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# The Impact of a Sixth Grade Laptop Initiative on Student Attitudes Concerning Their Learning and Technological Competencies

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by

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ABSTRACT

The Impact of a Sixth Grade Laptop Initiative on Student Attitudes Concerning Their Learning and Technological Competencies

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This research explored the impact of a sixth grade one-to-one laptop initiative on student attitudes about learning and technological competencies. The study compared student preintervention and postintervention survey data prior to and after a sixth grade laptop intervention initiative. The survey responses were divided into 5 dimensions (School Subject Attitudes, Teaching and Learning Preferences, Computer Use Perceptions, Technology Skills, and Personal Attitudes and Behaviors) on both pre- and postsurveys. District means were compared with preintervention and postintervention data, as well as the means from the 5 dimensions, using a one-sample t-test with a midpoint test value of 3 on a 5-point scale. Ninety students participated in the preintervention survey and 93 students participated in the postintervention survey across 3 schools. The findings indicated that there was a statistically significant difference in student responses in 4 of the 5 dimensions except Teaching and Learning Preferences. Overall the findings on the 2 dimensions related to technological competencies had statistically significant scores on the postintervention survey, whereas the findings on 2 of the 3 sections related to student attitudes about learning had statistically significant scores. In conclusion, generally the laptop intervention initiative had an overall positive impact on student attitudes and technological competencies. The researcher concluded that the timing of the postsurvey, as well as the research taking place during the first year of implementation could have had an impact on the Teaching and Learning Preferences results.

Examining the impact of one-to-one initiatives on student attitudes about learning and technological competencies could support districts in making the decision of adopting this technology.

# DEDICATION

I dedicate this journey to my family who make me feel invincible, strong, and smart, and I am truly blessed with their constant support and encouragement. To Brian, my husband, thank you for your love, your listening ear when I complained, and for never allowing me to give up on my dreams. To Taylor, my daughter, thank you for being my bestie and for encouraging me when I needed it the most. To Mom, thank you for always ensuring me education was a way to a better life and for your many sacrifices along the way. To Smokey, Weeney, Mocha, Bo Bo, and Daisy, you have spent many hours with my computer and me in the recliner providing moral support along the way.

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# CHAPTER 1

# INTRODUCTION

Because technology is the driving force in tomorrow's workplace, student technological skills must be developed to prepare students for future employment. The United States Bureau of Labor and Statistics reported that job postings are booming for positions in computer programming and for computer analysts (U.S. Department of Labor, 2016). Clearly, technology knowledge is critical for technology specific professions, but it is also important as it is embedded across other professions. In addition, communication technologies have changed the profiles and skills needed for many professions (OECD, 2016). As students are educated for a future work place, the classroom environment has changed to incorporate more technology. Computer to student ratio in public schools is 1:5 in the United States (Herold, 2016).

Programs such as "One Laptop per Child" and the "World Ahead Program" provided computers to students worldwide (Bebell & Kay, 2010). State, local, and federal funds were used to support laptop programs. To support charging, classroom laptops are charged on common laptop carts. Other programs involved parents leasing or purchasing the laptop for their child (State of New South Wales, 2009). Grant and federal funds were also used to provide technology for impoverished students.

A report from New South Wales listed common goals across laptop programs. These goals were listed as follows:

- Improvement of access to technology for all students
- Support for students to become computer literate especially those who are reluctant to use technology or do not have ready access to a computer
- Help for students to make sense of complex data
- Provision of more equitable access to educational resources and learning opportunities
- Provision of a broader range and timeliness of resources available in the classroom

- Improvement in student learning/academic achievement
- Preparation for students to compete in the technology-rich workplaces
- An increase in economic competitiveness of local region in the global marketplace
- Transformation of education to provide a differentiated, problem-based learning demanding higher-order thinking skills in a student-centered classroom with one-to-one laptops acting as a catalysis for reform toward a more constructivist and inquiry-based learning (State of New South Wales, 2009, p. 3).

One to one laptop programs required costly long-term financial commitments that led to expectations in the form of results from stakeholders. Maine's one-to-one program cost the state well over 120 million dollars with an additional 10 million dollars spent annually (The Abell Foundation, 2008, p. 7). As of June 2008, Michigan's Freedom to Learn Program held a $37 million price tag. Over the course of 7 years from 2001-2008, Henrico County Virginia invested over 50 million dollars in its one-to-one laptop program. "Northfield Mount Hermon School (MA) eliminated its five-year-old laptop program in 2002 after it found more resources were being expended on repairing the laptops than on training teachers to use them" (Holcomb, 2009, p. 52). As of 2014, a one-to-one program in Hoboken, New Jersey was eliminated due to several factors making it unsustainable (Barshay, 2014). "The increasing popularity of laptop initiatives with a wide variety of stakeholders in education—policymakers, administrators, teachers, parents, and students—makes the need for sound research-based evidence of effectiveness especially critical at this time" (Penuel, 2006, p. 342). According to BeBell and Burraston (2014) there were few one-to-one programs with more than 5 years of experience, so there was a high level of interest in one-to-one computing but little empirical findings regarding these initiatives.

## Statement of the Problem

This researcher sought to identify if a one-to-one computer intervention initiative would make an impact on student attitudes about school and their technological competencies. This was

the district's first year using the one-to-one laptop program, and it was important to identify if the program would have a positive impact on students. The financial investment of the external funding body in addition to the funding provided by the school district made this a situation to monitor. In a sense the findings were going to be used to determine the benefit of the program with the cost expended. With only one year of one-to-one laptop intervention implementation, academic achievement data was not considered as it can be a "disruptive technology" (Christensen, 2010). The impact of this study would be helpful in guiding district decision making about furthering the initiative in subsequent years or expanding into other grade levels across the school district.

## Research Questions

Research Question 1

Is the mean score for sixth graders on the five dimensions of the One-to-One Laptop Program preintervention survey (School Subject Attitudes, Teaching and Learning Preferences, Computer Use Perceptions, Technology Skills, and Personal Attitudes and Behaviors) significantly different from 3 (the mid-point or neutral score on the scale) for the three schools participating in the initiative?

Research Question 2

Is the mean score for sixth graders on the five dimensions of the One-to-One Laptop Program postintervention survey (School Subject Attitudes, Teaching and Learning Preferences, Computer Use Perceptions, Technology Skills, and Personal Attitudes and Behaviors) significantly different from 3 (the mid-point or neutral score on the scale) for the three schools participating in the initiative?

## Definition of Terms

The following key terms were used in the research study and are defined below:

Digital Divide – "social stratification due to unequal ability to access, adapt, and create knowledge via use of information and communications technologies" (Warschauer, 2001, pg. 1).

Disruptive Technology or Innovation- technologies or innovations that brought about higher quality education that was personalized, more equitable, and circumvented barriers to education reform (Christensen, 2010).

International Society of Technology Education Standards- A set of standards developed for students, teachers, and administrators aimed at transforming teaching and learning (iste.org, 2017)

Sesame Street Effect- "An innovation that promised to help at-risk children catch up educationally instead benefitted affluent children even more, as they leveraged their language and literacy skills, cultural capital, and social resources to better learn from and/or with the innovation" (Warschauer & Ware, 2008, p. 230).

## Significance of Study

The problem addressed in this study was the impact of technology on student attitudes about school and their technological competencies in a sixth grade one-to-one laptop intervention initiative. With thousands of dollars being spent on one-to-one devices in this district, the result of the initiative on student attitudes as it related to their education and technological competence was investigated. It was of paramount importance to identify if the district was getting a positive impact from its financial investment as well as to help guide further decision making for expanding the initiative into other grade levels across the school district.

The findings from this research study may be used by school district personnel as a resource for future resource allocation. The research was significant because districts are accountable for spending limited funding wisely. With goals that must be met for accountability purposes, districts were charged with the responsibility of getting the maximum benefit out of each dollar. Student proficiency rates and reduction in the achievement gap between socioeconomic groups were part of state accountability metrics. For this reason it was important that the program yield positive outcomes toward learning and student engagement.

The need for technology became even greater with the future of online standardized testing. Due to the swift turnaround of online grading and reporting, more states considered the need for technology. Fiscally it was critical to analyze the impact that one-to-one programs can make before spending funds in this manner. The role of technology may be varied as an assessment instrument or as a device immersed in classroom instruction

The study will provide information about the change in student attitudes about their learning and technological competencies after participating in a one-to-one laptop intervention initiative. The information derived from this could be very powerful to those considering the future of one-to-one initiatives in their classes, schools, or districts. In addition, it will add to the body of other one-to-one laptop initiative research studies.

## Limitations and Delimitations of the Study

There were delimitations that made the study not generalizable to other situations. This initiative was specific to sixth grade students in the school system, as they were the only ones involved in this initiative. Also, the population was part of a small school district initiative. The same type of laptops were deployed to students during the same week across the district, so the exposure time was the same. Also, the principals' expectations of classroom usage were similar

and flexible across the school district. Another delimiting factor was the duration of the study because it spanned a typical school year. All of the students received their laptops during the same week and received the same training from technology personnel.

There were limitations of this study that require consideration. This research was focused on student self-reported data that may have been subjective or biased. Although the students attended school within 10 miles of one another, the free and reduced lunch percentages at each school ranged by 40%. Most importantly, students who lived in the Clinton City Schools zone during fourth, fifth, and sixth grades would receive their laptop for personal ownership upon sixth grade graduation, but nonresident students would not.

Another limitation was the lack of achievement data. Achievement data were not studied because the students only participated in the program 8 months. The research indicated that one year was not enough to expect any differences in achievement gains, and it could actually serve as a disruptive technology. However, achievement was discussed in the literature review as attitudes and motivation factor into student achievement.

## Overview of Study

This quantitative study was divided into five chapters. Chapter 1 includes an introduction, statement of the problem, guided research questions, definitions of key terms used in the study, significance of the study, and limitations and delimitations. Chapter 2 is a comprehensive review of literature that began with the history, definition, and rationale for going with a one-to-one laptop program as well as a look into academic achievement, teaching practices, and the possibility of reducing the digital divide and achievement gaps. The advantages and disadvantages of one-to-one programs were outlined in addition to the role of professional development, leadership, student attitudes toward technology, and factors needed

for success. Teacher training, leadership, alternatives to one-to-one programs, items for consideration, and ideas for the future of students in a digital world concluded the literature review. Chapter 3 details the research methods used to conduct this study including the research questions and null hypotheses, instrumentation, population, and data collection and analysis. Chapter 4 contains the presentation and data analysis used in completing the study. Chapter 5 concludes the study with the summary of findings, conclusions, recommendations for practice, and recommendations for future research.

# CHAPTER 2

# REVIEW OF LITERATURE

This literature review encompassed a variety of topics beginning with the definition, history, and rationale of one-to-one computing. The impact of one-to-one laptop initiatives on a number of topics were investigated including (a) academic achievement, (b) teaching practices, (c) the digital divide, (d) and technology skills. The advantages and disadvantages of one-to-one computing as well as teacher professional development, the leadership aspect, factors for one-to-one success, student attitudes, alternatives to one-to-one, and ideas for future consideration were discussed.

One-to-one computer programs involve all students and teachers having their own laptop computer in an educational setting. "By definition, 1:1 computing refers to the level at which access to technology is available to students and teachers; by definition, it says nothing about actual educational practices" (BeBell & O'Dwyer, 2010, p. 6). According to Penuel as cited in the Abel Foundation (2008) three factors must be in place to officially be considered a one-to-one program. First of all, the environment must be wireless. Secondly, students must have their own portable computer loaded with software for educational use. And finally, the computer must be used for academic tasks.

A report from New South Wales (State of New South Wales, 2009, p. 3) described many ways that laptop programs were different but explained the following commonalities: individual student computers loaded with software, word processing, multimedia, and creation tools, internet access provided through the school's internet system, and assignments focused on

presentation, research, and assessment tasks. However, recent one-to-one laptop programs required that students were permitted to take home laptops.

## History

Laptop Initiatives increased in popularity since the mid 1990s (Penuel, 2006). "The small size and and lowered cost of laptops, along with the availability of wireless internet capabilities, increased the feasibility of school initiatives that provide laptop computers to students at a one-to-one ratio" (Maninger & Holden, 2009, p. 5). The earliest forms of one-to-one laptop programs can be traced back to Microsoft and Toshiba's Learn Anytime, Anywhere Program (Rockman, 2003) that ended within a few years (Grimes & Warschauer, 2008). Even in the mid 1980s, Apple originated the ACOT Project, known as the Apple Classrooms of Tomorrow Project for students in grades K-12 (Donovan, Hartley, & Strudler, 2007). Through this program, which originated in Australia, schools purchased computers for student use, and students often had an opportunity to lease or purchase computers (Penuel, 2006). Maine and Texas were involved in early one-to-one comprehensive initiatives (Weston & Bain, 2010) as well as large school districts such as Henrico County, Virginia and Talbot County, Maryland (Penuel, 2006) In 2014 the federal government was projected to spend $10 billion on education technology. This was an increase of $240 million from the previous year (Barshay, 2014). The ratio of computers per United States student has increased from 125:1 in 1983 to 3:1 in 2010 (Bebell & Burraston, 2014).

## Rationale

Educational organizations and state and federal policies encouraged the use of technology in education. "The National Technology Standards (NETS), published by the International

Society for Technology in Education (ISTE, 2007), had the objective of developing students' 'technological competence' the ability to understand and operate technological equipment to increase productivity, enhance communication and collaboration within and outside the classroom; conduct creative research, and devise strategies for problem-solving and decision-making" (Maninger & Holden, 2009, p. 6). Later on the NETS were changed to the ISTE (International Society for Technology in Education) Standards.

The Abell Foundation (2008) provided several goals that were similar across most ubiquitous computing programs. First of all, the primary goal was to increase academic achievement. Secondly, instruction was expected to change and become more student centered. "Many of the initiatives focused on transforming teaching seek specifically to make instruction more "student-centered," that is, more differentiated, problem- or project-based, and demanding of higher-order thinking skills" (Penuel, 2006, p. 335). These types of programs should reduce the digital divide between socioeconomic groups. This was the purpose of the Hoboken, New Jersey laptop initiative that aimed at helping students keep up with their wealthier peers (Barshay, 2014). Finally, future economic prosperity was dependent on an increase of technological skills.

Academic Achievement

Studies were conducted to examine the impact of one-to-one laptop programs on achievement at class, school, district, and state levels. Student achievement data were most often collected in the form of standardized test scores. The impact on achievement of several one-to-one programs is described below.

Research completed on the Maine Learning and Technology Initiative was reported in October of 2007 by the Maine Educational Policy Research Institute. This group found no

significant change in achievement other than in writing since the program's inception. On the other hand, the average student made significant gains from 2000 to 2005 in the area of writing (The Abell Foundation, 2008). Holcomb (2009) reiterated this by saying that writing scores improved both on computerized assessments and pencil and paper due to the laptop program. Conversely Warschauer (2006) found no evidence that the laptops made any difference in achievement in a study of laptop schools in Maine.

The Texas Technology Immersion Pilot program (TIP) was evaluated in terms of academic achievement. Shapley et al. (2009) researched the impact of technology immersion on the TAKS (Texas Assessment of Knowledge and Skills) scores. The results revealed seventh and eighth grade reading achievement scores reflected no significant differences, but a statistically significant difference was found in ninth grade reading scores. Mathematics scores reflected statistically significant achievement gains in seventh and eighth grade, but represented small insignificant gains for ninth grade students (Shapley et al., 2009). A study of Texas middle school students reported no difference in the performance of 21 schools with laptops compared to 21 schools without laptops (Holcomb, 2009). However, the Texas Center for Educational Research (2008) documented that the effect of laptop scores on mathematics became greater over time as both students and teachers became familiar with the educational technology.

Michigan initiated a one-to-one program called "Freedom to Learn (FLT)" in 2002. The funding for this initiative came from Title II, Part D to aid schools in economic distress (The Abell Foundation, 2008). Ross, co-author of the evaluation report on the "Freedom to Learn" program, explained that the successes of the program could not be measured by standardized tests. He said, "Despite the highly impressive impacts of the laptop program in engaging students' higher-level learning activities and improving their technology skills substantially, we

were not necessarily expecting noticeable achievement gains on the Michigan Educational Assessment Program (MEAP)" (The Abell Foundation, 2008, p. 6). He also mentioned that he did not think the success of the program would be reflected in scores in the future due to the type of assessment.

Virginia's Henrico County initiated a one-to-one program in 2001. This program benefited all groups of middle and high school students and their teachers. In terms of achievement, the district reported remarkable gains on the Virginia Standards of Learning test since the inception of the laptop program (Mann, 2008). Also, greater laptop use was associated with higher gains in each subject. Other than in Algebra I and Algebra II, students scored significantly higher scores in all other curriculum areas over the years of 2006-2008. "Although Algebra has been a consistent, if understandable, exception to the positive relations, in each of the three years, there have never been fewer than five curriculum topics where laptop use is positively related to test scores. And those score increases were in the core areas of the sciences, history and reading" (p. 12). Barrios et al. (2004) affirmed that the percentage of Henrico's schools with accreditation (based on the Virginia Standards of Learning) increased from 60% in 2000 to 100%.

Longitudinal data from Natick High School reflected impressive trends in student achievement over the span of two student cohorts (Bebell & Burraston, 2014). Students in Cohort 1 improved an average of seven scale score points in English and 10 points in mathematics. Growth for Cohort 2 increased 14% in English and 14% in mathematics. The proficiency in Cohort 1 included a 20% growth in English and 15% growth in mathematics. Students in Cohort 2 that started a year later grew 10 scale score points in English

and nine points in mathematics. Both cohorts spanning 2009-2014 scored on or above 90% proficient and advanced in both academic areas, well above the state average.

Suhr, Hernandez, Grimes, and Warschauer (2010) investigated the impact of a one-to-one program on English language arts scores in a California school district. The study sample was divided into laptop and nonlaptop groups. During the first year of the program, the nonlaptop group performed better on the standardized test, but the laptop group scored better after the second year. The authors suggested that laptop implementation is sometimes a disruptive technology (Suhr et al., 2010, p. 10). Overall this study pointed out that one-to-one programs may have a small positive impact on reading tests scores (Suhr et al., 2010).

Research at Harvest Park Middle School in California attested significant academic increases after participation in a seventh-eighth grade laptop program. However, the most significant increases occurred between the first and second years. After one year there was a significant impact on both mathematics and language arts scores and an overall gain in cumulative math GPA (Center for Digital Education, 2008).

