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Use of Technology and Perceived Level of Engagement with 1:1 Technology

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Use of Technology and Perceived Level of Engagement with 1:1 Technology

By
William Blake Tucker

A Dissertation Submitted to the
Gardner-Webb University School of Education
in Partial Fulfillment of the Requirements
for the Degree of Doctor of Education

Gardner-Webb University
2017

Approval Page

This dissertation was submitted by William Blake Tucker under the direction of the persons listed below. It was submitted to the Gardner-Webb University School of Education and approved in partial fulfillment of the requirements for the degree of Doctor of Education at Gardner-Webb University.

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Abstract

Student Use of Technology and Perceived Level of Engagement with 1:1 Technology Use. Tucker, William Blake, 2017. Dissertation, Gardner-Webb University, Middle Schools/1:1 Initiatives/Low Wealth Districts/Student Achievement and Engagement

This quantitative dissertation was designed to describe to the policymakers and stakeholders of School District Z the frequency of use of the 1:1 technology, the frequency of use of other technological devices by teachers and students, and the importance of 1:1 technology to student learning. District Z provided Chromebooks to each student in Grades 6, 7, and 8 during the 2014-2015 school year with the goal of harnessing the power of technology to engage students and ultimately to improve student achievement.

The researcher developed a survey instrument to capture data from approximately 1,100 students 1 year after implementation of the 1:1 Technology Initiative. The survey was administered to participating students through SurveyMonkey. No personally identifiable information was collected.

An analysis of the data revealed that students self-reported daily use of computers and the majority of the students believed that access to computers was important to learning. When using computers, students used descriptions such as hardworking, interested, and engaged. These data suggested that the use of 1:1 technology can be a precursor to more student engagement and enhanced student achievement.

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Chapter 1: Introduction

Is the impact of technology on student achievement and engagement positive or negative? Stakeholders throughout the nation ponder this question as they seek to ensure that student achievement matches educational expectations from parents, teachers, and administrators on all levels. School districts are scrambling to ensure that students have the technological skills they need to manipulate high-stakes tests that often contain sophisticated question types such as drag-and-drop and text select. The cost for technology is enormous, and some stakeholders do not see the cost as a long-term investment in human capital. Some low-wealth school systems that cannot afford sufficient technology face the dilemma of equal access for students and teachers. If students in low-wealth districts cannot or do not use technology as frequently and in similar ways as students in more affluent districts, they may be at a distinct disadvantage in the 21st century. District personnel and community stakeholders are weighing the benefits of technology initiatives against the enormous budgetary investment necessary to obtain devices and keep the technology up to date.

A recent trend in education is providing 1:1 technology. While 1:1 technology initiatives ensure that each student has access to a device, what may be equally as important is ensuring that teachers and students are using these devices consistently and effectively to enhance learning. Lei and Zaho (2008) quoted McFarlane (1997): "Computer use alone without clear objectives and well-designed tasks is of little intrinsic value" (p. 145). This question of the *value-added* by technology concerns stakeholders who seek to provide the best learning opportunities for students.

Many American school systems are questioning the practicability of continuously procuring laptops, tablets, or other technological devices for students and teachers

without definitive answers to several questions. How often must students use the technology for it to make a difference in achievement? Will students be actively engaged in educational activities when using the devices? Do students feel the devices are important to learning? These questions are relevant as school districts, large and small, weigh the benefits of the huge investment necessary to keep up with technological advances and provide devices for students and teachers.

In addition to previously purchased technology, District Z, the school system designated for this study, introduced a 1:1 technology initiative in the 2014-2015 school year. According to *1:1 Computing, a Guidebook to Help You Make the Right Decisions*, 1:1 technology can be defined as "an environment in which students use computing devices such as wireless laptops or tablet PC computers in order to learn anytime and anywhere" (Microsoft, 2005, para. 3). For education purposes, 1:1 means that the school provides each student with a laptop or other device that the student can take home, thus giving students access to technology both during the school day and at home (McLeod & Sauers, 2012). Prior to this writing, no substantive evaluation system was in place to assess the frequency of use of technology in District Z, nor were there means to determine if students felt the technological devices were important to their learning.

In addition to testing and technology, today's educators must determine how best to engage the students of the digital age. According to Marks (2000), "student engagement declines as students move through upper elementary grades to middle school and further into high school" (p. 156). Once students enter high school, an estimated 40% to 60% of them reportedly are disengaged (Marks, 2000). Stakeholders both for and against 1:1 technology and other sources of technology concur that student engagement yields student achievement, yet student engagement looks different for today's students

who use technology at a rate and in a manner never before seen. According to research conducted by Madden, Lenhart, Duggan, Cortesi, and Gasser (2013) with Harvard's Pew Internet Project, 95% of adolescents are online and use numerous devices including laptops, tablets, and smartphones. Educators want to know how to harness the power of technology to motivate the digital-age student to peak achievement. Conversely, educators must consider the risks of off-task behaviors on the part of students who are using devices for everything but learning. Thus, the age-old question emerges front and center: Do the benefits of regularly infusing technology into instructional plans outweigh the risks?

Technology is here to stay; and to determine its impact on education achievement, teachers and students must integrate technological devices into the classroom consistently and effectively.

> Technology integration is the use of technology resources – computers, mobile devices like smartphones and tablets, digital cameras, social media platforms and networks, software applications, the Internet, etc. – in daily classroom practices, and in the management of a school. Successful technology integration is achieved when the use of technology is (1) Routine and transparent, (2) Accessible and readily available for the task at hand, (3) Supporting the curricular goals, and helping the students to effectively reach their goals. (Edutopia, 2007, para. 1)

Because many of today's students in low-wealth communities are not "tech savvy," their teachers must be comfortable and proficient in the use of technological devices and impart that knowledge to the students. Teachers must teach certain basic skills that students can apply to many different technology tools. One myth of the digital divide is that all young people know how to use digital devices. Just as low-wealth districts cannot

afford to fully fund the schools, many who live in those districts or counties usually cannot afford to purchase technology devices.

