e.g., incorporating technology into your lessons)	0	0	0	0	0
How available is each type of support when you need it?	**Never**	**Seldom**	**Frequently**	**Mostly**	**Always**
d. Technical Support (e.g., computer and software fixes)	0	0	0	0	0
e. Instructional Support (e.g., incorporating technology into your lessons)	0	0	0	0	0
What is the quality of support that you receive?	**None Received**	**Poor**	**Fair**	**Good**	**Excellent**
g. Technical Support (e.g., computer and software fixes)	0	0	0	0	0
h. Instructional Support (e.g., incorporating technology into your lessons)	0	0	0	0	0

Open-Ended Questions:

1) **What benefits are associated with the one-to-one computing environment in your classroom?**

2) **What concerns are associated with the one-to-one computing environment in your classroom?**

3) **Is there anything else you want to add that I may not have covered? Your insight is appreciated.**

Appendix L

List of Codes

Complete List of Codes from Interview Data (Administrators)

Benefits (One-to-One Computing)	# of Reponses	Concerns (One-to-One Computing)	# of Reponses
Help You (accomplish tasks)	14	Care (taking care of devices)	8
Engagement	11	Prepare (items, laptops, etc.)	7
Access	8	Online Games	5
Comfortable (using technology)	5	Sustainability	3
Projects (project-based learning)	5	Funding	3
Opportunity (for learning)	5	Operational	2
Research	4	User Friendly	2
Share Items/Ideas	4	Damage (devices)	1
Tool	3		
Paperless	3		
Flipped Classroom	3		
Not Driving Force	1		

Complete List of Codes from Interview Data (Novice Teachers)

Benefits (One-to-One Computing)	# of Reponses	Concerns (One-to-One Computing)	# of Reponses
E-mail	13	Google (students google items and do not learn the material)	10
Research	5	Online Games/Off-Task Behavior	7
Communication	4	Access (social media, etc.)	5
Information (share & obtain)	3	Changes (technology changes so often)	5
Google Docs/Google Drive	3	Technology Problems	5
Application	2	Cost (weigh the cost/benefit of the devices)	4
Enhanced	2	Knowledge (how to utilize technology)	4
Feedback	2	Limits Interaction between Student (technology limits one-on-one student interactions)	2
		Support (technology)	2
		Limited Time (learn how to use items)	1

Complete List of Codes from Interview Data (Master Teachers)

Benefits (One-to-One Computing)	# of Reponses	Concerns (One-to-One Computing)	# of Reponses
Information (share & obtain)	15	Technology Issues (updates, computers charged, do not have device, etc.)	6
Engagement (involved)	10	Training (lack of training)	5
E-mail	10	Management (of devices)	4
Google & Google Docs/Google Drive	10	Cost	2
Learning Tool	9	Two Platforms/Software (having both Macs & PCs)	2
Chromebooks	8	Technology Support	2
Projects (project-based learning)	8	Social Media	1
Opportunities (technology has opened them up/for learning)	5	Online Games	1
Enhanced (teaching)	4		
Communication (a tool)	4		
LMS (learning management system)	4		
Access (information)	3		
Research	2		
Interactive	2		
Supplementary	1		

Complete List of Codes from Survey Data (All Teachers)

Benefits (One-to-One Computing)	# of Reponses	Concerns (One-to-One Computing)	# of Reponses
Access (information, Internet, etc.)	8	Technology Issues (updates, computers charged, do not have device, etc.)	8
Communication	5	Keeping Students on Task	6
Information (share & obtain)	4	Online Games	5
Motivation	2	Distracting	3
Projects (project-based learning)	2	Social Media	1
Opportunity (for learning)	2	Subject Matter (technology does not fit in every discipline)	1
LMS (learning management system)	1		