Research from the Time to Know Program for fourth and fifth graders verified significant academic achievement for reading and mathematics. Student achievement results were measured using the TAKS (Texas Assessment of Knowledge and Skills) from 2010 to 2011 using a pretest and posttest. Fourth graders in the laptop program improved 39.7 points greater in reading and 27.5 points greater in math compared to the control group. Fifth graders in the laptop program improved 21.1 points greater in reading and 18.2 points greater in math compared to the control group (Rosen & Beck-Hill, 2012).

Another large scale district initiative that endorsed one-to-one computing was instituted in Talbot County, Maryland in 2005. Through this program ninth graders received laptops for

use at both home and school. After the second year of implementation research was conducted to assess the program's impact on student achievement. Below are the achievement findings from the research from The Abell Foundation (2008):

- Students with teachers who have had two years of experience using laptops for instruction (graduating class of 2010) had the greatest academic improvement. A significantly higher proportion of students in the graduating class of 2010 passed the Maryland Algebra HSA (90%) compared to students graduating in 2008 and 2009 (55% in 2008 and 66% in 2009). This is consistent with Year I (2005-2006) evaluation findings that the class of 2009 with laptop access had higher final average grades in Algebra I than the 2008 cohort who did not have access to laptops.

- A significantly greater number of students in the class of 2009, which had laptops, passed the Biology and English HSA tests than the students graduating in 2008 who did not have laptops (The Abell Foundation, 2008, p. 14).

The data were inconsistent across locations and subjects in regard to student achievement. This could be surmised to the short duration of research on one-to-one computing programs "It usually takes five to eight years for an innovation to be implemented fully and for the impacts of the innovation to be discernible" (Holcomb, 2009, p. 51). Warschauer (2005) stated, "…laptop programs are still in their infancy and almost any technological innovation takes a number of years to have a full impact" (p. 34). The Center for Digital Education (2008), Warschauer (2005), and Holcomb (2009) make reference to the fact one-to-one technology innovation take time to demonstrate success.

A district wide high school one-to-one initiative using mini net books was implemented in Missouri beginning in 2009. Research was conducted to compare the standardized test scores of the students in this district compared to students in the state of Missouri on AYP Math, AYP Communication Arts, and ACT Composite. The means for both district and state were compared and no statistically significant difference were found in this 3-year period in regard to

standardized scores. Following the 3-year period, the district changed over to Apple laptops in 2012-2013 (Livesay, 2012).

The Denver School of Science and Technology was a grade 9-12 charter school with a one-to-one program. Their population consisted of at least 40% minority students and the rest came from a lottery type selection system. This school, which graduated its first class in 2008, boasted that all of the graduating seniors were accepted to a 4-year college or university the first 2 years and had some of the best test scores in the state (Zucker, 2009).

According to Barshay (2014) recent one-to-one initiatives in Mooresville, North Carolina and Cullman, Alabama boasted significant improvements in student achievement. In Mooresville, North Carolina proficiency on state tests improved 15% over a 3-year period, the graduation rate improved by 11%, and the district was third in state test scores (Schwartz, 2012). In Cullman, Alabama middle school students scored 92% proficient on the Alabama Direct Assessment of Writing (2009-2010), which was a steady increase of 18% over a span of 5 years (cullmancats.net). On the Alabama Reading and Mathematics Test Plus, Cullman students scored well above 95% proficient on both assessments. In addition Cullman City Schools ranked second out of 133 school systems in 2012 on the aforementioned assessment (cullmancats.net). These laptop programs confirmed clear student achievement statistics.

The management of each program was based on the needs and stipulations of the school, district, or state. The configurations ranged from computer use in specific classes, computer use in core classes, computer use in all classes, to computer use at home and at school. Texas and Henrico County demonstrate that students who take home their computers have higher reading and math scores (The Abell Foundation, 2008, p. 17). Qualitative data from (Mouza, 2008) corroborated that writing and mathematics improved during the 1-year laptop period.

Another factor in student achievement was the amount of time that students spent on the computer. According to Shapley et al. (2010) student achievement in one-to-one programs was closely related to the amount of time being immersed in technology. "In contrast to teacher-level predictors, the level of Student Access and Use (of technology) was a stronger and more consistent predictor of reading achievement" (p. 39). This study noted there was a positive impact on mathematics achievement, but it was not considered statistically significant. Information from Sauers and McLeod (2012) supported that there are cases of failures with laptop programs, but there were many more cases that supported the academic benefits of one-to-one computing. "Improvements in writing, literacy, science, exam scores, and GPAs all have been noted in various research studies," (p. 2).

Conversely other research demonstrated that one-to-one laptop programs do not increase student achievement. Laptop programs in Richmond, Virginia were dismantled after 5 years and no differences were found in achievement between laptop and nonlaptop students. Mixed results came from a Michigan study with eight schools involved in the research: high achievement was found in four schools, lower achievement in three of the schools, and no difference was found in the other (Lowther, Strahl, Inan, & Bates, 2007).

Change in Teaching Practices

As stated previously, a primary goal of laptop programs was to change the way that students are instructed. Addis and Faulk (2010) attributed much of the success from laptop programs back to the pedagogical view of the teacher in implementing the technology in the classroom. This started with the initial planning. Laptop programs altered the way that teachers design and deliver instruction. Compared to national norms, teachers from Michigan's

"Freedom to Learn" program reported confidence in their ability to design and integrate technology based on curriculum standards (Holcomb, 2009).

Florida's Educational Enhancing Technology Funds involved a component known as Leveraging Laptops in efforts to change teaching practices (Dawson, Cavanaugh, & Ritzhaupt, 2008). The state gave autonomy to districts to work on areas of instructional concern in their system, as the goal was to evaluate teacher practices, not achievement. Some of the findings revealed that teaching practices were positively impacted by increased student engagement and attention and a reduction in traditional seatwork. That this research was conducted over a period of a year suggested that ubiquitous computing can have an immediate impact on instructional practices (Dawson et al., 2008).

A number of researchers agreed that one-to-one programs have made the classroom environment more student centered. In this environment teachers acted as facilitators and coaches while students were actively involved in the learning process (Barron, Harmes, & Kemker, 2006). A fourth grade student in Mouza's study (2008) reported, "I feel smart when I can teach my teacher something" (p. 465). "Students can do more work on their own work at their own pace, and the teachers can act more as consultants to them, offering individualized suggestions, mid-course corrections, and more frequent assessments of individual and group progress" (Rockman, 2003, p. 26).

Researchers in a fifth through eighth grade program found one-to-one laptop environments to be constructivist where "teachers perceive themselves as guides more than leaders in the student's learning journeys" (Maninger & Holden, 2009, p. 14). Burns and Polman (2006) confirmed that a middle school teacher had more one-on-one time with students as they worked on their writing (p. 376). Information from the Abell Foundation (2008) alluded

that all of the states and districts in their study reported that learning was more student centered and that students were highly engaged in the learning process. BeBell and Kay (2010) concluded that the Berkshire Wireless Study demonstrated teachers transforming their teaching practices because of technology, which had an overall positive impact on student learning and engagement. The lecture mode of teaching moved to more latticing where the teacher weaved in and out consulting with student groups (Schwartz, 2012). This process had the teacher being more of a learning facilitator. Israeli junior high teachers from the KATOM program, meaning laptops for every class, every student, every teacher, described that they were more involved in guiding and channeling students' learning in a student-centered environment (Klieger, Ben-Hur, & Bar-Yossef, 2010). In Glover's work (2012), he shared how work environments need individuals to be creative and practical (p. 69) and how industry giants like IBM verbalized the need for creative employees (p. 108).

Mouza (2008) explained that both teachers and students reported that laptop environments changed instruction and student engagement. Teachers gave students more autonomy to extend their learning that led to an increase in student engagement. Students remarked that they were able to learn skills and share them with the class and teacher. Even students who tended to be quiet were recognized for their contribution to the classroom based on their acquired skills (p. 165). In this mixed method study the third graders with laptops did not report quantitatively that their enjoyment of school changed, but this was thought to be due to the initial anxiety and safety concerns of laptop ownership. Technology in Mooresville, North Carolina helped teachers tap into student emotions such as curiosity, boredom, embarrassment, and angst (Schwartz, 2012). High school students in Denver commented that-laptops helped

them work better with other students, how interested that they are in school and in their grades, and other outcomes (Zucker 2009).

Project-Based Learning

Warschauer (2005) declared that this type of learning allowed students to dig deeper and to become involved in project based learning. Gulek and Demirtas (2005) remarked that laptop students spent more time engaged in collaborative and project-based instruction than nonlaptop students. "Observation-based studies report students' involvement in a broader range of authentic literacy practices, such as those involving critical analysis of information or communication with a real audience beyond the teacher, than ordinarily takes place in non-laptop classes" (Suhr et al., 2010, p. 10). Because of the virtual at home activities, students are required to think on different levels (Klieger et al., 2010).

"Sparse evidence in the educational literature and in sustained practice shows the existence of innovative, individualized, problem-based instruction or for that matter any other reform or innovation at significant scale across schools, districts, and states" (Weston & Bain, 2010, p. 8). According to Weston and Bain (2010) technology critics determined that problem based learning in schools is only a myth. Larmer (2015) speculated that there was much misconception about problem-based learning. He commented that problem-based learning was not making something, did not focus on soft skills, did not take too much time, wasn't solely for older students, and that it wasn't too hard to manage. Clearly, there were myths and misunderstandings about the criteria for problem-based learning especially when combining it with one-to-one technology initiatives.

Shih, Chuang, and Hwang (2010) researched if one-to-one digital devices could increase student learning in a project-based environment. Using the computers the students took notes,

looked up research, and answered guided questions about a social studies field trip. A pretest and posttest were conducted based on students' knowledge about historic temples, cultures, and gods. The student scores increased from a mean of 85.56 to a 95 after the in-the-field experience using digital media. The students corroborated that the digital devices were much more helpful and interesting to them compared to a typical teacher guided field trip.

Reducing the Digital Divide

A rationale for implementing laptop initiatives was to reduce the digital divide between affluent and impoverished students and to bridge the achievement gap. Mark Edwards, the Director of Mooresville Special School District, endorsed that "technology had helped close racial performance gaps in a district where 27% of the students are minorities and 40% are poor enough to receive free and reduced-price lunches" (as cited in Schwartz, 2012, p. 1). Warschauer (2005) pointed out that equal technology would not bridge the achievement gap between students in different socioeconomic classes. The reason was that impoverished children may get equal laptop access, but the skills of the affluent students remain ahead and continue to grow over time. Attewell and Battle called this the "Sesame Street Effect" as technology helps all students, but benefited the advanced students more due to their prior knowledge and skills (as cited in Warschauer, 2005). "The bottom line: Learning with laptops can benefit all students, but don't count on laptop programs to erase education inequities in your district" (Warschauer, 2005, p. 35). It was noted that students who were prepared and encouraged to go to college from an early age were more successful in one-to-one laptop programs than students from low SES neighborhoods who were less likely to have a strong research focus or the critical and analytic skills necessary for such initiatives (Warschauer, 2006). This information was especially alarming considering that more than 25% of students in the United States will be considered

impoverished and that poverty is the greatest obstacle to overcome in education (Ravitch, 2011). "We seem blinded to the depth of disadvantage that poverty creates for learners and have been increasing the numbers of children living in poverty for several years" (Glover, 2012, p. 114).

Others remarked that technological hardware was not the key component in reducing the digital divide's impact on student learning. Peng, Su, Chou, and Tsai (2009) noted that the role of the teacher was paramount. "As the cost of portable wireless access to the Internet becomes affordable for everyone, the concern will be about the educational digital divide that separates those students who are taught by technology savvy teachers from those who are not" (p. 177). In their review of laptop programs, Addis and Faulk (2010) attributed the success of laptop programs to the teacher. Teachers need to be able to facilitate the learning of students without being impeded by a lack of technological skill during instruction.

There were positive and negative aspects to be considered with one-to-one programs that involve students taking home their computers. One of those issues was safety, as Mouza (2008) described qualitative interviews with students who were concerned about getting their computers from school to home because of neighborhood safety issues. The students reported that carrying the laptop in addition to their backpacks, instruments, and other personal items from school was cumbersome (Lowther, Ross, & Morrison, 2003). On a positive note, the students could extend their learning at home and often return to school with learning skills that they could share with one another (Mouza, 2008). Parents declared that there was family jealousy when every sibling did not have a laptop at home (Lowther et al., 2003).

"Lack of a computer at home is associated with less parental education and lower family income, with single parent homes, and with Hispanic and African American families"

(Rockman, 2003, p. 26). One-to-one programs that involved students taking their computers home were hoping to reduce the digital divide. Providing homes and families with learning tools was aimed at improving the parental involvement and overall family education.

Shapley, Sheehan, Maloney, and Caranikas-Walker (2010) corroborated that home learning is a statistically significant variable in mathematics achievement scores on the TAKS (Texas Assessment of Knowledge and Skills). This was particularly true with economically disadvantaged students. "As an example, after controlling for the other variables, an economically advantaged, non-minority, male eighth grader in Cohort 1 with a Home Learning score about one standard deviation above average ($z = 0.99$) had a 0.68 *T*-score point higher TAKS mathematics score" (Shapley et al., 2010, p. 43). Sauers and McLeod (2012) verified that consistent strength of home laptop usage was the strongest positive predictor of reading and math scores.

Another goal of several one-to-one programs was to reduce the achievement gaps between socioeconomic groups. Ninety percent of Talbot County, Maryland's teachers asserted that ubiquitous computing was helpful in reaching students from lower economic backgrounds (The Abell Foundation, 2008). Researchers at The Abell Foundation concluded that students in one-to-one environments developed greater proficiency using technology that led to more productivity and student knowledge gain for the workplace. Students who attended Malcolm X Academy in inner city Detroit, Michigan have made considerable gains since the inception of a laptop program from sixth to seventh grade. "An impressive 83% met or exceeded state writing standards (compared to the state average of 63%) and 63% met or exceeded state reading standards (compared to the state average of 49%)" (Barrios et al., 2004, p. 47).

There was a concern that technology was being used differently in low socioeconomic and high socioeconomic schools. In low SES schools technology was being used more for remedial type practice tasks, whereas more problem solving analytical, exploratory type tasks were found more in higher SES schools (Mouza, 2011). This could be attributed to teachers with less training and fewer support resources in low-SES schools. Mouza (2011) concluded that teacher comments from the study "illustrated the belief that students' deficits are barriers to learning, and, therefore, any technology use should be introduced in a teacher-controlled environment rather than an enriched environment that encourages experimentation and inquiry" (p. 20). It is also documented that students taught in urban and charter schools are often instructed using a scripted curriculum that leads for little opportunity for exploration. However, the Leveraging Laptops study in Florida, which spanned over 400 schools in a variety of socioeconomic settings, reported that laptop usage was considered to be highly meaningful across the schools more than 59.3 % of the time during the first year of implementation (Dawson et al., 2008).

The administrators at the one-to-one laptop initiative at Denver School of Science and Technology agreed that "lighting fast" assessment data is a critical factor in the program's success. The teachers were using assessment data to guide their instruction each day and to clarify student misunderstandings from the previous day's learning. Seventy percent of the students reported using the data system weekly, whereas 21% reported daily usage (Zucker, 2009). School wide review weeks of instruction were planned based on data from the laptops to target specific needs. "Forty-one percent of teachers agreed that the reteach weeks were "very important" for Denver School of Science and Technology students, and another 48% reported that the reteach weeks were "somewhat important." Interestingly, more Hispanic students (53%)

and African-American students (45%)—who typically receive lower test scores in urban school systems—than Caucasian students (33%) reported that the reteach weeks were "very helpful." Overall, the African-American and Hispanic students reported reteach weeks as "very helpful", whereas Caucasian students reported them helpful, but at a lesser scale of "somewhat helpful" (Zucker, 2009, p. 20).

## One-to-One Programs and Student Technological Proficiency

Lei and Zhao (2008) inferred that students became masters at skills and then shared their skills with others. Student technology proficiency increased with the time spent on the computer. Lei and Zhao (2008) concluded that student immersion in the laptop program led to statistically significant gains on a pre- and posttechnological skills one-to-one laptop initiative survey. The TIP (Texas Immersion Project) interpreted that one-to-one computing programs greatly enhance students' technological proficiency (The Abell Foundation, 2008). The Abell Foundation (2008) determined that students in one-to-one environments developed greater proficiency using technology that led to more productivity and helped students gain knowledge for the workplace. Lei and Zhao (2008) concluded that student technology skills increased significantly as students worked on various tasks such as learning, communicating, and exploring. This is endorsed by Dawson et al. (2008) who attested that students in their study most frequently used the computer for browsing, draw and paint graphics, and presentation software, and that students exhibited improved keyboarding skills and overall computer literacy skills. According to Lowther et al., (2003) the impact of daily technology immersion built student confidence, as 95% of the students in a laptop program reported comfort with internet

research projects. According to Lemke and Martin as cited in Sauers and McLeod (2012) students were building 21st century skills.

Higher levels of technological proficiency were confirmed in the following studies. Reports from a laptop program in British Columbia reflected high levels of perceived technological proficiency after being involved in the laptop program. Teachers gave the students' improvement the highest rating of a five, while 92% of parents described the improvement in technology skills as extensive or substantial (Barrios et al., 2004). Sixty-eight percent of students reported that they were able to help others with their computers, and their parents reported that they were able to help family members with their computers (Barrios et al., 2004). Low income students in an experimental groups had equal or better technology skills than those wealthier in a control group (Shapley et al., 2009).

## Measuring the Success of One-to-One Programs

Numerous researchers believed that the success of one-to-one computing initiatives can't be measured through traditional standardized methods. Silvernail (2005) determined that one-to-one programs were based on inquiry and problem solving skills that were not assessed by standardized multiple choice tests. Rockman (2003) reported that students' use of technology for writing, online research, and organizing information were more closely aligned to 21st-century skills than to standardized tests. "It also may be the case, as advocates suggest, that much of what is best taught and learned with laptops is not covered on standardized tests at all" (Suhr et al., 2010, p. 39). "When entering a one-to-one initiative, it is important to recognize that existing standardized assessments may be ill equipped to measure 21st century learning and often do not assess skills that are connected to 1:1 learning" (Holcomb, 2009, p. 54). "Those administrators

and board members who insist on a specific test score gain as the return on investment are, more likely than not, going to be disappointed" (Rockman, 2003, p. 25).