Statement of the Problem and Purpose of the Study

Technology is an integral part of today's society; thus, educators must employ the influence of technology in helping students become critical thinkers, communicators, and collaborators. Given the stress that high-stakes testing imposes on our current educational system, many schools are desperate to improve the academic scores of students who must not only be proficient in core areas such as language arts, math, social studies, and science but also must be prepared to be productive citizens in a globally connected 21st century economy. Toward that end, school systems throughout the country are spending millions of dollars to purchase technological devices. Politicians and stakeholders, including those in District Z, deserve to know the frequency of use and the benefits of such colossal spending, yet determining the returns on such investments is impossible if no system exists to capture the data necessary to communicate the benefits.

District Z, like many low wealth school districts in the United States, operates on a meager budget. Embarking on a 1:1 technology initiative was a major budgetary commitment. At this writing, no system was in place to evaluate and describe the benefits of the investment. Politicians, policymakers, and other stakeholders who expect efficient and effective spending of district dollars deserved to know if the huge technology expenditures were producing the desired results; therefore, this study was appropriate and necessary for the stakeholders of District Z. This quantitative study was designed to clarify and describe to the policymakers and stakeholders of School District Z how frequently students use the 1:1 technology; how frequently teachers and students

use technological devices in general; and finally, whether the district's middle school students felt that access to and use of the 1:1 technology was important to their learning.

Research Questions

The following three questions guided this research study.

1. How frequently do middle school students in District Z use 1:1 technology?
2. Do the middle school students in District Z believe that technology access is important to their learning?
3. How frequently do middle school teachers and students in District Z use other technological devices?

Professional Significance of Study

The 1:1 initiative was central to this study. Current research is limited in providing a connection between 1:1 technological devices, instructional attentiveness, and student success (Silvernail & Lane, 2004). Nonetheless, this study's results may illuminate the educational value of student access to 1:1 technology. Educators can ill afford to leave the importance of technology use to conjecture. To sustain funding for future technology, decision makers must have significant and convincing data. In the case of District Z, convincing data must prove that the frequency of use was substantial and that the students believed that the technology was important to learning.

Research conducted by the Stanford Center for Opportunity Policy in Education suggested that access to 1:1 technology can be transformational for at-risk students (Darling-Hammond, Zielezinski, & Godman, 2014). Darling-Hammond et al. (2014) provided numerous examples that indicate the positive affect 1:1 devices have in terms of engagement and achievement for at-risk students:

> Significant gains in achievement and engagement can occur for underserved students in learning environments characterized by computer use that engages students in interactive learning that offers multiple representations of ideas and real-time digital feedback, as well as opportunities to apply learning as they create content. (p. 145)

While the aforementioned research demonstrates promise for advocates of 1:1 devices, is it enough to convince taxpayers to invest significant money into the devices with no proof that the investment yields suitable returns? In some school districts throughout the nation, the taxpayers were not convinced. For example, constituents in the Kyrene School District in Arizona narrowly voted against extending a $33 million dollar technology initiative instituted in 2005 (Richtel, 2011). Why? They did not see the returns they expected on the investment in 1:1 devices and were dismayed by the cuts to other areas that resulted from the technology purchases.

The big business of high-stakes testing in education still remains at the forefront of the minds of public school administrators, if not those of taxpayers. Accordingly, the digital age has resulted in more cost-effective digital assessments that yield data more quickly. These evaluations pose a significant problem for impoverished school districts that lack the funding to buy the technology necessary to support these assessments, thus creating a digital divide between low wealth and more affluent school districts. Is this lack of funding fostering even more of an achievement gap? At the federal level, it appears that President Obama and his cabinet understand the importance of technology integration in school systems. The Obama administration's ConnectEd Initiative was designed to redirect $2 billion in federal funding to put high-speed broadband in all U.S. schools by 2017 (Garland, 2014). Schools, however, must spend money for devices to

utilize this perk. Today, the federal government provides only about 14% of the money for school districts from elementary through high school; more than half of the funding comes from local sources, especially property taxes (Porter, 2013).

This is where the digital divide deepens. The nationwide average per pupil spending is $10,608 (Frohlich, 2014); however, the gap between the states spending the most and the least is significant. New York, for example, spends over $19,000 per pupil on average, whereas North Carolina, which is toward the bottom of the list, spends $8,200 per pupil on average (Frohlich, 2014). This statistic is especially distressing for rural school districts in eastern North Carolina where income from property taxes is significantly lower than that in other counties in the state and nation. According to the 2014 National Report Card by the Education Law Center, in the five most regressive states (North Carolina is a regressive state), the poorest districts receive at least 20% less funding than wealthier districts (Baker, Sciarra, & Farrie, 2014). Thus, low-wealth districts like District Z must ensure that technology, when available, is used consistently throughout the core curriculum to produce positive results.

In addition to the issue of needing devices to even the playing field for high-stakes testing, there is the student engagement aspect of 1:1 devices. To actively engage students, educators across the country have recognized electronic devices as instrumental tools in meeting student needs (Fredricks et al., 2011). A study cited by Darling-Hammond et al. (2014) included several ninth-grade English classrooms that included a large number of at-risk students, including some who previously had failed English and others who were predicted to fail the state's ninth-grade reading test. The teacher used 1:1 technology to have the students create blogs, research-based websites, presentations, etc. to help prepare them for the state test. The results were impressive. The 1:1

technology classrooms with at-risk students outperformed their higher-track counterparts (some including AP students) who did not use technology before the state test (Darling-Hammond et al., 2014).

Importance of Study to Middle School Students

A plethora of published research highlights the critical nature of the middle school years; it is the time when students' future academic fate is most at risk. The Maryland Middle School Steering Committee (2008) report indicated that in both Maryland and nationwide, the middle school years are when "students' progress slows, performance declines, and gaps persist" (p. 1). Quoting statistics from the 2007 National Assessment of Educational Progress (NAEP) (Lee, Grigg, & Dion, 2007), the report highlighted significant declines in academic achievement for middle school students versus their elementary school years. For example, in 2007, NAEP statistics indicated that only 34% of eighth graders were proficient or better in reading, 7% lower than the fourth-grade reading average; and 39% of eighth graders were proficient or better in math, 6% lower than the fourth-grade math average. The 2007 NAEP statistics for poor and minority students were even more dismal with a mere 13% of African-American students proficient or better in reading and 12% of African-American students proficient or better in math. Regarding students categorized as socioeconomically disadvantaged, only 16% were proficient or better in reading, and only 17% were proficient or better in math (Maryland Middle School Steering Committee, 2008, p. 1). The 2015 NAEP statistics regarding the nation's eighth graders show results similar to the 2007 statistics highlighted in The Critical Middle with a slight increase in reading scores for African-American students to 16% as well as math scores to 13%. On average, students eligible

for the National School Lunch Program (NSLP) scored 28% lower than their peers who did not qualify for the NSLP (NAEP, 2016).

According to the Maryland Middle School Steering Committee (2008), a sixth grader who exhibits just one of the following signs had only a 10% chance of graduating on time and a 20% chance of graduating a year later: poor attendance, poor behavior, or a failing grade in math or English. Despite this alarming outlook, middle school students were still optimistic about their futures. A 2007 poll of middle school students reported that 93% said there was no chance they would drop out of high school; 92% said they either definitely or probably would go to college (Maryland Middle School Steering Committee, 2008, p. 2).

Adolescent learners desire meaningful connections to their learning and relevance between what they are learning and their future lives. When adolescents are excited about what they are learning, they are more likely to be engaged in learning, which in turn means they are more likely to achieve (Maryland Middle School Steering Committee, 2008, p. 4). Personal technology devices allow students to apply their learning to real-world problem solving; connect them with positive role models worldwide to whom they would usually not have access; and foster participation in projects that make a difference in their community, nation, and world (Maryland Middle School Steering Committee, 2008). So how do the Maryland Middle School Steering Committee's findings relate to the researcher's study? For this study, the researcher analyzed and described the responses of middle school students regarding the frequency of use of technology and their perceptions of the importance of 1:1 technology to learning. Hopefully, the findings will encourage educators to enhance student learning by channeling the power of 1:1 technology into daily instructional practices. The 1:1

devices might be the means to make learning relevant for middle school students and keep them from becoming statistics.

Context of the Study

The setting of the study, a rural, low wealth eastern North Carolina public school district with five middle schools, is comprised of 1,200 students from diverse racial and socioeconomic backgrounds. District Z implemented a 1:1 initiative in the five schools during the 2014-2015 school year. At this study's onset, the researcher was an assistant principal at one of the district's middle schools.

Methodology

Descriptive research, the methodology used in this study, is "aimed at finding out 'what is', so . . . survey methods are frequently used to collect descriptive data" (Spector, Merrill, Elen, & Bishop, 2008, p. 41). Studies of this type are "aimed at casting light on current issues or problems through a process of data collection that enables them to describe the situation more completely than was possible without employing this method" (Fox & Bayat, 2007, p. 45). Descriptive studies can involve a one-time interaction with the subjects. To collect the data necessary to answer the research questions, the researcher adapted items from two online surveys, one university survey, and a published book. The researcher then developed other items essential to answering the questions that guided the study. Notations on the bottom of the actual survey identify the source of specific questions and permissions granted to use questions from sources other than the researcher (see Appendices A and B). Because the study involved students, the researcher requested and was granted permission from the Institutional Review Board. Next, using student volunteers from two schools, the researcher

conducted a pilot study to validate the survey instrument. Students who participated in the pilot study took the online survey. Afterwards, the students were given a hard copy of the survey and instructed to highlight survey terms they found difficult to understand or felt needed clarification. The researcher used student feedback to revise and validate the survey before administering it to other students in the five schools who volunteered to complete the survey. The pilot study participants were not included in the administration of the final survey.

The researcher administered the 15-question survey through Survey Monkey to 1,122 middle school students in the five schools located in District Z. Those who participated in the pilot study, were absent on the day of administration, or opted out of completing the survey were excluded. Because the survey was online, the results were available quickly. Survey Monkey provided the percentages, central tendency (mean), and standard deviation to display data and assign meaning.

To select participants, the researcher used convenience sampling. Convenience sampling simply means that the study subjects were convenient. At the time of the study, the researcher served as assistant principal in one of the district's middle schools.

Definition of Key Terms

The researcher provided the following definitions to clarify the language throughout this dissertation.

1:1 computing.

An environment in which students use computing devices, such as wireless laptops or tablet PC computers in order to learn anytime and anywhere. Yet, the focus is not on the technology. It is about the paradigm shift in how instruction is

> delivered, and the spark that is created in students which provides a new sense of enthusiasm and ownership in their learning. ("How to Best Define the 1:1 Classroom," 2014, para. 7)

1:1 technology. Programs that provide all students in a school, district, or state with their own laptops, netbooks, tablet computers, or other mobile-computing devices (McLeod & Sauers, 2012).