Standards-based assessments were not equipped to measure student learning and creativity in an exploratory learning environment with one-to-one devices. Glover (2012) scrutinized how standards-based assessments and learning environments were producing students with similar instruction delivered at the same pace. "Is the primary goal of education in America to reduce differences and generate similarity among its younger population? Is this what we really want for our children? Do we want to define equal opportunity as sameness?" (Glover, 2012, p. 55).

Performance-based assessment was being used at Whitfield High School where the students incorporate digital tools into their classroom projects. One of the 11th grade teachers had required his students to develop a world truth and depict it through designing a magazine cover. Since the students had been using the digital tools, the teacher has reported a major change in the success of the project. "The English teacher in charge reports that students seemed considerably more involved in the project when using digital tools, and their designs communicated their intended message to the student juries 90% of the time. When covers were designed using the old magazine cutout method, student juries were typically able to identify the truth depicted only 50% of the time" (Livingston, 2009, p. 46).

Project-based learning can't adequately be measured with a standards based assessment. Dawson et al. (2008) reported that a one-to-one initiative increased project-based learning from the fall to spring semester by .93 with $p < .001$ (p. 148). However, the instruction and student activities involved computers, and the assessment was administered traditionally.

## Advantages of One-to-One Programs

### Student Engagement

Improved student engagement in learning was cited frequently in research on one-to-one initiatives. Warschauer (2006) declared students to be “"multimediasponges," whose out-of-school hours were filled with images, video, sound, music, and animation. It is unrealistic to expect students to give up all these things when they walk through the school door (p. 35). Maninger and Holden (2009) remarked on the curiosity and excitement found in laptop classrooms. According to Grimes and Warschauer (2008) 74% of students found school more interesting since the implementation of the one-to-one program. The Abell Foundation (2008) reported that 60% of Maine’s teachers agreed that students were more motivated to learn since the laptop program began. Research from a ubiquitous program in three high schools with varied socioeconomic groups indicated that 55% of the teachers reported that internet access increased student engagement (Drayton, Faulk, Stroud, Hobbs, & Hammerman, 2010). A study from Dawson et al. (2008) in over 400 K-12 schools in Florida showed a significant increase in student engagement from the fall to spring semester following the implementation of a one-to-one computer program. “High student attention, interest, and engagement (ES=+1.00, $p < .001$) and a decrease in the use of traditional “independent seatwork” (ES=-1.00, $p < .001$) were reported in this study (Dawson et al., 2008, p. 148).

Berry and Wintle (2009) investigated student engagement as one of several factors in a seventh and eighth grade project involving understanding the earth’s axis and the impact on the seasons. In this research Group A had access to atlases, books, the internet, and art materials, and Group B had access to the internet, specific educational websites, podcast capabilities, and animation software. Student on task behavior was recorded at 15 second intervals. The study

reported that students in Group A were on task 70% of the time compared to the students in Group B with a 100% on task rating (p. 7).

Interviews with the students at the project's completion verified that the students in Group B were challenged more with the animation part of their projects, but they reported having "hard fun" (Berry & Wintle, 2009). The assessment at the end of the project revealed significant differences between the two groups of students in the retention of the material. Students in Group A scored a 63.08 average on the assessment, whereas students in Group B scored an 87.27 average (p. 7).

"Working with multimedia on a daily basis in school created higher levels of student engagement-and engaged students spent more time on task, worked more independently, enjoyed learning more, and took part in a greater variety of learning activities at school and at home" (Warschauer, 2005, p. 35). After 2.5 months of the Gateway laptop program, 86% of teachers in Sergeant Bluff-Luton School District in Iowa affirmed that the students were more engaged, and none of the teachers reported that the students were less engaged (Center for Digital Education, 2008). Increased student attention, interest, and engagement were the most positive outcomes from the Leveraging Laptops Program in Florida (Dawson et al., 2008). Special education teachers pronounced significant amounts of positive impact in the areas of interest/engagement, motivation, and work independence with seventh grade students (Harris & Smith, 2004). Ninety-two percent of teachers documented improved engagement and interest, and 88% of the teachers stated that their students improved in motivation. In addition, working independence was improved by 80% based on teacher surveys. Eighty-six percent of high school students at Natick High School declared that classes became more interesting with

laptops; whereas 86% of teachers reported that their classes were more interesting (BeBell & Burraston, 2014).

Student Motivation

Motivation was another factor considered when researching the impact of technology on student learning. Pink's 1995 book *Drive* described human motivators and how they were an integral part of learning. According to Pink we need to be striving to help students reach Motivation 3.0. Pink called autonomy, mastery, and purpose ingredients of genuine motivation (p. 49). "Education can provide our young with the higher-order thinking and learning skills that, when paired with motivation 3.0, can enable them to create the organizations and products our future requires" (Glover, 2012, p. 60).

Student Attendance

Attendance rates are often calculated prior to and during laptop programs to assess changes after the implementation. Attendance rates increased in Maine by 7.7%, and a decrease of absenteeism rates was reported in Texas (Lemke & Martin, 2003). One Maine high school reported a reduction in absenteeism from 9% to 2% (Barrios et al., 2004, p. 25). Only 20% of the teachers in the Berkshire Wireless Program reported the one-to-one program had been beneficial at increasing attendance in traditional, at risk, and high achieving student groups (BeBell & Kay, 2010). On the other hand, the Abell Foundation (2008) indicated that Texas students had lower attendance rates with greater laptop usage. Barrios et al. (2004) reported a reduction in absenteeism by nearly 40% with students with laptops. Harris and Smith (2004) reported that 34% of middle school special education students demonstrated improved school attendance, while 66% showed no impact. BeBell and Burraston (2014) remarked no

relationship between student absences and frequency of technology use in the classroom. Since the inception of the Cullman Middle School laptop initiative, attendance had remained relatively stable (95% over 7 years from 2004-2012), except for a spike of 98% average daily attendance in 2007-2008 (cullmancats.net).

Student Discipline

Discipline was another area that had been investigated in one-to-one settings. Intel (2008) reported that discipline referrals were down by 29% in one Alabama school. In Maine's first year of the one-to-one initiative, Lemke and Martin (2003) noted that behavior letters sent home decreased by 54%. Discipline improvements were reported with traditional, at risk, and high achieving students when involved in the Berkshire Wireless Program (BeBell & Kay, 2010). "In Texas, laptops have led to fewer disciplinary actions, although teachers in all studies reported that classroom management became more challenging with laptops" (BeBell & Kay, 2010, p. 17). The primary concern from teachers was "How do I stop them from playing with the laptop when I am teaching?" (Donovan, Green, & Hartley, 2010, p. 436). According to a teacher in Burns and Polman's study (2006), the use of computers made a connection between him and the students and reduced discipline issues (p. 379). Oftentimes students with behavior issues were trained as helpers and used as technology support in The Urban School (Livingston, 2009). Middle school special education teachers acquiesced that after the inception of one-to-one laptops, positive behavior improved by 65%, 23% of students displayed no change in behavior, and 12% of students demonstrated a decline in a behavior. Research from Shapley reflected that middle school students enrolled in a one-to-one laptop initiative were sent to the office less frequently and were suspended for fewer days than those in nonlaptop settings (as cited in Sauers & McLeod, 2012). Two counties in Kentucky instituted laptop programs and

both reported a reduction in discipline referrals as students were more interested in laptops than in traditional classroom instruction (Roscorla, 2010). Office behavior incidents decreased by 12%, as well as a decrease by 37% in terms of classroom incidents (cullmancats.net).

Student Collaboration

The impact of a one-to-one program on student collaboration was investigated. Maninger and Holden (2009) confirmed that student helpers were not seen as egotistical and those needing help were not demoralized in a one-to-one setting. On the other hand, BeBell and Kay (2010) reported that in the Berkshire Wireless Program collaboration had increased, but so had the ability of all types of students to work independently. Findings from the Pennsylvania program, Classrooms for the Future, demonstrated that students were spending more time working together collaboratively (The Abell Foundation, 2008). Mouza (2008) identified that ubiquitous computing allowed students to work together in a civilized way allowing them to collaborate much more effectively. On-line discussion boards involved students who wouldn't normally speak up in class share their thoughts with the class and get feedback (Zucker, 2009). Burns and Polman (2006) pronounced that in two of three classes students were showing signs of becoming a community of learners (379). Dawson et al. (2008) studied students before and after a one-to-one initiative and found significant differences in cooperative/collaborative learning between students (ES =+.62, p = .010) (148). Dawson et al. (2008) surmised a statistically significant increase in collaboration and project based learning. Teachers declared that student collaboration improved by 73% with special education middle schoolers once engaged in a one-to-one laptop program (Harris & Smith, 2004, p. 4). Teachers in Mooresville, North Carolina increased collaboration with shy students by having them blog to one another to increase

communication (Schwarz, 2012). One student in Schwarz's article reported that the program allowed him to open up and communicate better through using a keyboard (Schwartz, 2012).

Special Needs Students

One-to-one laptop programs were advantageous in reaching struggling or special needs' students. "Additionally, over 70% of teachers surveyed reported that the laptops helped them to more effectively meet their curriculum goals and individualize their curriculum to meet particular student needs" (Holcomb, 2009, p. 51). Teachers remarked that students with dysgraphia benefited from one-to-one programs because they were no longer singled out for being the only student with a keyboard (Maninger & Holden, 2009). Teachers overwhelmingly agreed that the laptop program was beneficial in reaching the various students groups: English Language Learners 72%, Special Education 65%, and At Risk Students 67% (Grimes & Warschauer, 2008). Surveys indicated that 63% of teachers in a special education program reported improved organization (Harris & Smith, 2004). Maine special education teachers documented significant improvements in their students' organization, class preparation and participation, attendance, and interactions among their students (Silvernail & Lane, 2004).

Differentiated Instruction

One-to-one programs naturally lend themselves to students working at their own speed. But research-based differentiated instruction was limited in a Florida laptop program (Dawson et al., 2008). However, the program in Mooresville, North Carolina touted differentiated instruction as part of its success (Schwartz, 2012). More than 70% of the teacher respondents from a Maine study shared that they were better able to individualize instruction to fit their students' needs (Silvernail & Lane, 2004). One teacher from this study reported that going one

to one allowed her to be more individualized with the kids and that she can't imagine going back.

English Language Learners

A large portion instruction for English Language Learners is coming through technology and one-to-one laptop programs. Liu, Navarrette, and Wivagg (2014) examined the use of one-to-one mobile technology using iPod touches for ESL students. In the study three student learning supports were identified from using the one-to-one initiative: supporting language, differentiated support for student needs, and extended learning opportunities at home. Teachers also maintained that the student learning was more customized and students were more engaged. Surveys at the end of the year represented that more than 92% of students reported that audio books were helpful in their learning.

Diallo (2014) studied the enhancement of students' learning experience through using technology. Knutson (2015), Diallo (2014), and Liu et al. (2014) surmised that technology is beneficial for language acquisition. According to Diallo (2014) English Language Learners should have differentiated instruction that is exciting and hands on both using innovation computer input and other methods. Most importantly, Diallo (2014) established that technology can build confidence, reduce anxiety, and help students acquire language faster and in a less stressful way.

Knutson (2015), like Diallo (2014) and Liu et al. (2014), agreed that differentiated instruction as well as teaching in a student-centered low stakes way through games benefitted English Language Learners. Programs like NewsELA allowed students to toggle between English and Spanish and incorporated five different levels of reading for differentiation,

Brainpop ESL involved videos and questioning, and Pocoyo Playground supported students through dual language digital storytelling (Knutson, 2015). These were ways that differentiated instruction made learning more interesting to students. Knutson (2015) posed that programs like these help by supporting students to reach their Zone of Proximal Development (ZPD).

Teachers' limited knowledge in using available educational technologies was also acknowledged by students. A student said, "… sometimes the teacher just say "Oh, you gotto do this" and they do not explain and [he does] not know how to do it and it is on the laptop" (Turgut 2012, p. 9). Turgut's study alluded to a heavy reliance on instructional technology in the ESL classroom.

Student Writing and Organization

Students wrote more frequently in one-to-one classrooms. Reducing the amount of time spent in the writing process was another positive aspect of laptop programs. With word processing programs students were easily able to write, revise, and add in pictures making their final draft more polished (Lei & Zhao, 2008) and (Mouza, 2008). Warschauer (2006) verified that students received more feedback on their writing due to teacher accessibility, reading ability compared to handwritten papers, and automated writing scoring systems (p. 36). In Drayton et al.'s study (2010) teachers cited using Microsoft Word most frequently because it helped students' thinking, organization, and understanding. More than 46% of the fourth graders in the literacy study confirmed using their laptops to write papers several times a week at school (Suhr et al., 2010). Teachers in Zucker's work (2009) reported a faster writing process that is easier to grade and read as well as a springboard to model the revision process. Organization and research were considered positive outcomes in Livingston's studies (2009).

Other programs across the country have touted gains in student writing. A laptop program for sixth and seventh graders in North Peace River, British Columbia boasted increases in student writing. "The percentage of students whose writing met expectations on the British Columbia Performance Standard Test increased from 70% on the pretest to 92%. The percentage whose writing exceeded expectations rose from 0% to 18%" (Barrios et al., 2004, p. 38.) Ninety-three percent of parents maintained an improvement in their child's writing, and 70% reported the improvement as extensive or substantial. Ninety percent of the students concluded that the laptop program helped improve their writing by "a lot" or "quite a bit".

Students involved in Michigan's Freedom to Learn made significant gains on the MEAP writing assessment. "In Bear Lake Schools, fifth graders in 2002 went from 33.3% proficient in MEAP writing to 76% in 2004 as seventh graders (Bear Lake Schools)" (Center for Digital Education 2008, p. 24*)*. Over a 5-year period from 2000 to 2005, Maine middle school students increased from a 29.1% proficiency rating to 41.4% proficiency.

Special education teachers remarked that the laptop program had a positive impact on their students, especially in writing. The following quote spoke volumes about the one-to-one program. "One student who has historically been a very reluctant writer is now able to compose full essays. His writing has been shared with his last years' special ed. teacher who could not believe it was the same child," (Harris & Smith, 2004, p. 4).

Organization was confirmed as an area that was improved through student laptop programs. Lei and Zhao (2008) documented that more than 80% of the middle school students in their study agreed that they are more organized by filing notes in separate computer folders. High school teachers surveyed in Drayton et al.'s work (2010) shared that school intranet increased responsibility and organization. "Similarly, Silvernail and Lane (2004) (n =

26,000) found that more than 70% of students surveyed reflected that the laptops helped them to be better organized and to get their work done more quickly and with better quality" (Holcomb, 2009, p. 50). BeBell and Burraston (2014) documented that 89% of the students felt more organized, and 93% of the students responded using their laptop has made it easier to track assignments. When Urban School students in California were surveyed about the best use of their laptop computer, 63% reported improvements in organization (Livingston, 2009). Teachers at the Denver School of Science and Technology instituted assignment deadlines to students via Microsoft's Outlook so that the students could add assignments to their calendars and plan their work, which improved organization (Livingston, 2009). However, Harris and Smith (2004) identified that special education student struggled with file naming and misfiled assignments.

Research Simulations and Skills

On-line virtual labs and simulations from the laptops have allowed students to participate in experiments that would otherwise be too dangerous, laborious, expensive, or impractical for a school environment. "Students can get a clearer, in-process picture of the components and their interactions, and often can repeat the animation, sometimes with variations" (Drayton et al., 2010, p. 33). On-line virtual labs decreased the amount of preparation time and laboratory time needed for students to observe the particular scientific objective assigned by the teacher (Drayton et al., 2010). A student in a high score honors physics class stated that interactive lectures and computerized animation have made processes easier to understand (Zucker, 2009). Simulations and games using technology have demonstrated promise when used with students in mathematics. Games were an avenue used by The National Center for Research on Evaluation, Standards, and Student Testing to assess the impact of gaming technology on students' mathematics performance. However, instructing the teachers how to play and incorporate the

games into mathematics instruction was of critical importance. (Dietel et al., 2012). "CRESST found that the math games, even if used for just 40 minutes of a single class period, could lead to improved achievement" (Dietel et al., 2012, p. 4).

According to Gredler and Jonassen (2004) there was a distinction to be made between computer games and simulations. "Games are competitive exercises in which the objective is to win and players must apply subject matter or other relevant knowledge in an effort to advance in the exercise and win." Whereas simulations are opportunities for students to take on a "particular role, address the issues, threats, or problems that arise in the situation, and experience the effects of their decisions" (p. 571).

Bell and Smetana (2005) endorsed the advantages and best practices of using simulations in the classroom. "Learners can observe, explore, recreate, and receive immediate feedback about real objects, phenomena, and processes that would otherwise be too complex, time-consuming, or dangerous," (p. 23). However, it is important to use simulations to supplement not replace other modes of teaching, keep the lessons student centered, point out the limitations of simulations to students, and make the content, not technology, the focus of the lesson (Bell & Smetana, 2005).

Access to important up-to-date resources was another advantage of laptop programs. Students from The Urban School are able to access online library collections such as Find Law rather than visiting a law library (Livingston, 2009). Other students at the Denver School for Science and Technology communicated with researchers in the field and use blogs and wikis for other types of interaction (Livingston, 2009).

Teachers at Nicolas School in the Fullerton School District reported increased use of student research (Grimes & Warschauer, 2008). Examples of this program's first-year research

projects included background information about Emily Dickinson, current events learning following the East Asian tsunami, and health service projects about tobacco and school violence. Eighty-two percent of teachers reported that students were involved in more in-depth research and 90% agreed that students explored topics more (Grimes & Warschauer, 2008, p. 315.

A small scale study in a Northwestern middle school encountered students receiving Apple ibooks for use at both home and school. Seventy-one percent of the students in this study confirmed that their computers were used for research at both home and school (Lei & Zhao, 2008). One project involved their research of the election process at different levels of government as well as investigating current events.

Florida students increased in their usage of research during one calendar year of laptop implementation from 25.7% to 59.3% with other increases in science and social studies respectively (Dawson et al., 2008). There was a statistically significant difference in this study comparing student research and inquiry activities prior to and after the one-to-one computer initiative.

Higher Order Thinking

The usage of computers for higher order thinking projects was researched. The Leveraging Laptops program study corroborated that the computers are often used for applications other than assessment when used in low frequency in the classroom. Classrooms with higher levels of computer usage attested to greater opportunities for students to think critically on problem solving projects (Dawson et al., 2008). According to Lowther et al. (2003) students in a one-to-one laptop program scored significantly better on five of seven problem solving tasks compared to the control group.