Adequate yearly progress (AYP*).* "AYP is an individual state's measure of yearly progress toward achieving state academic standards . . . the minimum level of improvement that states, school districts and schools must achieve each year" ("Glossary of Terms: Adequate Yearly Progress," 2004, para. 3).

Convenience sampling. According to Suen, Huang, and Lee (2014),

> Convenience sampling is a non-probabilistic sampling technique applicable to qualitative or quantitative studies, although it is most frequently used in quantitative studies. In convenience samples, subjects more readily accessible to the researcher are more likely to be included. (p. 105)

Descriptive research. Research characterized by the deliberate and systematic articulation and analysis of issues lacking clarity (Butin, 2010). Descriptive research is "aimed at casting light on current issues or problems through a process of data collection that enables them to describe the situation more completely than was possible without employing this method" (Fox & Bayat, 2007, pp. 69-70).

Descriptive statistics.

> Statistics that constitute the basic features of the data in a study, simple summaries about the sample and the measures, that provide a way to present quantitative descriptions in a manageable form, to simplify large amounts of data

in a sensible way. (Trochim, 2000, p. 15)

Digital divide. A term that refers to the growing gap between the underprivileged members of society, especially the poor, rural, elderly, and handicapped portion of the population who do not have access to computers or the internet; and the wealthy, middle-class, and young Americans living in urban and suburban areas who have access (Roberts, 2004, p. 233).

District Z. This district, a low wealth school system located in rural eastern North Carolina, has five middle schools and a diverse student population.

Infrastructure. The basic underlying framework or features of a system or organization (Flexner & Hauck, 1987).

Low wealth. A term that refers to counties that do not have the ability to generate local revenue to support public schools (Cook, Fowler, & Harris, 2008).

Methodology. "Methodology is the philosophical framework within which the research is conducted or the foundation upon which it is based" (Brown, 2006, p. 12).

Middle school student. A student enrolled in sixth, seventh, or eighth grade in school District Z.

NSLP. NSLP is "a federally assisted meal program operating in over 100,000 public and non-profit private schools and residential child care institutions. It provided nutritionally balanced, low-cost or free lunches to more than 31 million children each school day in 2012" (Food and Nutrition Services, 2013, para. 1).

Quantitative research. The use of standardized measures to separate statistical data that incorporates testing scores, classroom climate reports, and other archival data in addition to classroom climate and student achievement variables (Leedy & Ormrod, 2009).

Student achievement.

> The most common indicator of achievement generally refers to a student's performance in academic areas such as reading, language arts, National Assessment of Educational Progress (NAEP) scores . . . student achievement has three dimensions: Mastery of Academic Skills and Content, High Quality Work, and Character. (National Conference of State Legislatures, 2012, p. 1)

Standard deviation. A term that means the values in the statistical data set are either close to the mean or farther from the mean on average (Rumsey, 2016).

Statistical Package for Social Sciences (SPSS). Developed by SPSS, Inc. and acquired by IBM in 2009, SPSS is "The Statistical Package for the Social Sciences (SPSS), . . . a software package used in statistical analysis of data in a number of fields" ("Statistical Package for the Social Sciences," 2016, para. 1).

Student engagement. In education, student engagement refers to the level of attention, curiosity, interest, optimism, and passion that a learner shows during instruction (Kezar & Kinzie, 2006).

Technology devices. In the context of computer technology, a device is a unit of hardware, outside or inside the case or housing for the essential computer (processor, memory, and data paths) that is capable of providing input to the essential computer or of receiving output or of both (Rouse, 2005).

Technology integration. Integration is a term that refers to the use of technology in schools where the lines between cognitive tools, teaching, learning, and technology are more than blurred. In other words, they are so well integrated that they are inseparable (Weston & Bain, 2010).

Limitations of the Study

The study focused on 1,200 middle school students (Grades 6, 7, and 8) in a rural, low wealth North Carolina school district who were chosen for their accessibility. Therefore, the findings of this study may not be generalizable to other environments (i.e., other middle schools or urban or suburban populations). It also may not be applicable to larger or smaller populations or other sample groups such as elementary or high school students.

Requesting middle school students to report their behaviors may be subject to participant bias. The participants may have been susceptible to responding in ways that they perceived favorable to teachers or administrators rather than being honest. At the time of this study, the researcher was an assistant principal in one of the middle schools in this study. Implementing anonymity was intended to eliminate these limitations.

Conclusion and Organization of the Dissertation

Many schools desire a structured and innovative way to address the lack of student engagement and academic performance. According to Akyürek and Afacan, (2012), 1:1 technological initiatives can significantly affect test scores and other student achievement data. District Z, a low wealth school district in eastern North Carolina, allocated funding to implement a 1:1 initiative in all five of the middle schools in the district with the anticipation of positively affecting student achievement. At the time of this writing, no data were available to the stakeholders and policymakers that described the frequency of use of the devices or clarified the importance of the technological devices to the learning of the middle school students.

This study was designed to clarify and describe to the policymakers and

stakeholders of School District Z how frequently students use the 1:1 technology, how frequently teachers and students use technological devices, and finally whether the students believe that technology access was important to their learning. The chapters of this study are organized as follows. Chapter 1 presented the introduction to this study. Chapter 2 presents the related literature. Chapter 3 describes the collection and analysis of the data. Chapter 4 presents the findings from the data analyses, and Chapter 5 summarizes the descriptive data and the researcher's professional perspective.

Chapter 2: Review of Literature

Introduction

District Z, a rural, low wealth school district in North Carolina, funded a 1:1 technology initiative in its five middle schools during the 2014-2015 school year. Each student was given a Chromebook that could be taken home in order for the District to determine if the technology would engage students in the pursuit of academic achievement. As with most school districts, the school system had already spent thousands of dollars providing basic technology such as computers for classrooms or labs, but this 1:1 initiative was a major innovation for the county. In the process of structuring this initiative, the district failed to develop a system to provide evaluative data to the stakeholders and policymakers. Among the data needed for evaluation and decision making was the frequency of use of the 1:1technology, the frequency that previously purchased technological devices were being used, and the importance to learning that middle school students placed on access to technology. This study sought to provide the missing data and was guided by the following three questions.

1. How frequently do middle school students in District Z use 1:1 technology?
2. Do the middle school students in District Z believe that technology access is important to their learning?
3. How frequently do middle school teachers and students in District Z use other technological devices?

In this chapter, the researcher developed a conceptual framework for 1:1 laptop initiatives that examined student engagement and student achievement. This framework is grounded in literature on the history of technology in education, the related research on 1:1 laptops in school districts, case studies of 1:1 laptop initiatives, and what experts

determined as successes and failures of 1:1 laptop initiatives that focused on student engagement and student achievement. As stated in Chapter 1, 1:1 laptop initiatives are huge investments that many school districts are exploring with the hope of harnessing the power of technology to increase student engagement and, ultimately, increase student achievement, yet school districts considering 1:1 initiatives are still faced with questions. Are students using the existing technology frequently enough? Do students perceive technology access as being important to learning? Will the benefits to student achievement of a 1:1 technology initiative justify the cost?

Although 1:1 laptop programs have been implemented for over a decade, many scholars describe the research regarding their effectiveness as *limited*. The research related to 1:1 laptop effectiveness presents a dilemma for underfunded school districts that are financially strapped, yet these schools must equip students with the tools needed to bridge the digital divide between economically advantaged and disadvantaged students. While current research may suggest that 1:1 laptops increase student engagement, measuring student engagement is somewhat subjective. Additionally, the literature on the impact engagement has on achievement is not clear. The literature reviewed in this chapter examined the instructional approaches in traditional settings versus 1:1 settings and how these approaches positively or negatively affected engagement and achievement.

Review of Related Literature

Historical Overview of Technology in Education

Over the past 3 decades, school districts throughout the nation have made considerable progress toward the implementation and integration of new technology.

> By 2009, 97% of classrooms had one or more computers, and 93% of classroom computers had Internet access. For every 5 students, there was one computer. Instructors stated that 40% of students used computers often in their educational methods, in addition to interactive whiteboards and digital cameras. College students nowadays are rarely without some form of computer technology: 83% own a laptop, and over 50% have a Smartphone. ("The Evolution of Technology in the Classroom," 2016, para. 13)

The most substantial growth in technology integration within schools has transpired over the past 15 years, fueled in part by the federal initiative entitled Technology Literacy Challenge Fund. In 1996, former President Bill Clinton "launched a national mission to make all children technologically literate by the dawn of the 21st century, equipped with communication, math, science, and critical thinking skills essential to prepare them for the Information Age" (Technology Literacy Challenge, 1996, p. 1). Over the past decade, changes in infrastructure, the parallel growth of home computing and the Internet, and continuous educational technology plans by the U.S. Department of Education have affected teachers and classrooms (McLeod & Richardson, 2013).

The substantial growth of technology in education can best be highlighted by the statistics below. In 1994, only 3% of public classrooms, computer labs, and libraries had Internet access (McLeod & Richardson, 2013). By 2008, 97% of public classrooms had Internet access. The student-to-computer ratio had also decreased drastically. In 1996, the average ratio was 11:1; and by 2009, the ratio was 7:1 (McLeod & Richardson, 2013). However, with bring your own device (BYOD) and 1:1 initiatives spreading rapidly throughout American public education, the ratio of students to devices is trending in a

pattern that one may soon see a 3:1 or even a 2:1 ratio (McLeod & Richardson, 2013). In 2002, .5% of students were enrolled in an online course; while today, 5% take at least one online course (McLeod & Richardson, 2013). Finally, teachers are using technology at a vastly increased rate as well. In 1999, less than 10% of teachers used the Internet to access research and best practices. Ten years later, a staggering 94% of teachers used computers often or sometimes for classroom, instructional, or administrative tasks (McLeod & Richardson, 2013). With this drastic change in access to technology, the shift is moving from whether schools should have technology to how the technology is being used (McLeod & Richardson, 2013).

With the recognition that our students live in a digital world, the current trend in educational technology is 1:1 laptops or other devices. Basically defined, 1:1 means that each student is provided a laptop or other device by the school that he or she can take home, thus giving the student access to technology both during and after the school day (McLeod & Sauers, 2012). Both proponents and opponents of educational technology agreed that the full impact of computers in education will not be realized until computers are not a shared resource, thus the 1:1 initiative is a current and growing trend in education (Bebell & Kay, 2010).

Research on 1:1 Laptop Initiatives

According to Spies, Kjos, Miesner, Chestnut, and Fink (2010), there are three tenets regarding integrating technology into the classroom. First, the millennials were born during the computer age, and these students have grown up with an awareness of technological advances. Second, research suggested that if technology is promised, student commitment levels increased. Finally, researchers suggested that classrooms

should simulate real-life application as much as possible. Using the 1:1 technology and simulating realistic situations caused learners to believe that learning was relevant and was pertinent to real-life situations (Spies et al., 2010).

The data results of this descriptive study may suggest to decision makers the advantages of middle school students accessing technology as a powerful learning tool. Nevertheless, a gap in the literature revealed that conclusive data do not exist. Supplemental studies suggest that the implementation of 1:1 technological initiatives may produce academic gains in writing and mathematics. In addition, data suggested that policymakers, researchers, and practitioners, especially those who are interesting in filling the digital divide, might investigate 1:1 initiatives (Roschelle, Pea, Hoadley, Gordin, & Means, 2000; Wells & Lewis, 2006).