### Student Attitudes and Parental Satisfaction

Other factors to be considered when it came to laptop initiatives were the impact that they may have on students' attitudes and parents' satisfaction. "Nearly 90% of the parents verified an improvement in their children's attitude in response to the laptop initiative. Three quarters of the students indicated that their attitudes toward school had improved "a lot" or "quite a lot" due to having an iBook" (Barrios et al., 2004, p. 39). Increased parental involvement and educational satisfaction had also been corroborated in schools with laptop programs. In Henrico County, Virginia, 94% of parents were satisfied with their child's education compared to the national average of 70% (Barrios et al., 2004).

## Disadvantages of One-to-One Programs

### Financial and Time Resources

The budget for one-to-one laptop computing programs showed constant expansion. Warschauer (2006) listed several items that went beyond the laptop computers that must be added to the budget including software, hardware, replacement parts, and extra instructional technology support staff. In Hoboken, New Jersey the small instructional technology staff could not keep up with the demands of the seventh through ninth grade initiative (Barshay, 2014). In addition to replacement costs, there was the factor of updating programs with continually changing technology. Maintenance and upkeep of technology is another concern as well as purchasing newer technologies (Drayton et al., 2010). There were other costs to consider such as carts, electrical work, insurance policies, and loaner laptops, [software], parent education programs, (Center for Digital Education, 2008, p. 36). In the United States laptop programs cost approximately $1,000 annually per student (Zucker & Light, 2009). This involved the total cost

of ownership with the factors considered previously. Licensing and security software added additional costs that may require renewal (Barshay, 2014). In developing nations the total cost of ownership was expected to total $400.00 per student with half of that amount spent on training, service, and support (Zucker & Light, 2009). Many districts are taking a backward step when it comes to 1:1 implementation because there is not a guarantee of success (Holcomb, 2009).

Issues with laptop damages and hacking were not only costly and time consuming. A school in Massachusetts eliminated its program because funding was spent more on repairs than professional development (Hu, 2007). Barshay (2014) referred to keys popping off, viruses, cracked screens, and other expensive damages. In addition, there were issues with theft. Approximately 60% of high school students at Natick High School reported their ability to circumvent the school's internet filter over a span of 3 years (BeBell & Burraston, 2014). An entire classroom was converted to a laptop repair center at a one-to-one school (Hu, 2007). Newsweek confirmed that bandwidth was a major problem as students tried to connect at the same time (Laptop Program Fizzles, 2011).

Meaningful professional development for teachers and other staff members was extremely costly. It is necessary for teachers and specialists to have opportunity to plan so that the goals of the program will be reached (Center for Digital Education, 2008). Weston and Bain (2009) warned that without continual professional development and follow up, the technology became wasted as teachers ignored the laptops and returned to traditional teaching. According to Zucker and Light (2009) teacher competence in laptop usage was associated with greater usage during instruction. Barshay (2014) scrutinized the demise of the Hoboken laptop initiative with a lack of planning and meaningful professional development.

Technology Costs

Although the price tag for laptop programs was extraordinary, their funding often came from other educational costs that are being defrayed. Sixty-five positions were eliminated in the Mooresville, North Carolina school district to help fund the laptop program as well as saving for eliminations of costly computer labs and needless instructional supplies based on having technological resources (Schwartz, 2012). For example, many districts were forgoing textbook purchases to implement/maintain one-to-one programs as resources could be viewed on-line. However, in West Virginia a proposal was made for 57.1 million dollars to spend toward online social studies materials and one-to-one devices, and it was denied by the state legislators (Laptops Fizzle, 2011). Cushing Academy, a private school in Boston, dismantled its library giving away 20,000 books in lieu of e-books and e-resources based on the school getting the most of its resources (Martin & Brouwer, 2009). Also, there were savings from a reduction in assessments, paper, textbooks, and paperwork (Goodwin, 2011; Greaves, Hayes, Wilson, Gielniak, & Petson, 2010; Roscorla, 2010).

Connectivity and Support

Connectivity and instructional technology support were other factors to consider. Zucker and Light (2009) discussed that poorer nations may need to slow down and implement smaller scale one-to-one initiatives and pilot programs. Security software bogged down memory and teachers complained that the computers took up to 20 minutes to boot up (Barshay, 2014). Every day in a New York high school connectivity shut down because of the load on the server during Study Hall (Hu, 2007). Newsweek (Laptop Program Fizzles, 2011) reported that bandwidth was a major problem in West Virginia as high school students tried to connect at the same time.

Technology as a Distractor

Despite student enthusiasm about laptops, there was criticism that the laptops were distractors to students. More than 39% of teachers in a Midwestern middle school determined that music, internet, and games distract from the learning process, but 84% of the students disagreed that the laptops had been distracting to them (Lei & Zhao, 2008). A teacher from Drayton et al.'s study (2010) established that it was difficult to keep students from surfing and viewing other websites. Liverpool, New York teachers shared that their students downloaded pornography, played games, and cheated on tests with their laptops (Holcomb, 2009). Student off-task behavior with laptops was established in all three different configurations studied (Donovan et al., 2010). Despite their positive experience with a one-to-one laptop program, teachers confirmed that monitoring internet use was one of the most difficult aspects (Lowther et al., 2003). Teachers of seventh grade special education students diagnosed with ADHD depicted the laptops as distractors especially during research when students became overstimulated (Harris & Smith, 2004). Teachers in Hoboken, New Jersey complained that their students were too distracted by the computers to be engaged in their lessons (Barshay, 2014). There was also the issue of students working ahead of the instructor missing out on valuable instruction (Laptops Fizzle, 2011).

Laptop programs were noted to be a real problem for teachers already struggling with classroom management. Teachers in Liverpool, New York, which phased out their laptop program in 2007, described the laptops as boxes that got in the way (Hu, 2007). "This explained why teachers with less than five years of experience (and fewer classroom management skills) reported that laptop computers could be a distractor for special education students compared to teachers with more than six years of experience" (Harris & Smith, 2004, p. 4). With classroom

distractions, parents were concerned that their children were spending too much time playing games on their laptops (O'Donovan, 2009).

Problems from Keyboard to Paper

Although some research reflected that writing skills were increased through laptop programs, one problem may be the conversion from keyboard to paper. "A study by Russell and Plati (2002) corroborated Silvernail's observation; students who were accustomed to writing with computers in the classroom performed 0.4 to 1.1 standard deviations lower when they took writing tests by handwriting instead of computer" (Suhr et al., 2010, p. 11). Rockman (2003) described handwritten revisions as laborious and cited that handwritten writing assessments suffered due to the change. According to ELL teachers (Turgut, 2012) overreliance on programs such as Microsoft Word was detrimental to students so these students were required to publish writing by hand.

Issues with Child Development and Health

The overuse of technology was cited as a cause for both developmental and health issues. Epstein (as cited in Lentz, Seo, & Gruner, 2014) and DeLoatch (2015) linked the overuse of technology and lack of movement to obesity, and Straker et al. reported that this lack of movement could lead to poor circulation (as cited in Lentz et al., 2014). Children were so involved in the computer that they ignored their own discomfort, and because of this should have activity breaks at least every 30 to 60 minutes, with younger children needing more frequent breaks (Straker et al., 2010). DeLoatch (2015) observed that as the time we spend sedentary on technology increases, physical activity levels drop.

Computer addiction was concerned a serious issue. In a study of Korean 5-years old (Seo, Chun, Jwa, & Choi) children with higher computer addiction scores scored much lower on

scores of socio-emotional development, and conversely students with higher scores on socio-emotional development had lower scores in computer addiction (as cited in Lentz et al., 2014). Tynan (2015) cautioned that when screen time interferes with play or socialization, it could impact health and emotional growth. A report from the United Kingdom revealed that children who spent 4 or more hours on computer games at home remarked on a lower level of well-being compared to those who spent an hour or less on computer games (DeLoatch, 2015).

Research speculated that higher levels of computer usage impacted student empathy. A Boston University study questioned that heavy device use during young childhood could interfere with development of empathy, social and problem solving skills, unstructured play, and interacting with peers (Boston University Medical Center, 2015). A study with sixth grade students found that a break from technology for 5 days led to students' improvement in picking up on emotions and nonverbal cues (DeLoatch, 2015).

## Teachers and One-to-One Programs

### Technology Instruction for the Teachers

Even though a majority of preservice teachers grew up as digital natives, they needed instruction on how to incorporate technology into their future classrooms. Donovan et. al (2009) affirmed that personal technology use did not equate to knowledge of interactive boards, websites, and software that are prevalent in education. Barrios et al. (2004) suggested that preservice teachers must have technology infused through their education program and complete internships in classrooms equipped with technology. Based on work from Martin and Brouwer (2009), graduate students may know how to use digital devices but find the learning format difficult to digest. All the while, elementary school students seemed to have this type of

technology build into their DNA. With students coming to school as digital natives, this makes technology implementation easier than one would think for elementary students in the primary grades.

According to Hannafin (2008) there is a misconception that as soon as teachers receive technological tools and access that classroom integration will be an "add technology and stir" mentality, when that is often not the case. Ongoing professional development requires time and fiscal resources. "The success of a 1:1 initiative can hinge on the ability and comfort levels of teachers to effectively integrate laptops into learning" (Holcomb, 2009, p. 53). Barrios et al. (2004) agreed that we cannot assume teachers have the skills to change to teaching with technology upon demand (p. 8). One-to-one programs will not survive without teacher training related to the technological needs of the teacher and in-depth professional development about teaching to specific age groups and subject areas (Klieger et al., 2010). Inman, a consultant for Educational Collaborators, asserted that lack of teacher preparation could have disastrous effects (Roscorla, 2010).

According to Burns and Polman (2006) an intrinsic desire develops from some educators once they see a benefit that supports their teaching. Shapley et al. (2010) stressed that program success is based around collegial cultures with a "We are all in this together attitude" (p. 46). Burns and Polman (2006) noted that allowing teachers exploration time with flexible expectations was an important component in the infancy of a laptop program (p. 370). Teachers at Howard Middle School suggested that teachers should receive their laptop a half to a full year prior to implementation of a laptop initiative (Barrios et al., 2004).

Teacher Attributes and Understanding for Success

Teachers who were successful at using technology in the classroom were found to have certain attributes. One of the most important attributes was a strong self-efficacy toward using computers. According to Liaw, Huang and Chen, "Teachers' computer self-efficacy influences their use of ICT in teaching and learning" (as cited in Buabeng-Andoh, 2012, p. 139). Bauer and Kenton (2005) found that technology integration was reported more often in classrooms with teachers that were highly confident compared to those that reported they were skilled in technology (as cited in Ertmer & Ottenbreit-Leftwich, 2010).

"A number of suggestions for building computer or technology self-efficacy are offered in the literature: giving teachers time to play with the technology (Somekh, 2008); focusing new uses on teachers' immediate needs (Kanaya, Light, & Culp, 2005; Zhao & Cziko, 2001); starting with small successful experiences (Ottenbreit-Leftwich, 2007); working Ertmer & Ottenbreit-Leftwich AERA, 2009 6 with knowledgeable peers (Ertmer, Ottenbreit-Leftwich, & York, 2006); providing access to suitable models (Albion, 1999; Ertmer, 2005); and participating in a professional learning" (Putnam & Borko, 2000)" (Ertmer & Ottenbreit-Leftwich, 2009).

Also, to be successful teachers must have a conceptual understanding of not only their content knowledge and appropriate subject specific strategies, but they must also have an understanding of how this intersects with using technology (Ertmer & Ottenbreit-Leftwich, 2009). This was an extension of Shulman's work (1986-1987) that is known as PCK-pedagogical content knowledge (Ertmer & Ottenbreit-Leftwich, 2010). This type of understanding involved the incorporation of technology into the pedagogy and content knowledge and was known as PTICK (pedagogical technology integration content knowledge; Brantley-Dias, Kinuthia, Shoffner, DeCastro, & Rigole as cited in (Ertmer & Ottenbreit-Leftwich, 2010).

Higgins and Moseley (2001) studied teachers that successfully integrated technology in the classroom and found similar characteristics. Naturally, this group of teachers had a positive

disposition toward technology. However, these teachers tended to be more interested in pupil choice rather than directed teacher activities, viewed pupil empowerment as learners (not receivers of instruction), and preferred the concept of independent study for students (Mumtaz, 2000). According to Ertmer, Ottenbreit-Leftwich, Sadik, Sendurur, and Sendurur (2012) teachers who used technology were committed to preparing students for the future by leveraging technology.

Changing Relationships

The one-to-one classroom changed the roles of both the teachers and students and increased positive attitudes. Teachers became more like facilitators, pronounced a more reciprocal relationship with their students, and affirmed that the collaboration created a community of learners (Fairman, 2004). Sauers and McLeod (2012) reported that as the use of direct instruction reduced as teachers acted more like coaches and facilitators. Fairman (2004) discussed that students helped or taught other students or adults in the classroom. In a study by Gunner (2007), teachers and students spent more time collaborating, kids began to work with each other, and barriers between student groups began to be diminish. However, there was a concern that electronic communication would reduce face-to-face communication.

An improvement in teacher/student relationships was reinforced. Burns and Polman (2006) shared that two of the three teachers in the study declared that the computers helped improve relationships by changing perceptions and helping the students and teachers connect and establish common bonds. One teacher alluded to an improvement with rapport and an overall change in her teaching persona making her more "mother-like". Asking for help from students led to an understood reciprocity between student and teacher. A teacher pronounced an improvement in the students' respect for him as he was trying to learn and change his teaching,

and the teacher admitted that it reduced his need for control in the classroom. However, another teacher remarked no change or less interaction with students based on the desire to email rather than face-to-face communication.

Teachers may adjust their management practices in response to one-on-one environments. This was part of Mooresville, North Carolina's success. "You have to trust kids more than you've ever trusted them. Your teachers have to be willing to give up control" (Shwartz, 2012). Clearly classroom management for a new teacher would require much training in this type of environment.

Not only did teacher feelings about technology impact their students, but it also impacted the teachers around them, so that the attitudes and beliefs of other teachers became a barrier to technology integration (Ertmer et al., 2011). Zhao and Frank as cited in (Ertmer & Ottenbreit-Leftwich, 2009) suggested that technology innovation was greatly impacted by the attitudes of the teachers and administrators in the school building for group membership. Brodie referred to this as a sink-or-swim situation as the person can adopt the same philosophy or struggle with being uncomfortable (as cited Ertmer and Ottenbreit-Leftwich, 2009).

In some places technology greatly improved teacher collaboration. Burns and Polman (2006) explained all three teachers in their study noted increased amounts of teacher collaboration in terms of sharing websites, emailing, meeting with other teachers, and visiting other schools to share their knowledge. At Urban High School collaboration was considered the "cornerstone" of what they do. "Teachers appreciate how easy it now is to share information with other teachers, students, and parents and how that can lead to better integration and organization of curriculum across all content areas," (Livingston, 2009, p. 42).

Combination of Beliefs for Success

According to Mouza (2008) the outcomes of laptop programs were contingent upon the attitudes and professional development of teachers. Before the implementation of a one-to-one program laptop program, one county in Kentucky surveyed teachers to find out their interest levels and how they could make the program beneficial (Roscorla, 2010). This was important to gauge not only the teachers' interest levels but their technological needs as well. Mouza (2008) explained that the usage of technology is neither intuitive nor automatic (p. 451). Ertmer (2005) reported that widespread technological integration was impossible until teacher beliefs, or the "final frontier" were conquered. The final frontier was really the epitome of what was important, which was the "teachers' beliefs". This meant that teachers needed more than training, but they needed to be able to apply, integrate, and believe in the usefulness of technology in the learning environment.

Preservice Program Development

Many preservice teacher education programs redesigned their programs and experiences for future educators. Even though a majority of preservice teachers grew up as digital natives, they need instruction on how to incorporate technology into their future classrooms. Students who were involved in one-to-one laptop classrooms in their field experience and were instructed throughout their core education classes using Macbooks in a ubiquitous program demonstrated much greater use of technological proficiency and much stronger positive attitudes toward having technology in the classroom (Donovan et al., 2009). According to Shapley et al. teachers' level of implementation was related to the "quality of professional development ($r$ = .47)" (2010, p. 33). The teachers in Drayton's study associated not having time to collaborate or for professional development as reasons for implementation barriers (Drayton et al., 2010). In

addition, the rate of teacher development in changing their teaching practices to incorporate technology was not directly related to their technological skill (Burns & Polman, 2006). Burns and Polman documented the teacher with the most initial computer skills changed his teaching practices the least.

## Leadership and One-to-One Success

The EnGauge survey referenced by Hannafin (2008) demonstrated that the role of school leadership was important for the integration of technology. According to Hannafin (2008), many schools have technology plans, but few have clear goals or an assessment to measure the impact of the technology. Peng, Chou, and Tsai (2009) agreed that the success of ubiquitous computing rests on the vision of leadership as well as educational decision makers, the technology planners, teachers, and teacher preparation programs. Weston and Bain (2010) called for a complete change in vision for one-to-one programs to be successful. "Laptop computers are not technological tools; rather, they are cognitive tools that are holistically integrated into the teaching and learning processes of their school" (Senge, Scharmer, Jawerski, & Flowers as cited in Weston & Bain, 2010, p. 10). In BeBell and Kay's study of five middle school one-to-one programs, one school struggled so much in the third implementation year that the amount of time students spent using technology fell in the range of those schools that were controlled non-one-to-one settings (2010).

However, Burns and Polman (2006) argued that flexible administrative expectations are critical. "Maintaining flexible expectations may have been the best way to allow teachers to work out ways to deal with this new phenomenon of ubiquitous technology," (Burns & Polman, 2006, p. 370). The school administration at DSST provided the teachers with much latitude in regard to how the technology is used in the classroom, but it provided the much needed technical

support and professional development (Zucker, 2009). "A leader is a learner and openness to learning creates the opening for others to be open to learning" (Glover, 2012, p. 154).

Nevertheless, BeBell and Kay (2010) found that lack of consistent leadership support led to weaker amounts of technology usage (p. 50). Drayton et al. (2010) found that consistent and informed administrative policy was needed, while Weston and Bain (2010) cited the necessity for an "explicit set of clear rules" by the school community to sustain a one-to-one program (p.11).