There have been many educational initiatives designed to reform education and increase student achievement, yet, "few modern educational initiatives have been as widespread, dramatic, and costly as the integration of computer technologies into American classrooms" (Bebell & Kay, 2010, p. 5). Proponents of educational technology believe that the increased use of computers will ultimately result in better teaching and learning, improved efficiency, and the development of important skills in students (Bebell & Kay, 2010). Consequently, 1:1 laptop initiatives have exploded over the past decade with school districts investing countless dollars into what they hoped to be the bridge over the digital divide in learning between economically advantaged and disadvantaged students. While research on 1:1 effectiveness is relatively new, the results of 1:1 laptop effectiveness were diverse and inconsistent (Goodwin, 2011).

When 364 leaders of large school districts with 1:1 initiatives were surveyed in 2008, 33% believed the laptops were having a significant effect on student achievement,

while 45% believed the laptops were only having a moderate effect on student achievement (Goodwin, 2011). These statistics mirror achievement results from several of the largest 1:1 laptop initiatives over the past decade. For example, after 5 years of laptop implementation, Maine found little to no effect on student achievement except in one area, writing (Goodwin, 2011). In Texas, researchers noted slightly higher growth in math but no growth in reading and a slight decline in writing achievement (Goodwin, 2011). In Michigan, four laptop immersion schools showed gains in achievement, while three posted declines in achievement (Goodwin, 2011). What does this data mean? The most precise conclusion that can be reached was that the laptops were only as effective as the school personnel and students who implemented them. Bebell and Kay aptly summarized, "It is impossible to overstate the power of individual teachers in the success or failure of one-to-one computing" (Goodwin, 2011, p. 78).

With this in mind, it is critical to note the findings of a 10-year study by Rockman (2003) on 1:1 laptop initiatives. Rockman's research indicated that teachers in 1:1 classrooms spent less time in large or whole group work, lectured less, implemented more small group and individual project work, and collaborated more with other teachers (McLeod & Sauers, 2012). Could the inconsistencies in achievement be more of a reflection of instructional practices and less about laptops and effectiveness? Many experts in education agree that the answer is yes, that 1:1 laptop effectiveness hinges on a plethora of factors. A 2010 study of 997 schools across the United States identified nine factors that, if present, appear to contribute to higher levels of achievement. The top three factors included ensuring uniform technology integration in every class, providing time (at least monthly) for teachers to collaborate and learn, and using technology daily for online student collaboration and cooperative learning (Goodwin, 2011). These factors

align with the conclusion regarding technology and business that author Jim Collins wrote in his book *Good to Great*, "Technology alone never holds the key to success. However, when used right, technology is an essential driver in accelerating forward momentum" (Goodwin, 2011, p. 78). In summary, educational leaders must change the way they look at laptops. Instead of seeing laptops as the solution to all of their achievement woes, they must view them as a tool that enhances research-based instructional practices that have been proven to increase student achievement.

Although early research studies on 1:1 laptop initiatives portray mixed results regarding student achievement, many other positive outcomes have been noted. Increased student engagement was recorded in virtually all research studies. Other positive outcomes included decreased disciplinary problems; a movement towards student-centered classrooms; increased use of laptops for research, analysis, and writing; and a change in student behaviors at home, most notably more time spent doing homework and less time spent watching television (Goodwin, 2011).

Despite many documented positive outcomes, 1:1 laptop initiatives have many critics. In fact, the term *techno-critics* has been coined to describe those who have questions, concerns, and issues regarding 1:1 laptop immersion in classrooms. One well-respected techno-critic, education reformer Larry Cuban (2006), openly admonished 1:1 advocates who claim that laptops led to improved learning, better teaching, and students getting better jobs. In his article, Cuban argued that any gains in student achievement in 1:1 settings were likely the result of innovative teaching and individualized problem-based instruction. Might this explain the inconsistent gaps in achievement between schools, subjects, and teachers with seemingly similar demographics and settings? Cuban and other techno-critics agreed, comparing 1:1 laptop initiatives to other

educational reform initiatives with equally lackluster results (Weston & Bain, 2010).

In order to make educational reforms such as 1:1 laptop initiatives affect teaching, learning, and achievement, Cuban (2006) argued that more research should be conducted and published on proven methods that actually do significantly impact student learning and achievement. This research could serve as a model to change what Cuban coined "uninspired" use of technology by both teachers and students in school (Weston & Bain, 2010). Fortunately, techno-critics viewed 1:1 laptops as the most promising chance for much needed educational reform. However, this reform requires a new vision and way of thinking. Instead of seeing the laptops as the final or only solution, educators must view technology as a tool or vehicle to drive the change. According to research conducted by David Jonassen, Professor of Education at the University of Missouri, "When technology enables, empowers, and accelerates a profession's core transactions, the distinctions between computers and professional practice evaporate" (Weston & Bain, 2010, p. 10). Jonassen compared laptops to education with Computer Assisted Design (CAD) to engineers or scalpels to surgeons, just tools used in their practice. However, for the most part, educators are not currently using laptops as a cognitive tool but as a substitute tool to automate processes (Weston & Bain, 2010).

How can 1:1 laptop initiatives be the tool that drives change? First, the technology device must be viewed as a cognitive tool. These tools should be used to accelerate, differentiate, deepen, and maximize learning experiences for all students. Teachers would use these tools to design, deliver, and manage research-based practices that have been proven to significantly impact student achievement such as cooperative learning, differentiated instruction, and problem or project-based learning. The cognitive tools would be holistically integrated into the learning processes of the entire school, not

just pockets of teachers here and there in isolation, and used daily by students, parents, and teachers to collaborate regarding the next steps in their "collective pursuit" of learning. These collective decisions would be driven by real-time data mined daily with ease because of the transformative use of the cognitive tools (Weston & Bain, 2010). The big question now is how to shift the paradigm from laptops as the reform to laptops as cognitive tools that can be employed to drive change that results in significant gains in learning and achievement.

According to Weston and Bain (2010), the shift begins from the bottom up when the school community comprised of students, teachers, school leaders, and parents develop an explicit set of simple rules that define what they believe about teaching and learning. These rules are not a mission statement but drivers for the design of the school and all learning that occurs within the school. These drivers could include how they feel about cooperation, feedback, etc. The entire school community then "deliberately and systematically uses its rules to embed its big ideas, values, aspirations, and commitments in the day-to-day actions and processes of the school" (Weston & Bain, 2010, p. 12) from how desks are arranged in classrooms to what technology is integrated to what professional development is offered. Each member of the school community, including students, would be actively involved in creating, adapting, and sustaining the embedded school design with clearly articulated roles and responsibilities, thus creating buy-in, a key component missing from many educational reforms that are done to educators, not by them (Weston & Bain, 2010).

Consistent and continuous feedback is another essential element of the new paradigm. The feedback is generated from all members of the learning community and either reinforces what works or helps drive decision making to sustain continuous

learning. The feedback is the catalyst for bottom-up change, not top-down change which is the unfortunate norm in education. Consequently, the school's framework for learning is dynamic, ever-evolving, and improving from feedback given by all stakeholders (Weston & Bain, 2010).

Finally, and most relevant to the role that 1:1 laptops play in achieving this paradigm, is that the school demands "systemic and ubiquitous" use of technology, not the spotty and inconsistent use highlighted in many of the case studies of 1:1 laptop implementation cited by the researcher (Weston & Bain, 2010). The laptops, functioning as cognitive tools, helped the school community design and deliver the curriculum, gather and share feedback, create portfolios, enable research for depth of understanding, engage parents, and so much more. Since cognitive tools (laptops in this case) were part of the embedded culture of the school; there is never the issue of "getting teachers to use them" (Weston & Bain, 2010). Technology use was an explicit aspect of the school's culture that was demanded, not suggested. To sum it up, "in schools with cognitive tools, teaching, learning, and technology are more than blurred" (Weston & Bain, 2010, p. 13). In other words, they are so integrated that they are inseparable (Weston & Bain, 2010).

To conclude, research on the effectiveness of 1:1 laptop initiatives appeared promising in some areas but contradictory and inconclusive regarding student achievement, which is generally the end goal for the laptop initiatives. However, techno-critics did not see the 1:1 initiatives as a failure but as "fertile ground" for the educational reform districts are so passionately seeking. Instead of scrapping 1:1 technology, as often happens in the swinging pendulum of educational reform, it must be viewed as an agent of change that can be used as a tool to achieve the Holy Grail all educators seek, dramatic and sustaining student learning achievement. Current research on 1:1 initiatives missed

the mark but presented opportunity for relevant future research that measures the impact of laptops as a cognitive tool in a "new vision" learning community (Weston & Bain, 2010).

Overview of Case Studies/Background and Methodology

While research on the effectiveness of 1:1 laptop initiatives is fairly new, keyword searches produced many similarities in a variety of formats such as journal articles, published reports, books, and articles. While several case studies were referenced, a few were explored in greater detail: the Berkshire Wireless Learning Initiative in Massachusetts (BWL Initiative), the Texas Immersion Program (TIP), and the Maine Learning Technology Initiative (MLT Initiative). All of these case studies featured 1:1 laptop immersion in middle school settings and measured both student engagement and student achievement, thus making the studies relevant to questions posed by the researcher.

BWL Initiative. The BWL Initiative was a 3-year pilot program in which every student and teacher in five middle schools in western Massachusetts were provided laptops beginning in 2005. In addition to the laptops, all classrooms were equipped with wireless networks, select classrooms were given LCD projectors, and teachers were provided both technical and curricular support to help integrate technology in the classrooms. The BWL Initiative was launched midway through the 2005-2006 academic year and lasted through the end of the 2007-2008 academic year. The $5.3 million program was funded through a combination of district and state funds combined with local business investments. The project was designed to "determine the efficacy of a one-to-one laptop initiative in transforming teaching and learning in a traditional middle

school setting" and included explicit targeted outcomes (Bebell & Kay, 2010, p. 7). These outcomes included enhanced student achievement, improved student engagement, improved classroom management, enhanced student capability for research and collaboration, and fundamentally transformed teaching strategies and curriculum delivery (Bebell & Kay, 2010).

In the BWL Initiative, a mixed-methods research study was employed, incorporating both qualitative and quantitative data from the five experimental schools along with two control schools from neighboring public middle schools with similar demographics. Three cohorts of students were followed for 3 years, beginning in early January 2006, when all seventh-grade students in the experimental schools received Apple laptops to use for the duration of the school year. In the first months of the second and third years of study, each student in Grades 6, 7, and 8 in participating schools was provided a laptop for the majority of the school year. In order to track the impact of 1:1 laptops on teaching and learning, researchers conducted teacher and student surveys (pre and post), teacher interviews, classroom observations, and analysis of student drawings, records, and test scores (Bebell & Kay, 2010).