The set up for a one-to-one initiative was critical for program success. Burns and Polman (2006) asserted that it was important to make sure that staff members had access to the technology and became comfortable with it prior to integration. In addition, having on-site just in time technology support was a great benefit. Creating a professional development library with continued resources was a supportive resource for staff. Zucker (2009) documented that involving staff in decision making about purchases and resources was important for success.

There were numerous rationale for implementing one-to-one programs in schools, but it was important to start with the goal or purpose in mind. "Teachers and administrators should carefully consider the outcomes that they would like to see, and then design their implementation, training, and assessment efforts accordingly" (Sauers & McLeod, 2012, p. 6). The purpose of the one-to-one program and goal setting were critical aspects of establishing effective programs. The school needs to establish upfront goals and objectives as well as a way to measure the goals (Roscorla, 2010). According to one district superintendent there is a fallacy in looking at one measure of student improvement in evaluating one-to-one program success, but it is a measure that is looked at by the state and parents (Schwartz, 2012).

Bebell and Kay (2010) concluded that it is "impossible to overstate the power of individual teachers in the success or failure of 1:1 computing" (p. 47). Because the teacher was of paramount importance, their buy-in in one-to-one programs was critical. "Respondents at schools with higher rates of 1:1 implementation report that committed leaders, thorough 'planning, teacher buy-in, preliminary professional development for teachers, and a commitment to the transformation of student learning were keys to their successful implementation of Technology Immersion" (Shapley et al., 2010, p. 46). Having a teacher leadership team is another critical component to the success of a one-to-one initiative as well as administrative support (K-12 One-to-One Computing Handbook, 2008).

When teachers had a basic understanding of technology or familiarity, it made the process of converting to a one-to-one classroom much less difficult. In Burns and Polman's study (2006), the teachers had their own personal laptops for 2 years and did not require extensive training for technology integration in the classroom. Toledo (2005) developed a Five-Stage Model for classroom technology integration involving preintegration, transition, development, expansion, and system wide integration. Using this as a framework, educators received their computers 2 years in advance as well as the implementation of a system grading system that supported teachers' development along the integration continuum.

In summation, the success and failures of laptop programs were based largely on establishing key procedures. According to Cullman City Schools in Alabama which served as a model in one-to-one programs, the following elements are critical: discipline procedures, laptop inventory, procedures for enrollment, and software that works in conjunction with the state student information system (cullmancats.net). Technical needs were considered important from standardizing the operating system, handling upgrades, laying out repair plans, planning for

software and hardware obsolescence, purchasing supportive presentation devices, and student network access (O'Donovan, 2009). One of the most important aspects was a technical support system because that was the number one concern of students and teachers (O'Donovan, 2009).

## Realization of the Assessment and Instruction Mismatch

Unfortunately, high stakes testing impacted the success of one-to-one programs. If test scores did not reach the expectation, teachers frequently returned to their teaching comfort zone of traditional teaching methods (Center for Digital Education, 2008). This was especially problematic when students were taught in a manner different from the one by which they were assessed. Dawson et al., (2008) noted that teacher instruction and student activities shifted in relation to the technology, but the assessment procedures were of a traditional method.

# CHAPTER 3

# RESEARCH METHOD

This research provided a look into the impact of a sixth grade laptop computer intervention initiative on student attitudes about their learning and technological competencies. The district collected this data to help support future decision making about one-to-one expenditures for this grade level as well as future one-to-one roll outs at other grade levels. This study documented student responses prior to and after being participants in the laptop initiative. This information was viewed and discussed at the district level, and the researcher asked for permission to use this information for this nonexperimental quantitative research study.

## Population

The population for this one-to-one laptop study was composed of sixth grade students from six homeroom classes. The homeroom classes spanned the sixth grade student body in a suburban East Tennessee school district. Total enrollment for this group of students was 105 students. Because of the free and reduced price lunch percentages, the school district qualified as a Title I school district. The ethnicity of students in this district was approximately 95% White, 4% African American, and 1% other races.

The largest school (School 1) had a population of 504 total students. The students involved in this study were in departmentalized, ability grouped classes with three teachers. The free and reduced lunch price percentage was approximately 49%. Of the three teachers who participated in this study, one had more than 10 years of experience, one had more than 5 years of experience, and the other was a first year teacher. Two of the teachers were female.

The second largest school (School 2) had a population of 240 total students. The students involved in this study had homeroom teachers, but they attended classes that were departmentalized. Approximately 51% of students qualified for free and reduced lunch prices. Of the two teachers who participated in this study, one teacher had more than 25 years of experience and the other had 5 years of experience.

The smallest school (School 3) was a small neighborhood school with a total population of 138 students. The students involved in this study had one homeroom teacher and received instruction in a self-contained environment. This was a high needs school with many at-risk students. The free and reduced lunch price percentage was approximately 92%. The teacher of this class was a new teacher with no former classroom experience.

All of the sixth graders involved in this study received a Dell Vostro computer for their daily use during the school day. In addition each classroom was equipped with a Smartboard and Proxima projector for visual presentations. The laptops were docked in a charging station when teachers were not using the laptops as instructional tools. However, all students used the computer assigned to them throughout the school year as indicated by the number on the computer tag. The computers were issued to the students in mid-September and were returned to the technology department in mid-May. Students who qualified for receiving their laptop upon graduation were reissued the laptop to take home as personal property. The other laptops were returned to their original status and inventoried for the next year.

The funding for the laptop program was a joint venture that originated in 2008 between an educational organization in the community, the local government, and the school board in an effort to increase and sustain enrollment in the school district. The school system funded

approximately 1/2 of the yearly program, but the other 1/2 came combined from the other two entities. All sixth graders in the school district had daily use of the laptop within the school building. However, students who lived within the school district limits throughout their fourth, fifth, and sixth grade academic years received the laptop as personal property at the completion of the school year.

## Research Questions and Null Hypothesis

This quantitative research design study addressed the following research questions and accompanying null hypothesis to determine the impact of the implementation of a sixth grade laptop initiative:

Research Question 1

Is the mean score for sixth graders on the five dimensions of the One-to-One Laptop Program preintervention survey (School Subject Attitudes, Teaching and Learning Preferences, Computer Use Perceptions, Technology Skills, and Personal Attitudes and Behaviors) significantly different from 3 (the mid-point or neutral score on the scale) for the three schools participating in the initiative?

$Ho1_1$: The mean scores are not significantly different from 3 for Dimension 1 (School Subject Attitudes) for sixth graders on preintervention survey for the three participating schools.

$Ho1_2$: The mean scores are not significantly different from 3 for Dimension 2 (Teaching and Learning Preferences) for sixth graders on preintervention survey for the three participating schools.

$Ho1_3$: The mean scores are not significantly different from 3 for Dimension 3 (Computer Use Perceptions) for sixth graders on preintervention survey for the three participating schools.

$Ho1_4$: The mean scores are not significantly different from 3 for Dimension 4 (Technology Skills) for sixth graders on preintervention survey for the three participating schools.

$Ho1_5$: The mean scores are not significantly different from 3 for Dimension 5 (Personal Attitudes and Behaviors) for sixth graders on preintervention survey for the three participating schools.

Research Question 2

Is the mean score for sixth graders on the five dimensions of the One-to-One Laptop Program postintervention survey (School Subject Attitudes, Teaching and Learning Preferences, Computer Use Perceptions, Technology Skills, and Personal Attitudes and Behaviors) significantly different from 3 (the mid-point or neutral score on the scale) for the three schools participating in the initiative?

$Ho2_1$: The mean scores are not significantly different from 3 for Dimension 1 (School Subject Attitudes) for sixth graders on postintervention survey for the three participating schools.

$Ho2_2$: The mean scores are not significantly different from 3 for Dimension 2 (Teaching and Learning Preferences) for sixth graders on postintervention survey for the three participating schools.

$Ho2_3$: The mean scores are not significantly different from 3 for Dimension 3 (Computer Use Perceptions) for sixth graders on postintervention survey for the three participating schools.

$Ho2_4$: The mean scores are not significantly different from 3 for Dimension 4 (Technology Skills) for sixth graders on postintervention survey for the three participating schools.

$Ho2_5$: The mean scores are not significantly different from 3 for Dimension 5 (Personal Attitudes and Behaviors) for sixth graders on postintervention survey for the three participating schools.

A nonexperimental quantitative research design was chosen for this study. The entire population of sixth grade students in the school system were exposed to the same laptop program intervention treatment. Ninety preintervention surveys and 93 postintervention surveys were submitted. At School 1, 51 surveys were returned for both the pre- and postsurvey. At School 2, 25 surveys were submitted for the presurvey and 29 were submitted for the postsurvey. Fourteen surveys were returned at School 3 for the presurvey, and 13 were returned for the postsurvey. The pre and post means in each dimension of the survey as well as the means of both surveys were analyzed against a mean test value of 3.

## Instrumentation

The instrumentation was a survey developed by one of the administrators participating in the school district. Appropriate measures were taken by the school district to insure the reliability and validity in the development and administration of the survey. The preintervention and postintervention surveys were used exclusively for evaluation of the one-to-one laptop initiative. There were pretest (Appendix A) and posttest (Appendix B) forms that contained 36 items with a

Likert-type scale related to student attitudes about learning and technology skills. Each survey was divided into five dimensions (School Subject Attitudes, Teaching and Learning Preferences, Computer Use Perceptions, Technology Skills, and Personal Attitudes and Behaviors). The scale ranged from 1-Strongly Disagree (SD), 2- Disagree (D), 3-Not Sure/Not Applicable (N), 4-Agree, (A) and 5- Strongly Agree (SA). The school surveys were color coded so that differences between schools could be determined.

## Data Collection

The data for the study were collected by the school system with each student group during 1 academic year. All students were given the same instructions prior to completing the survey. These data were collected to assess the impact prior to and after laptop implementation on this select group of students' attitudes about school and their technological competencies. The data were separated by school. The Director of the school system, the School Board, and the Institutional Review Board at East Tennessee State University were contacted for permission to use the data derived from the survey.

The presurvey was administered in September, and the posttest survey was administered in May of the same school year. The homeroom teachers administered the surveys during regular classroom time. The surveys were color coded by school in the event that school based data needed to be analyzed. However, data received by the research did not contain any identifying information. The surveys were collected by the technology department.

## Data Analyses

These de-identified data were retrieved from the school system's Data Coach and Technology Department. Data from the Student One-to-One Laptop Program Preintervention and Postintervention Surveys were analyzed using a one sample t-test to compare the mean

student response to a test value of 3. A test value of 3 was chosen because it indicated the midpoint of the scale without being a degree of positive or negative. The means of each survey were compared with the test value of 3 to determine if the laptop intervention had a statistically significant positive or negative impact on student attitudes about school and their technological competencies. In addition the means on each of the five dimensions of the survey were compared to a test value of 3 to determine if the dimension score was significantly difference. The five dimensions were School Subject Attitudes, Teaching and Learning Preferences, Computer Use Perceptions, Technology Skills, and Personal Attitudes and Behaviors. Each of these means were compared against the test value of 3. The mean score of the pre- and postsurveys were analyzed by calculating the mean difference divided by the standard deviation to determine the effect size.

Data collected in this ex post facto study were analyzed through quantitative methods using IBM-SPSS and Microsoft Excel. The data sources that were analyzed were the student responses on the system's One-to-One Sixth Grade Initiative Pre- and Postintervention Surveys administered in September and May of the same school year. All research questions were analyzed at the .05 significance level.

## Chapter Summary

Chapter 3 contained the framework for the research study. The methodology and procedures used to complete this study were also outlined in Chapter 3. Included in this section were an introduction, the population, the research questions and null hypotheses, the instrumentation, data collection method, and data analyses.

# CHAPTER 4

# DATA ANALYSIS

This research was based on surveys given to sixth grade students across three schools in a school district in East Tennessee prior to and after a one-to-one laptop initiative. The surveys were developed by the administrative team and retained by the technology department. All preintervention and postintervention surveys were administered to the entire population of students in sixth grade at the three schools that included approximately 105 students. However, 90 student surveys were returned for the presurvey and 93 were returned for the postsurvey. Each survey was anonymous, and the survey administrator provided students with directions about omitting their names to protect identity and answering only questions that they felt comfortable answering. Table 1 displays the pre- and posttest means for each of the schools on the five dimensions of the survey. Table 2 displays the pre- and posttest survey means for males and females in the five dimensions of the survey.

Both the preintervention and postintervention surveys were developed with five dimensions: School Subject Attitudes, Teaching and Learning Preferences, Computer Use Perceptions, Technology Skills, and Personal Attitudes and Behaviors. The surveys were designed in a multiple choice format with a Likert-type scale of 1-Strongly Disagree (SD), 2-Disagree (D), 3-Not Sure/Not Applicable (N), 4-Agree, (A) and 5- Strongly Agree (SA). Each of the means of the five dimensions (pre and post) were compared using a one sample *t*-test with a midpoint of 3, which assumed a midpoint or neutral opinion.

Table 1

*Preintervention and Postintervention Means and Standards Deviations for the Three Participating Schools*

| School | Dimension | Preintervention M | Preintervention SD | Postintervention M | Postintervention SD |
|---|---|---|---|---|---|
| School 1 | School Subject Attitudes | 4.03 | .52 | 3.82 | .50 |
| School 2 | School Subject Attitudes | 4.00 | .46 | 4.19 | .51 |
| School 3 | School Subject Attitudes | 4.07 | .50 | 4.06 | .45 |
| School 1 | Teaching and Learning Preferences | 3.84 | .44 | 3.05 | .60 |
| School 2 | Teaching and Learning Preferences | 3.72 | .37 | 3.09 | .72 |
| School 3 | Teaching and Learning Preferences | 3.67 | .48 | 3.12 | .64 |
| School 1 | Computer Use Perceptions | 3.78 | .63 | 4.23 | .58 |
| School 2 | Computer Use Perceptions | 3.51 | .79 | 4.31 | .52 |
| School 3 | Computer Use Perceptions | 3.82 | .62 | 4.36 | .54 |
| School 1 | Technology Skills | 3.31 | .78 | 3.80 | .79 |
| School 2 | Technology Skills | 3.20 | .87 | 3.70 | .73 |
| School 3 | Technology Skills | 3.31 | .70 | 3.79 | .74 |
| School 1 | Personal Attitudes and Behaviors | 3.82 | .37 | 3.71 | .61 |
| School 2 | Personal Attitudes and Behaviors | 3.88 | .37 | 3.98 | .62 |
| School 3 | Personal Attitudes and Behaviors | 3.83 | .55 | 3.80 | .65 |

Table 2

*Preintervention and Postintervention Means and Standard Deviations by Gender*

| Gender | Dimension | Preintervention M | Preintervention SD | Postintervention M | Postintervention SD |
|---|---|---|---|---|---|
| Female | School Subject Attitudes | 4.01 | .52 | 3.98 | .74 |
| Male | School Subject Attitudes | 4.04 | .58 | 3.90 | .50 |
| Female | Teaching and Learning Preferences | 3.70 | .50 | 2.90 | .58 |
| Male | Teaching and Learning Preferences | 3.93 | .30 | 3.32 | .60 |
| Female | Computer Use Perceptions | 3.67 | .74 | 4.20 | .58 |
| Male | Computer Use Perceptions | 3.87 | .49 | 4.39 | .51 |
| Female | Technology Skills | 3.18 | .80 | 3.64 | .78 |
| Male | Technology Skills | 3.47 | .68 | 3.96 | .69 |
| Female | Personal Attitudes and Behaviors | 3.82 | .40 | 3.80 | .64 |
| Male | Personal Attitudes and Behaviors | 3.86 | .46 | 3.81 | .61 |

## Data Analysis

Research Question 1

Is the mean score for sixth graders on the five dimensions of the One-to-One Laptop Program preintervention survey (School Subject Attitudes, Teaching and Learning Preferences, Computer Use Perceptions, Technology Skills, and Personal Attitudes and Behaviors) significantly different from 3 (the mid-point or neutral score on the scale) for the three schools participating in the initiative?

$Ho1_1$: The mean scores are not significantly different from 3 for Dimension 1 (School Subject Attitudes) for sixth graders on the preintervention survey for the three participating schools.

A one-sample *t* test was conducted on the School Subject Attitudes dimension of the preintervention survey to evaluate whether the mean scores for sixth grade students were significantly different from 3, the mid-point or neutral score on the 5-point scale. The mean of 4.02 (SD = .54) was significantly different from 3, $t(89) = 17.99$, $p < .001$. Therefore $Ho1_1$ was rejected. The 95% confidence interval for the School Subject Attitudes dimension mean ranged from .91 to 1.14. The effect size *d* of 1.9 indicated a large effect. Figure 1 shows the distribution of School Subject Attitudes scores. The results support the conclusion that sixth grade students preintervention had a positive attitude toward their school subjects.

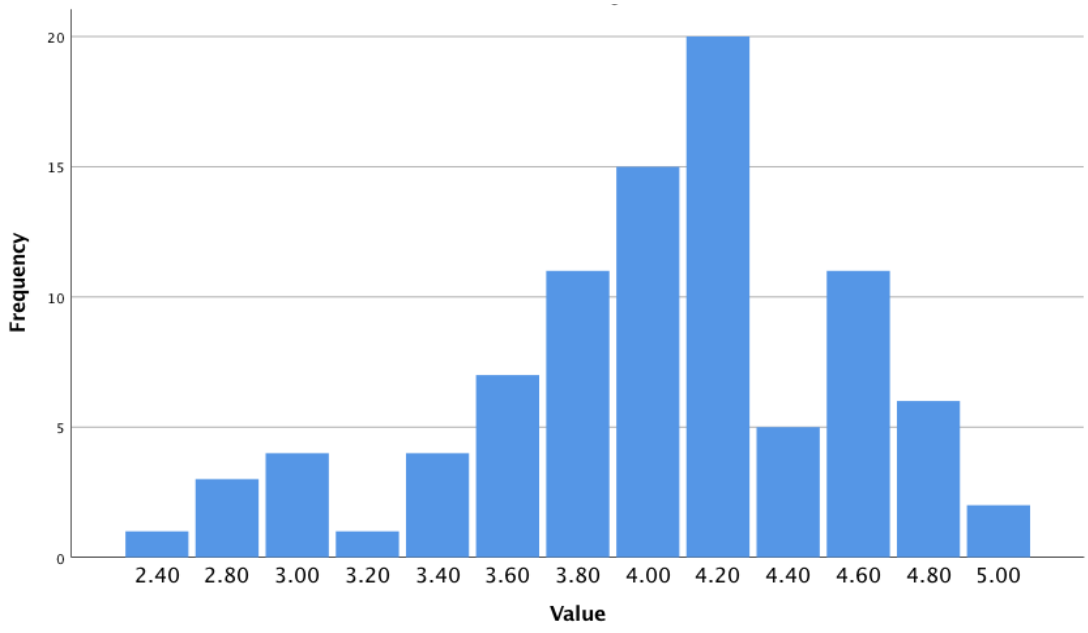


*Figure 1.* Preintervention School Subject Attitudes

$Ho1_2$: The mean scores are not significantly different from 3 for Dimension 2 (Teaching and Learning Preferences) for sixth graders on the preintervention survey for the three participating schools.

A one sample *t*-test was conducted on the Teaching and Learning Preferences dimension of the preintervention survey to evaluate whether the mean score for sixth grade students was statistically different from 3, the midpoint and neutral score on the 5-point scale. The mean was 3.79 (SD = .44) was significantly different from 3, $t(89) = 16.94$, $p < .001$. Therefore, $Ho1_2$ was rejected. The 95% confidence interval for Teaching and Learning Preferences dimension mean ranged from .70 to .88. The effect size *d* of 1.8 indicated a large effect. Figure 2 shows the distribution of Teaching and Learning Preferences scores. The results support the conclusion that sixth grade students preintervention had a positive attitude toward their teaching and learning preferences.

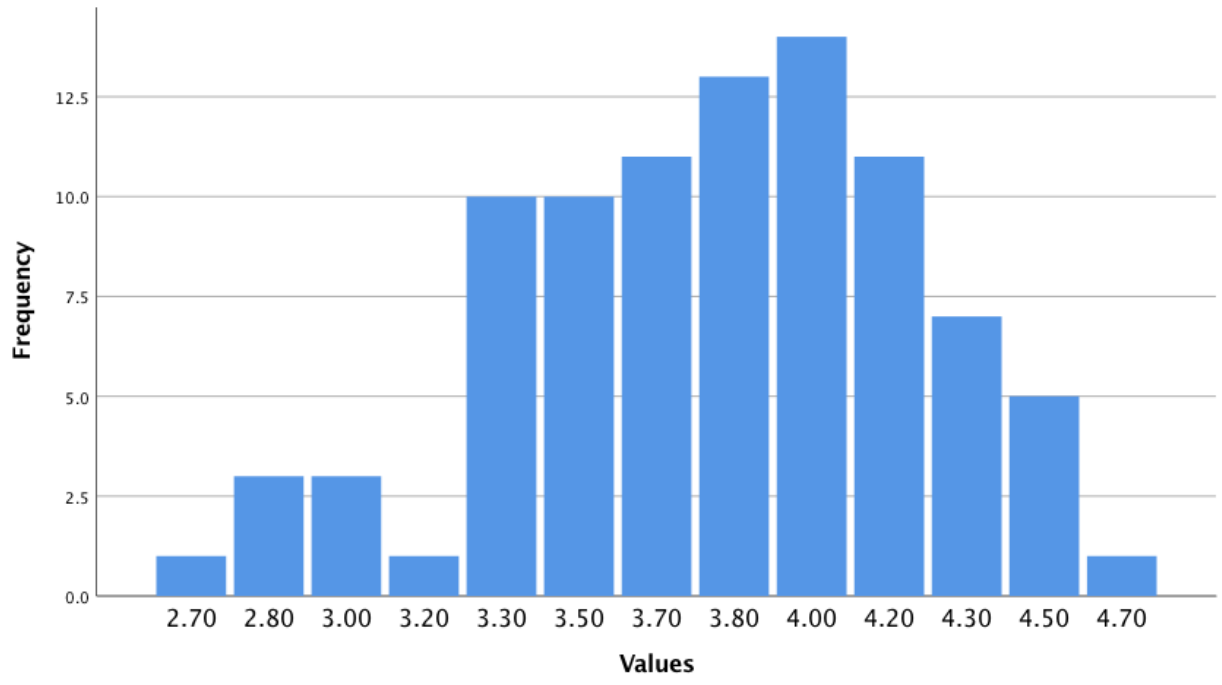


*Figure 2.* Preintervention Teaching and Learning Preferences

$Ho1_3$: The mean scores are not significantly different from 3 for Dimension 3 (Computer Use Perceptions) for sixth graders on the preintervention survey for the three participating schools.

A one sample *t*-test was conducted on the Preintervention Computer Use Perceptions dimension of the preintervention survey to evaluate whether the mean score for sixth grade students was statistically different from 3, the midpoint and neutral score on the 5-point scale. The mean was 3.75 (SD = .65) was significantly different from 3, $t(89) = 10.88$, $p < .001$. Therefore, $Ho1_3$ was rejected. The 95% confidence interval for Preintervention Computer Use Perceptions ranged from .61 to .89. The effect size *d* of 1.1 indicated a large effect. Figure 3 shows the distribution of Preintervention Computer Use Perception scores. The results support the conclusion that sixth grade students preintervention had a positive attitude toward their computer use perceptions.

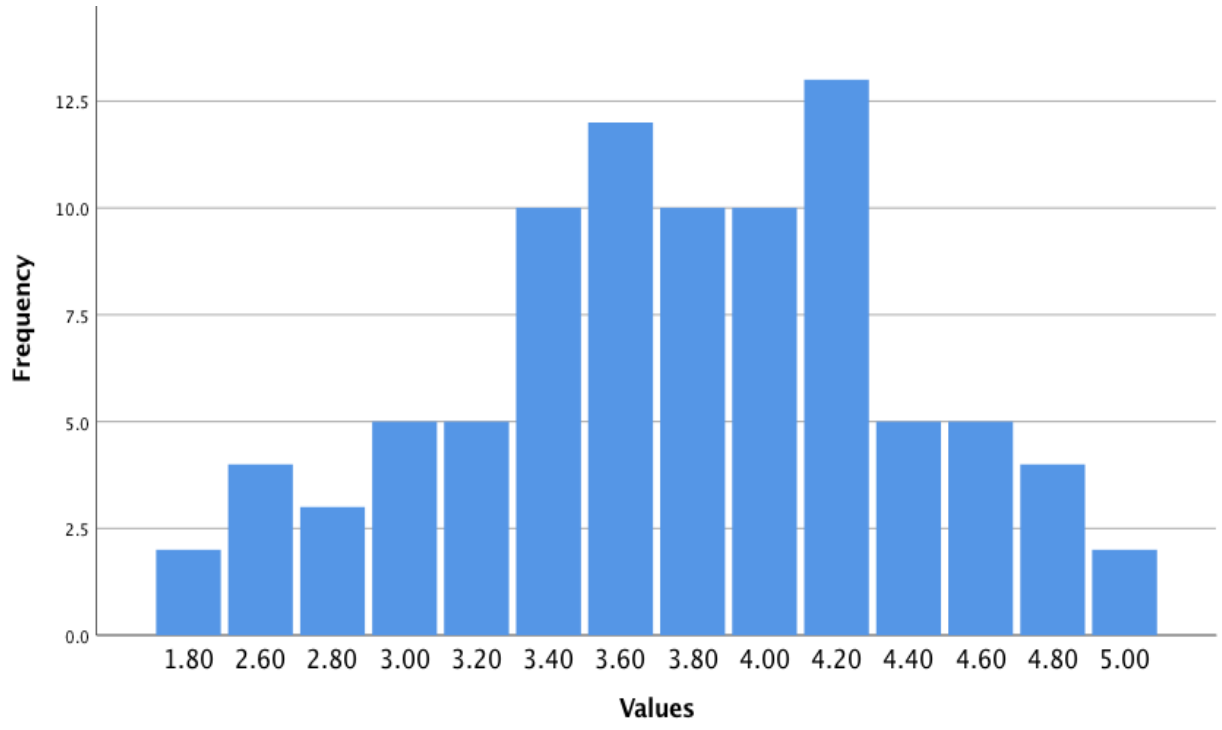


*Figure 3*. Preintervention Computer Use Perceptions

Ho1$_4$: The mean scores are not significantly different from 3 for Dimension 4 (Technology Skills) for sixth graders on the preintervention survey for the three participating schools.

A one sample *t*-test was conducted on the Technology Skills Self-Assessment dimension of the preintervention survey to evaluate whether the mean score of sixth grade students was statistically different from 3, the midpoint and neutral score on the 5-point scale. The mean 3.30 (SD = .76) was significantly different from 3, $t(89) = 3.65$, $p < .001$. Therefore, Ho1$_4$ was rejected. The 95% confidence interval for Technology Skills Self-Assessment Perceptions ranged from .13 to .45. The effect size *d* of .4 indicated a small effect. Figure 4 shows the distribution of Technology Skills Self-Assessment Perception scores. The results support the

conclusion that sixth grade students preintervention had a positive attitude toward their technology skills.

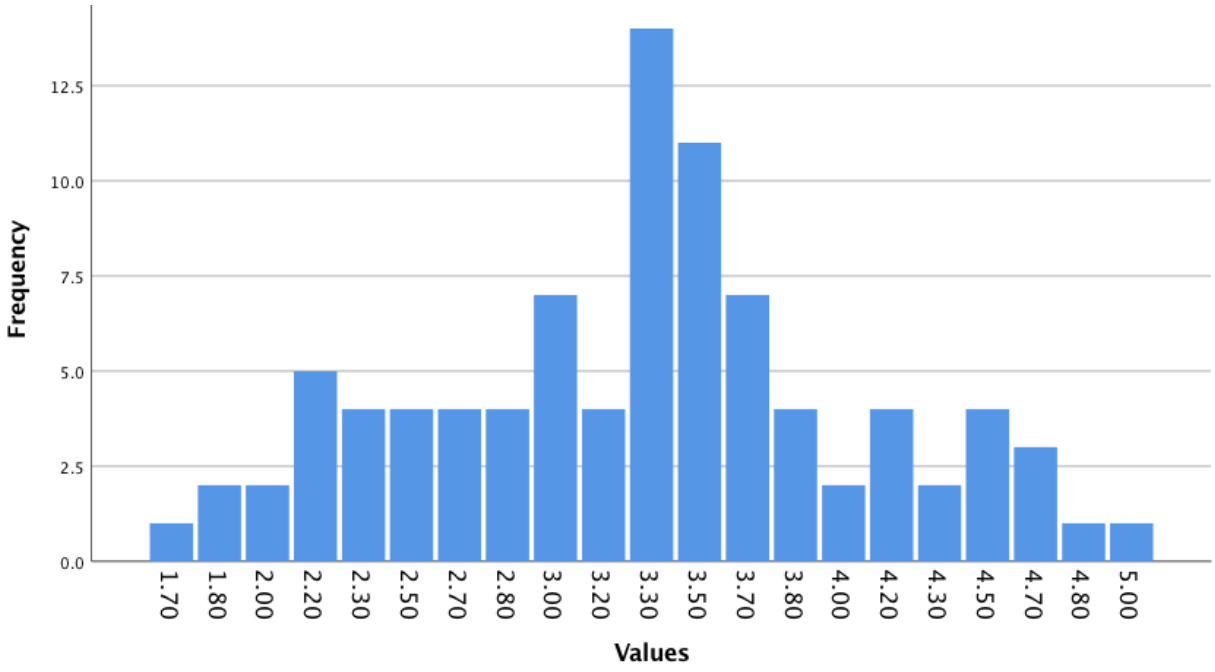


*Figure 4.* Preintervention Technology Skills

> $Ho1_5$: The mean scores are not significantly different from 3 for Dimension 5 (Personal Attitudes and Behaviors) for sixth graders on the preintervention survey for the three participating schools.

A one sample *t*-test was conducted on the Personal Attitudes and Behaviors dimension of the preintervention survey to evaluate whether the mean score of sixth graders was statistically different from 3, the midpoint and neutral score on a 5-point scale. The mean 3.83 (SD = .42) was significantly different from 3, $t(89) = 18.65$, $p < .001$. Therefore, $Ho1_5$ was rejected. The 95% confidence interval for Personal Attitudes and Behaviors dimension ranged from .75 to .92. The effect size *d* of 2.0 indicated a large effect. Figure 5 shows the distribution of Personal

Attitudes and Behaviors scores. The results support the conclusion that sixth grade students preintervention had a positive attitude toward their personal attitudes and behaviors.

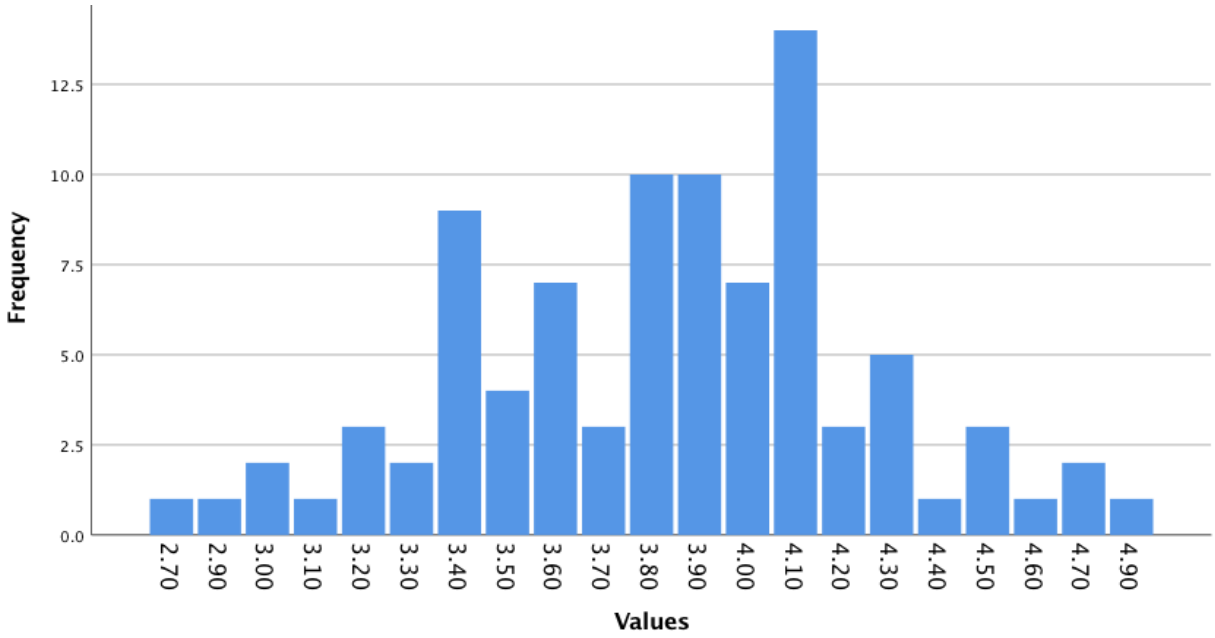


*Figure 5*. Preintervention Personal Attitudes and Behaviors

Research Question 2

Is the mean score for sixth graders on the five dimensions of the One-to-One Laptop Program postintervention survey (School Subject Attitudes, Teaching and Learning Preferences, Computer Use Perceptions, Technology Skills, and Personal Attitudes and Behaviors) significantly different from 3 (the mid-point or neutral score on the scale) for the three schools participating in the initiative?

$Ho2_1$: The mean scores are not significantly different from 3 for Dimension 1 (School Subject Attitudes) for sixth graders on the postintervention survey for the three participating schools.

A one sample *t*- test was conducted on the School Subject Attitudes dimension of the postintervention survey to evaluate whether the mean score of sixth graders was statistically significant from 3, the midpoint and neutral score on a 5-point scale. The mean 3.95(SD = .42) was significantly different from 3, $t(92) = 18.22$, $p < .001$. Therefore, $Ho2_1$ was rejected. The 95% confidence interval for School Subject Attitudes ranged from .85 to 1.05. The effect size *d* of 1.89 indicated a large effect. Figure 6 shows the distribution of School Subject Attitudes scores. The results indicate that sixth grade students postintervention had a positive attitude toward school subjects.

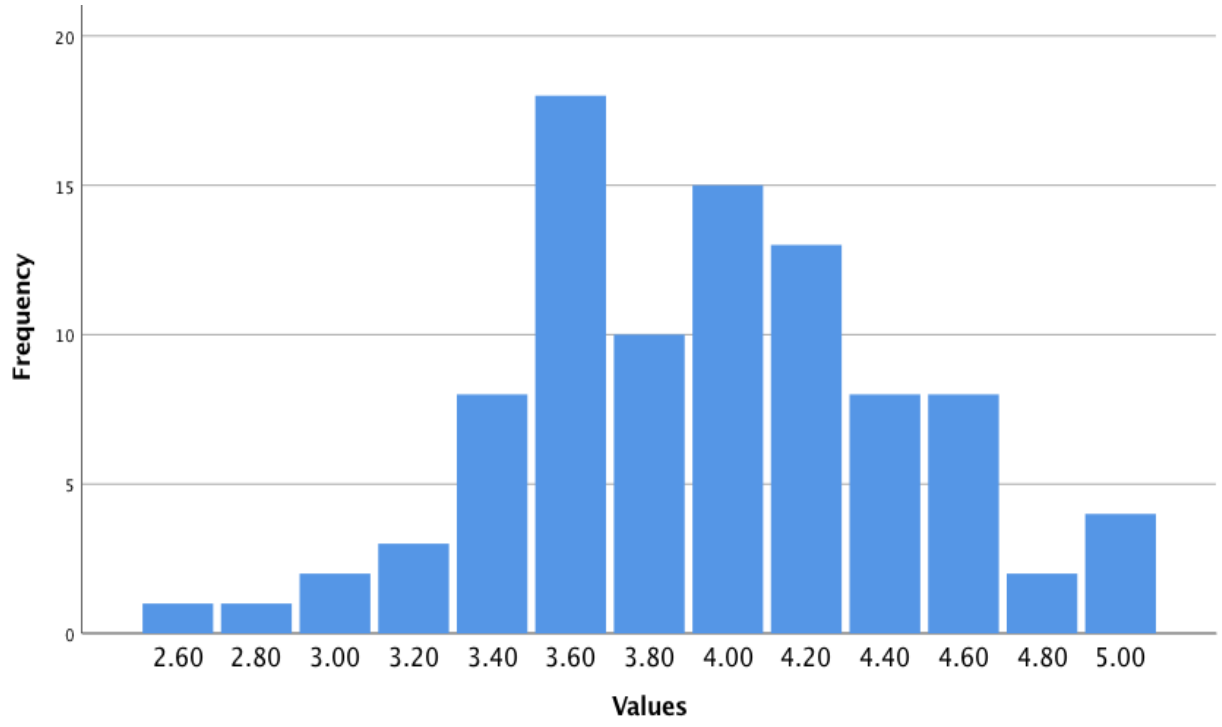


*Figure 6*. Postintervention School Subject Attitudes

$Ho2_2$: The mean scores are not significantly different from 3 for Dimension 2 (Teaching and Learning Preferences) for sixth graders on the postintervention survey for the three participating schools.

A one sample *t*- test was conducted on the Teaching and Learning dimension of the postintervention survey to evaluate whether the mean score of sixth graders was statistically significant from 3, the midpoint and neutral score on a 5-point scale. The mean 3.08 (SD = .63) was not significantly different from 3, $t(92) = 1.20$, $p = .235$. Therefore, $Ho2_2$ failed to be rejected. The 95% confidence interval for Teaching and Learning ranged from -.05 to .21. The effect size *d* of .1 indicated a small effect. Figure 7 shows the distribution of Teaching and Learning dimension scores. The results indicate that sixth grade students postintervention did not have favorable attitudes toward teaching and learning.

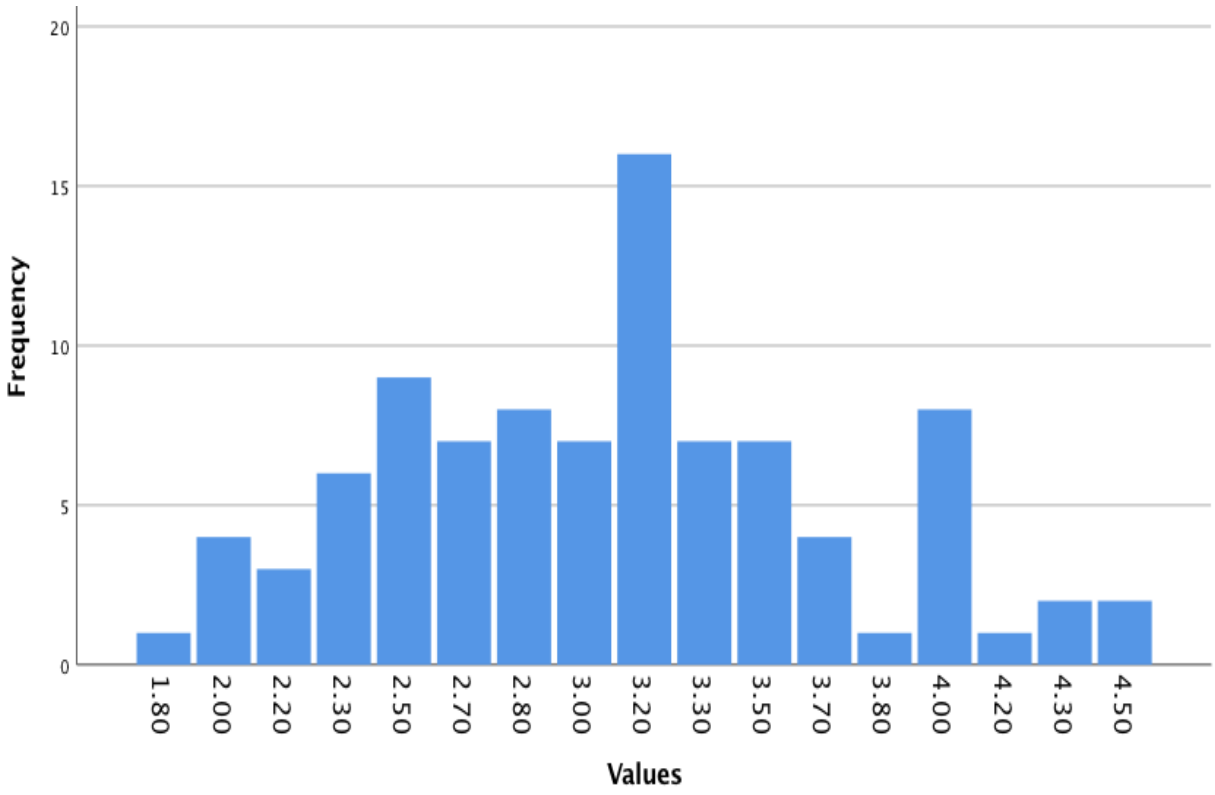


*Figure 7.* Postintervention Teaching and Learning Preferences

$Ho2_3$: The mean scores are not significantly different from 3 for Dimension 3 (Computer Use Perceptions) for sixth graders on the postintervention survey for the three participating schools.

A one sample *t*- test was conducted on the Computer Use Perceptions dimension of the postintervention survey to evaluate whether the mean score of sixth graders was statistically significant from 3, the midpoint and neutral score on a 5-point scale. The mean 4.28 (SD = .56) was significantly different than 3, $t(92) = 22.15$, $p < .001$. Therefore, $Ho2_3$ was rejected. The 95% confidence interval for School Subject Attitudes ranged from 1.17 to 1.40. The effect size *d* of 2.3 indicated a large effect. Figure 8 shows the distribution of Computer Use Perception

scores. The results indicate that sixth grade students postintervention had a positive attitude toward computer use.

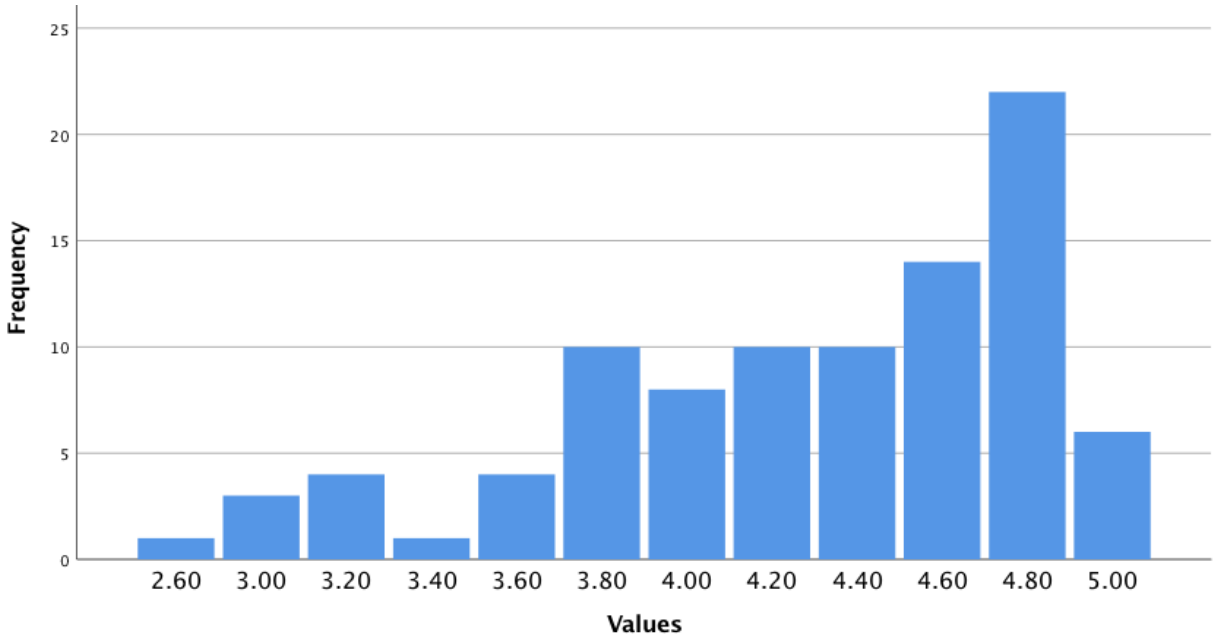


*Figure 8*. Postintervention Computer Use Perceptions

Ho2$_4$: The mean scores are not significantly different from 3 for Dimension 4 (Technology Skills) for sixth graders on the postintervention survey for the three participating schools.

A one sample *t*- test was conducted on the Technology Skills Self-Assessment dimension postintervention survey to evaluate whether the mean score of sixth graders was statistically significant from 3, the midpoint and neutral score on a 5-point scale. The mean 3.77 (SD = .76) was significantly different from 3, $t(92) = 9.83$, $p < .001$. Therefore, Ho2$_4$ was rejected. The 95% confidence interval for Technology Skills ranged from .62 to .93. The effect size *d* of 1.0 indicated a large effect. Figure 9 shows the distribution of Technology Skills Self-Assessment

scores. The results indicate that sixth grade students postintervention had a positive attitude toward technology skills.

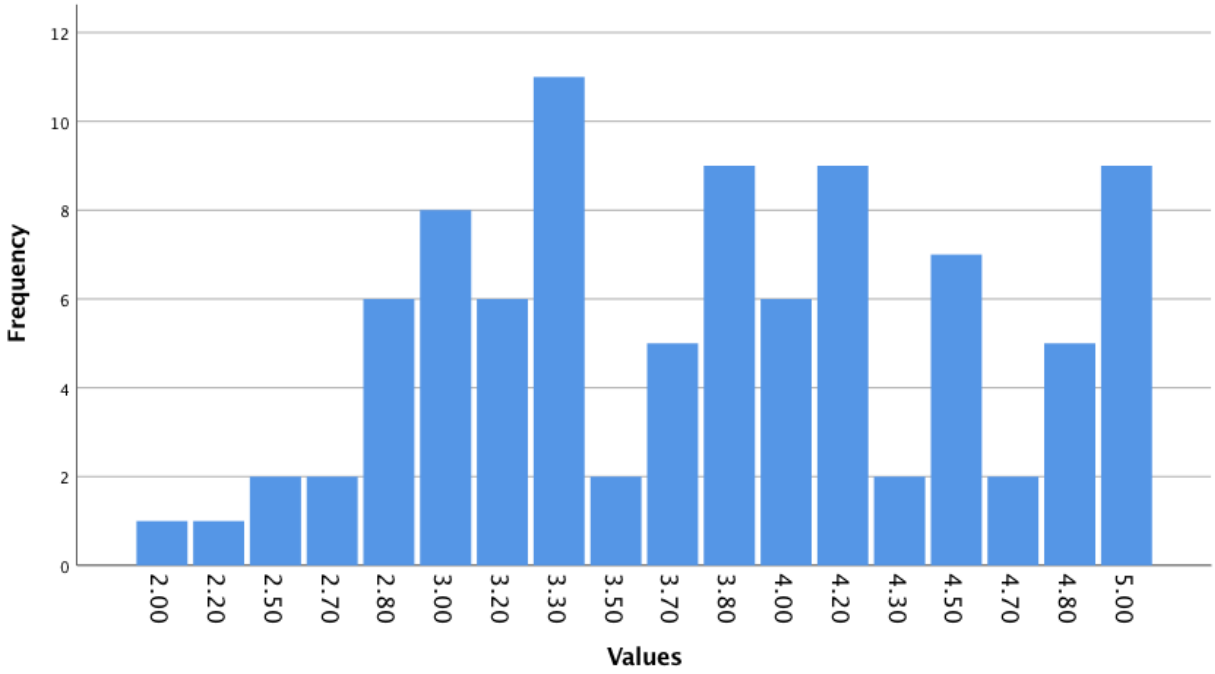


*Figure 9*: Postintervention Technology Skills

$Ho2_5$: The mean scores are not significantly different from 3 for Dimension 5 (Personal Attitudes and Behaviors) for sixth graders on the postintervention survey for the three participating schools.

A one sample *t*- test was conducted on the Personal Attitudes and Behaviors dimension postintervention survey to evaluate whether the mean score of sixth graders was statistically significant from 3, the midpoint and neutral score on a 5-point scale. The mean 3.78 (SD = .76) was significantly different from 3, $t(92) = 12.06$, $p < .001$. Therefore, $Ho2_5$ was rejected. The 95% confidence interval for School Subject Attitudes ranged from .65 to .91. The effect size *d* of

1.3 indicated a large effect. Figure 10 shows the distribution of Personal Attitudes and Behaviors dimension scores. The results indicate that sixth grade students postintervention had a positive attitude toward their personal attitudes and behaviors.

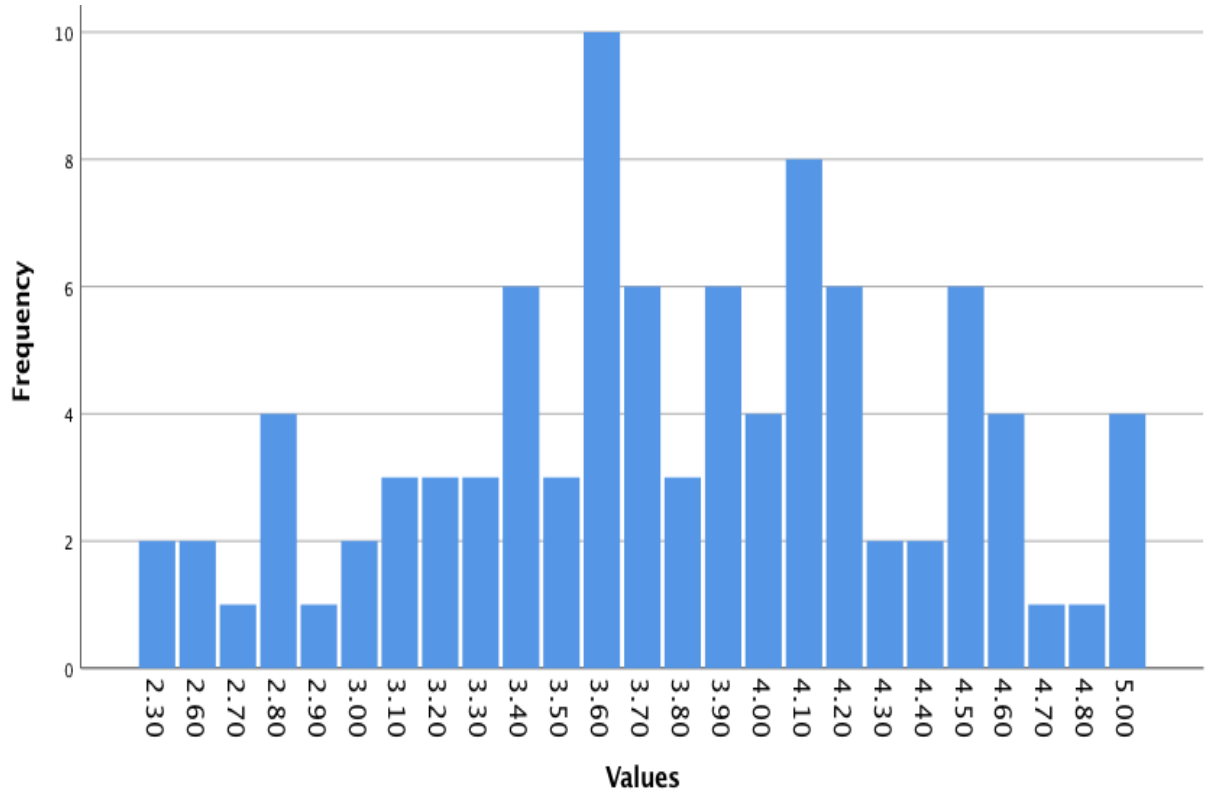


*Figure 10*: Postintervention Personal Attitudes and Behaviors

# CHAPTER 5

# SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

This quantitative research provided a look into the impact of a sixth grade laptop computer initiative on student attitudes about their learning and technological competencies. The following research conclusions and recommendations derive from data from the quantitative surveys given to sixth grade students prior to and after a one-to-one laptop initiative.

Both preintervention and postintervention surveys contained sections that provided information about the five research questions (five for the presurvey and five for the postsurvey) based on the following dimensions: Subject Attitudes, Teaching and Learning Preferences, Computer Use Perceptions, Technology Skills, and Personal Attitudes and Behaviors. Ninety preintervention surveys were administered prior to the intervention, and 93 postsurveys were submitted after the intervention program. These data were collected and processed using IBM-SPSS Version 25. Both pre- and postdata were compared to a midpoint of 3 using a one sample *t*-test on each of the five dimensions.

Dimension 1 School Subject Attitudes were statistically significant on the pre- and postintervention surveys, yet the overall mean score decreased from 4.02 to 3.95. The means at School 1 decreased from 4.03 on the preintervention survey to 3.82 on the postintervention survey. The number of survey participants was much greater at School 1, which had an impact on the total sample mean for all three schools. The mean score increased at School 2 by .19 and decreased at School 3 by .01.

The mean score for question 1 had an impact on the dimension of School Subject Attitudes. Question 1 related to students' enjoyment of their reading class. The preintervention survey mean for the question was 3.51 and the postintervention survey mean was 3.04. The student responses on this question could be attributed to how the technology was used in reading class. Students were often required to find text evidence for various types of writing and arrange it in digital organizers.

Dimension 2 Teaching and Learning Preferences were statistically significant on the preintervention survey with a mean of 3.79 but not on the postintervention survey with a mean of 3.08. The decrease in means was found across schools and gender. A decrease on the mean response was found on all six questions in the dimension.

Research questions 6 and 7 were related to student work preferences. Question 6 was an average of 3.0 on the preintervention survey and a 2.77 on the postsurvey and was related to student preferring to work individually on school tasks. Question 7 was based on student preference for working in cooperative groups. The preintervention survey mean was 4.34 and the postintervention survey mean was 3.86. Based on these responses, students decreased their preferences for working individually and in groups. Students may consider working on the laptop differently from working individually or with a group. Perhaps the question should have been posed if they preferred working on the laptop rather than doing their schoolwork through paper and pencil methods.

Research questions 8 and 9 focused on writing. Question 8 focused on student enjoyment of writing reports. The responses reflected a decrease in means of 1.8 on a 5-point scale.

Question 9 was based on student enjoyment of the revision process. There was a .9 decrease from preintervention survey to postintervention survey on this question.

The creation of posters, charts, and graphs by hand was the focus of Research Question 10. There was a dramatic decrease from the preintervention survey to the postintervention survey of .87. This could be attributed to students learning how to use Microsoft and Excel for creation of posters, charts, and graphs as their digital artifacts were printed and displayed outside the classroom.

Dimension 3 contained five questions related to Pre- and Postcomputer Use Perceptions. Both pre- and postintervention means were considered statistically significant on this domain at the .01 level. The mean of the preintervention survey was a 3.75, and the postintervention survey mean was a 4.28 reflecting an increase of .53 on a 5-point scale demonstrating that students gained confidence in computer use.

Each of the five questions' means within the postsurvey reflected increases in the mean response ranging from 0.3 to 0.7. Research questions 12 and 14 were related to typing quickly and accurately and being able to make digital presentations through Microsoft Power Point. Both of these questions showed increases of 0.7 points in mean responses. These responses support the idea that students felt more comfortable with technology. The other questions focused on locating information digitally, changing font and color, and being proficient at cutting and pasting into a document showed increases as well.

Dimension 4 contained six questions related to students assessing their technology skills. On both the pre- and posttechnology intervention surveys the Technology Skills Self-Assessment scores were statistically significant at the .01 level. The mean 3.30 on the

preintervention survey, whereas the postintervention survey mean was 3.77. However, on the preintervention survey this question was the only one where females scored greater than males on the assessment of their skills. Nevertheless, both genders reported increases in their skills of at least 0.4 on the postintervention survey.

After the laptop intervention it is clear that males reported stronger self-assessment skills and confidence with technology. All of the questions showed an increase from pre- to postassessment; however, two questions reflected greater increases. Research question 21 was based on how to transfer files to and from a flash drive with an increase of 1.0 from pre- to postsurvey, and question 22 asked about inputting data to create charts and graphs and reflected an increase of 0.7. The question of making videos and podcasts showed a modest increase of 0.05 indicating those higher level products was not a focus during the first year of the one-to-one laptop initiative.

The section for Dimension 5 contained 14 questions related to personal attitudes and behaviors. The mean was 3.83 on the preintervention survey and 3.78 on the postsurvey with both being statistically significant at the .01 level. Interestingly, the standard deviation was much greater on the postsurvey indicating that the data were much more spread out. The means of each dimension on the pre- and postintervention surveys are included in table 3.

Table 3

*Preintervention and Postintervention Means and Standard Deviations by Dimension*

| | Preintervention | | Postintervention | |
|---|---|---|---|---|
| Dimension | M | SD | M | SD |
| 1 | 4.02 | .54 | 3.95 | .42 |
| 2 | 3.79 | .44 | 3.08 | .63 |
| 3 | 3.75 | .65 | 4.28 | .56 |
| 4 | 3.30 | .76 | 3.77 | .76 |
| 5 | 3.83 | .42 | 3.78 | .76 |

In terms of personal attitudes and behaviors, School 2 was the only school of the three that reported an increase on the postintervention survey mean. The other schools reported a small decrease of up to 1.1 on the Dimension 5 Personal Attitudes and Behaviors mean score. Males and females decreased on Dimension 5 by less than 0.05 in this dimension. It is important to note that even though there were small decreases in the means, Dimension 5 had statistically significant high scores on the pre- and postintervention surveys.

Four questions on Dimension 5 Personal Attitudes and Behaviors need to be noted. Question 28 was related to behaviors of students in the classroom. On the overall dimension mean, students reported that students helped one another 0.3 more than on the presurvey. Oddly enough, the responses on question 34 about computer skills being important increased by 0.32, but question 32 reported a decrease of 0.22 on teachers teaching skills that were important for later in life.

In summation on all five dimensions of the preintervention survey, students reported statistically significant responses with 3 being the midpoint or neutral response. On the postintervention survey, four of the five dimensions reflected statistically significant mean responses on four of the five dimensions except Dimension 2 Teaching and Learning Preferences. Both questions on working individually or working in groups reflected decreases from pre- and postassessment. Without students showing an affinity for one type of work structure or other, leads the researcher to believe that students did not understand how using the laptop related to this question.

## Conclusions

The one-to-one laptop initiative researched in this study met the criteria for one-to-one classification according to Penuel (2006) and The Abell Foundation (2008). The environments in all three schools involved all students having their own computers and access to a wireless network, and the computers were used for educational purposes. Similar to the report from New South Wales (State of New South Wales, 2009, p. 3), the laptop programs had word processing, multimedia, and creation tools that were used for presentation, research, and assessment. Unlike other one-to-one initiatives, the students in this district were not permitted to take the laptops home.

The overall mean scores remained stable on Dimension 1 School Subject Attitudes from preintervention survey (4.07) to the postintervention survey (4.06). However, both scores were statistically significant on the one sample *t*-tests, and the attitudes were generally positive on both the preintervention and postintervention surveys. Holcomb (2009) described that it can take

from 5 to 8 years for the impact of an innovation to be discernible, so this supports the data that a major shift in attitudes had not occurred.

Dimension 2 Teaching and Learning Preferences was not statistically significant on the postintervention survey. The mean score on each of the six individual questions within the dimension was lower on the postintervention survey. Question 8 was related to writing reports, and student responses decreased by 1.84 from pre- to postintervention survey. Question 9 was focused on revising and editing work, and student responses decreased by 0.66 from pre- to postintervention survey. These questions were used to assess student enjoyment of the aforementioned activities prior to after the laptop intervention, but they did not measure writing proficiency and success based on technology. In Cullman, Alabama middle school students scored 92% proficient on the Alabama Direct Assessment of Writing (2009-2010), which was a steady increase of 18% over a span of 5 years (cullmancats.net). Research from Holcomb (2009) and Sauers and McLeod (2012) tout the success of laptop programs with student writing.

Dimension 3 Pre- and Postcomputer Use Perceptions were supported both in literature and in the research study. Warchauser and Grimes (2005) reported an increased use of student research in their study. According to Lowther et al., (2003) 95% of students reported confidence in internet research projects. In a survey 80% of the students preferred completing and editing their writing on the laptop (Barrios et al., 2004). More than 1/3 of parents cited research skills as the best part of the laptop initiative in their school (Lowther et al., 2003).

An improvement in self-reported technology skills (Dimension 4 Technology Skills Self Assessment) was found in this research study as well as in the professional literature. The Abell Foundation (2008) determined that students in one-to-one environments developed greater

proficiency using technology. Lei and Zhao (2008) concluded that student technology skills increased significantly as students worked on various tasks such as learning, communicating, and exploring. Dawson et al. (2008) attested that students exhibited improved keyboarding skills and overall computer literacy skills. This research study corroborated Lei and Zhao's findings that student immersion in a one-to-one program had statistically significant gains on a pre- and posttechnology skills survey.

Dimension 5 Personal Attitudes and Behaviors was statistically significant on both the preintervention and postintervention surveys. However, two specific questions showed significant increases from preintervention and postintervention and are supported by research. Question 30 was related to students helping one another with questions and increased by 0.30. Fairman (2004), Gunner (2007), and Mouza (2008) found that collaboration increased between students and barriers began to come down between students allowing for effective communication. In addition, an increase of .30 was found on postsurvey responses for question 34 related to the importance of computer skills. This is a positive finding considering that students reported improvements in their technology skills in Dimension 4.

## Recommendations for Practice

Much of the research was consistent with the survey results, but there are areas that could be improved upon based on research literature and student responses. The recommendations for practice are included in this section.

If implementing a new one-to-one laptop initiative, the researcher suggests that teachers spend at least 1 year with the technology prior to student implementation. The professional development prior to implementation would be differentiated for the teachers and would focus

on exploratory ways to integrate technology into meeting the objectives of standards content. Also, time for collaboration would be advantageous in building teacher skills and improving student lessons. Hiring a technology coach would be an important aspect as teachers could use the coach to develop lessons and research current technologies and their results with students.

Even though students reported that their technology skills improved, their responses on the writing and revising questions were not as strong as the other questions. The researcher considers that this could be related to lack of keyboarding skills rather than writing. This was the district's first year with a one-to-one implementation, so the students had not had a significant amount of keyboarding practice. Building keyboarding skills at a younger age should help support one-to-one initiatives especially in the area of writing.

Taking one-to-one usage to the next level would be a recommendation as students understand basic computer keyboarding and concepts. Using simulations and virtual type tours could bring learning to life and could increase their motivation. Making podcasts and videos would benefit students by sharing their knowledge through creation. Even though students reported being able to make presentations, exploring other types of presentation tools would be another way to for students to demonstrate their learning.

Using Google Apps for Education, students could work on projects collaboratively at school and home. Students could log into their Google accounts on multiple applications within the platform. Using Google Docs students could add in text within group reports and proofread and revise one another's work. In Google Sheets students could enter data and create graphs. Google Slides could be used for presentations as students could work simultaneously on the

same slide show. Using Google Apps for Education would be a tremendous benefit for building student collaboration.

## Recommendations for Further Research

As a future recommendation the researcher recommends studying other one-to-one programs in different districts as well as other grade levels. This study was confined to a small district with sixth grade students. More information could be gleaned from studying students in other locations and grade levels. This research was completed after the initial year of a one-to-one laptop implementation. Further follow-up research for students in subsequent years would rule out issues related to first year implementation.

Other future recommendations would include expanding the research to see if student attitudes about technology would match academic performance. Researching the impact of one-to-one programs on grades, homework completion, and test scores would also be beneficial. Another important recommendation would be researching the impact of one-to-one program implementation on student behavior.

In addition, qualitative data would have been extremely beneficial for further research. This would have allowed the research to dig deeper into specific questions as a follow up, so a mixed methods study would have provided much more insight. For example, the researcher would have benefitted from using some clarifying questions especially on some questions that were answered in a manner that the researcher did not predict.

Most importantly, the timing of the postintervention survey had an impact on the results. Students were surveyed after their laptops were taken up for processing at the end of the school

year in May. Students were preparing to go to Sixth Grade Camp, and this is their last chronological year in elementary school. In retrospect, students were ready to graduate from sixth grade and elementary school and if this survey were to be administered to another group the postsurvey should be administered at the end of March.

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APPENDIX A

One to One Laptop Program Pre Survey

Please take a few minutes to fill out the survey below by circling one of the answer choices. *Answer only questions that you feel comfortable answering.* The purpose of this survey is to gather information in an effort to assess the effectiveness of the one to one laptop program. Participation in this survey is voluntary and completely confidential. Thanks in advance for your consideration.

**SA-Strongly Agree A-Agree N-Not sure/Not Applicable D- Disagree SD-Strongly Disagree**

| **School Subject Attitudes** | | | | | |
|---|---|---|---|---|---|
| 1. I enjoy learning and practicing reading skills. | SA | A | N | D | SD |
| 2. I enjoy learning and practicing math skills. | SA | A | N | D | SD |
| 3. I enjoy learning and practicing science skills. | SA | A | N | D | SD |
| 4. I enjoy learning and practicing social studies skills. | SA | A | N | D | SD |
| 5. Overall, I enjoy learning and practicing new skills at school. | SA | A | N | D | SD |
| **Teaching and Learning Preferences Through Traditional Methods** | | | | | |
| 6. I prefer to work individually on school tasks. | SA | A | N | D | SD |
| 7. I prefer to work in cooperative groups on school tasks. | SA | A | N | D | SD |
| 8. I enjoy writing reports. | SA | A | N | D | SD |
| 9. I enjoy revising and editing my work. | SA | A | N | D | SD |
| `10. I enjoy creating posters, graphs, and charts by hand. | SA | A | N | D | SD |
| 11. I enjoy sharing what I have learned. | SA | A | N | D | SD |
| **Pre-Distribution Computer Use Perceptions** | SA | A | N | D | SD |
| 12. I am able to type quickly and accurately. | SA | A | N | D | SD |
| 13. I am able to locate information easily for reports and projects. | SA | A | N | D | SD |
| 14. I am able to make presentations for class on a computer (power points). | SA | A | N | D | SD |
| 16. I am able to change the font, color, and text on documents. | SA | A | N | D | SD |
| 17. I am able to copy, cut, and paste objects and pictures. | SA | A | N | D | SD |

*Continued on Back

One to One Laptop Program Pre Survey

| **Technology Skills Self-Assessment** | | | | | |
|---|---|---|---|---|---|
| 18. I am able to email others and respond to their emails. | SA | A | N | D | SD |
| 19. I am able to attach documents to emails. | SA | A | N | D | SD |
| 20. I am able to upload/download pictures and videos. | SA | A | N | D | SD |
| 21. I know how to make videos and podcasts. | SA | A | N | D | SD |
| 22. I know how to transfer files to and from a flash drive. | SA | A | N | D | SD |
| 23. I know how to input data and create charts and graphs. | SA | A | N | D | SD |
| **Personal Attitudes and Behaviors** | | | | | |
| 24. I am excited about coming to school. | SA | A | N | D | SD |
| 25. I am motivated to complete in class assignments. | SA | A | N | D | SD |
| 26. I enjoy the lessons that my teachers develop. | SA | A | N | D | SD |
| 27. I am actively involved in the classroom discussions and activities. | SA | A | N | D | SD |
| 28. I am interested in school lessons. | SA | A | N | D | SD |
| 28. Students in my class behave. | SA | A | N | D | SD |
| 29. My teachers are positive and encouraging. | SA | A | N | D | SD |
| 30. Students often help one another with questions. | SA | A | N | D | SD |
| 31. I feel that school lessons are preparing me for the future. | SA | A | N | D | SD |
| 32. My teachers are teaching me skills that I will use later in life. | SA | A | N | D | SD |
| 33. I am interested in careers that involve using computers. | SA | A | N | D | SD |
| 34. I believe that computer skills are important. | SA | A | N | D | SD |
| 35. Most of my schoolwork involves completing worksheets or writing the answers by hand. | SA | A | N | D | SD |
| 36. I think the laptop program will change the way that I feel about school. | SA | A | N | D | SD |

Please circle the correct response below.

Gender Male Female

School 1 2 3

APPENDIX B

One to One Laptop Program Post Survey

Please take a few minutes to fill out the survey below by circling one of the answer choices. *Answer only questions that you feel comfortable answering.* The purpose of this survey is to gather information in an effort to assess the effectiveness of the one to one laptop program. Participation in this survey is voluntary and completely confidential. Thanks in advance for your consideration.

**SA-Strongly Agree A-Agree N-Not sure/Not Applicable D- Disagree SD-Strongly Disagree**

| **School Subject Attitudes** | | | | | |
|---|---|---|---|---|---|
| 1. I enjoy learning and practicing reading skills. | SA | A | N | D | SD |
| 2. I enjoy learning and practicing math skills. | SA | A | N | D | SD |
| 3. I enjoy learning and practicing science skills. | SA | A | N | D | SD |
| 4. I enjoy learning and practicing social studies skills. | SA | A | N | D | SD |
| 5. Overall, I enjoy learning and practicing new skills at school. | SA | A | N | D | SD |
| **Teaching and Learning Preferences Through Traditional Methods** | | | | | |
| 6. I prefer to work individually on school tasks. | SA | A | N | D | SD |
| 7. I prefer to work in cooperative groups on school tasks. | SA | A | N | D | SD |
| 8. I enjoy writing reports. | SA | A | N | D | SD |
| 9. I enjoy revising and editing my work. | SA | A | N | D | SD |
| `10. I enjoy creating posters, graphs, and charts by hand. | SA | A | N | D | SD |
| 11. I enjoy sharing what I have learned. | SA | A | N | D | SD |
| **Post-Distribution Computer Use Perceptions** | SA | A | N | D | SD |
| 12. I am able to type quickly and accurately. | SA | A | N | D | SD |
| 13. I am able to locate information easily for reports and projects. | SA | A | N | D | SD |
| 14. I am able to make presentations for class on a computer (power points). | SA | A | N | D | SD |
| 16. I am able to change the font, color, and text on documents. | SA | A | N | D | SD |
| 17. I am able to copy, cut, and paste objects and pictures. | SA | A | N | D | SD |

*Continued on Back

One to One Laptop Program Post Survey

| **Technology Skills Self-Assessment** | | | | | |
|---|---|---|---|---|---|
| 18. I am able to email others and respond to their emails. | SA | A | N | D | SD |
| 19. I am able to attach documents to emails. | SA | A | N | D | SD |
| 20. I am able to upload/download pictures and videos. | SA | A | N | D | SD |
| 21. I know how to make videos and podcasts. | SA | A | N | D | SD |
| 22. I know how to transfer files to and from a flash drive. | SA | A | N | D | SD |
| 23. I know how to input data and create charts and graphs. | SA | A | N | D | SD |
| **Personal Attitudes and Behaviors** | | | | | |
| 24. I am excited about coming to school. | SA | A | N | D | SD |
| 25. I am motivated to complete in class assignments. | SA | A | N | D | SD |
| 26. I enjoy the lessons that my teachers develop. | SA | A | N | D | SD |
| 27. I am actively involved in the classroom discussions and activities. | SA | A | N | D | SD |
| 28. I am interested in school lessons. | SA | A | N | D | SD |
| 28. Students in my class behave. | SA | A | N | D | SD |
| 29. My teachers are positive and encouraging. | SA | A | N | D | SD |
| 30. Students often help one another with questions. | SA | A | N | D | SD |
| 31. I feel that school lessons are preparing me for the future. | SA | A | N | D | SD |
| 32. My teachers are teaching me skills that I will use later in life. | SA | A | N | D | SD |
| 33. I am interested in careers that involve using computers. | SA | A | N | D | SD |
| 34. I believe that computer skills are important. | SA | A | N | D | SD |
| 35. Most of my schoolwork involves completing worksheets or writing the answers by hand. | SA | A | N | D | SD |
| 36. I think the laptop program has changed the way that I feel about school. | SA | A | N | D | SD |

Please circle the correct response below.

Gender Male Female

School 1 2 3

# VITA
## JAMIE BYRD JORDAN

| | |
|---|---|
| Education: | Ed.D. Educational Leadership, East Tennessee State University, Johnson City, Tennessee 2018<br>Ed.S. Education, University of Tennessee, Knoxville, Tennessee 2007<br>M.A. Education, University of Tennessee, Knoxville, Tennessee 1999<br>B.A. Psychology, University of Tennessee, Knoxville, Tennessee 1998<br>Campbell County Schools, Jacksboro, Tennessee |
| Professional Experience: | Assistant Director of Schools, Clinton City Schools; Clinton, Tennessee, 2017 – Current<br>Supervisor of Student Health, Interventions, and Testing, Clinton City Schools; Clinton, Tennessee, 2014 – 2017<br>Principal, Clinton Elementary School; Clinton, Tennessee, 2007 – 2014<br>Teacher, North Clinton Elementary School; Clinton, Tennessee, 1999 – 2007 |
| Honors and Awards: | 2013 Principal of the Year<br>Clinton Elementary School, Clinton City Schools<br>Otho Brown Scholarship, University of Tennessee, Knoxville, 2005-2007<br>2003 Teacher of the Year<br>North Clinton Elementary, Clinton City Schools |