Student surveys were web-based and given to both BWL Initiative and control group students both before and after the 1:1 laptop implementation. Survey questions revolved around the frequency and variance of technology use both in and outside of the classroom and across the curriculum. The survey also included demographic items and a brief inventory of attitudes and beliefs. During the first year of implementation, only seventh-grade students were administered the survey, with 574 students across the schools completing the presurvey and 524 students completing the postsurvey. After 1,839 of 1,898 students in Grades 6 through 8 were provided laptops in year 2 (2007), the

students completed the online survey. In the final year of the case study, all students in both the BWL Initiatives and the two control schools were administered the survey, with 98.7% of BWL Initiative students and 74.6% of control school students actually completing it (Bebell & Kay, 2010).

Web-based surveys were also given to both BWL Initiative and control school teachers before (pre) and after (post) using 1:1 laptops in the classroom. The teacher survey was designed to capture the variety and extent of technology use; the teacher's attitude towards technology, teaching, and learning; and the teacher's beliefs regarding the effect of the 1:1 pilot program. Each teacher was surveyed both pre and post 1:1 laptops in all BWL Initiative and control schools with a response rate of 97.6% in BWL Initiative schools and 57.6% in control schools (Bebell & Kay, 2010).

Other forms of qualitative data utilized included classroom observations conducted by the research and evaluation team over the 3 years of implementation, informal interviews of teachers, formal and informal interviews of principals and other building and district leadership, and student drawing activities. Students were asked to draw themselves "writing in school" both before and after 1:1 laptop implementation. Over 3,500 student drawings were analyzed using an emergent analytic coding process established through previous student drawing and research studies (Bebell & Kay, 2010).

Quantitative achievement data were pulled from the Massachusetts Department of Education from 1998-2008. The methodology is explained later in the student achievement section. Additionally, students were given an experimental writing assessment that is outlined in the achievement section (Bebell & Kay, 2010).

TIP. With the goal of immersing schools in technology by providing tools, training, and support for teachers to fully integrate technology in their classrooms, TIP

was initiated in 2003 by the Texas legislature (Argueta, Corn, Huff, & Tingen, 2011). The legislative mandate was funded with over $20 million in federal money, and schools applied for money through a competitive grant process. Research was conducted on 42 middle schools from rural, suburban, and urban settings in Texas. Three student cohorts were followed over 3 years and were comprised of predominantly minority (65%) and economically disadvantaged (67%) students. The overarching purpose of the study was to scientifically examine the effects of 1:1 laptop immersion in regards to increasing middle school student achievement in core academic subjects (math, science, language arts, social studies) as measured by the Texas Assessment of Knowledge and Skills, henceforth referred to as TAKS (Garner, 2012).

Prior to laptop distribution, researchers conducted site visits at each of the TIP schools to gather data on existing conditions in order to establish comparability between treatment (TIP) and control schools. Then the researchers documented technology access, technical and pedagogical support, professional development practices, and teacher and student technology use. During the site visits, educators, both teachers and administrators, expressed dismay over the lack of involvement in the decision-making process for TIP, thus indicating a lack of buy-in. A plethora of issues that might possibly jeopardize the success of the pilot were noted as well, including internet access problems, limited technical support, ineffective professional development that centered on computer literacy rather than effective, research-based technology integration, and minimal and low-quality technology use by teachers and students (Texas Center for Educational Research, 2006).

Researchers used the compiled data to carefully match immersion and nonimmersion schools, 22 of each, based on size, regional location, demographics, and

student achievement. The selected TIP schools employed approximately 1,300 teachers with 18,000 students in Grades 6 through 8 with a large minority and economically disadvantaged presence. Researchers collected data in a variety of ways such as building walkthroughs; campus inventories; and interviews with principals, technology coordinators, central office administrators, teachers, and students. They also used TAKS data to measure achievement (Texas Center for Educational Research, 2006).

All TIP participants, educators and students, were provided with "immersion components," including a wireless mobile computer that ensured on-demand access to technology. In addition, they were given productivity, communication, and presentation software; online instructional resources that supported the Texas curriculum for core area subjects; online assessment tools for diagnosis of student strengths and weaknesses; professional development for technology integration; and ongoing technical support (Texas Center for Educational Research, 2006).

At the end of year 1 of implementation, researchers discovered that none of the TIP schools had fully implemented the immersion components provided to them. Rollout delays; varied access to technology; and a plethora of hardware, software, and Internet maintenance issues resulted in some students only having access to laptops for 72 days. In addition, some schools would not let students take the laptops home, while other schools did. The level of tech support varied widely from school to school as well, often leaving teachers to support each other with ideas for technology integration. While professional development on technology integration was provided by vendors the first year, many teachers had difficulty retaining the content and reported being exposed to "too much in a short period of time," leaving them overwhelmed (Texas Center for Educational Research, 2006, p. 4).

Despite the shortcomings of year 1 of immersion, researchers continued to follow the three cohorts of students for the 3 years of the pilot. A quasi-experimental research design was to address a number of questions. What are the characteristics of participating schools? How is technology immersion implemented? What is the effect of technology immersion on schools? What is the effect of technology immersion on teachers and teaching? What is the effect of technology immersion on students and learning? Does technology immersion impact student achievement? (Texas Center for Educational Research, 2006). The first two questions were addressed in the 2005 academic year, while the remaining questions were addressed in subsequent years (Texas Center for Educational Research, 2006). The findings from this study are discussed later in this chapter.

MLT Initiative. The MLT Initiative was the vision of Angus King, the state's former governor, who believed that "if Maine wanted to prepare Maine's students for a rapidly changing world, and wanted to gain a competitive edge over other states, it would require a sharp departure in action from what Maine had done in the past" (MLT Initiative Research and Evaluation Team, 2011, p. 2). In late 1999, a one-time state surplus provided the opportunity to make the vision a reality. A task force was convened to research issues and recommend a course of action. The task force concluded "in order to move all students to a high level of learning and technological literacy, all students will need access to technology when and where it can be most effectively incorporated into learning" (MLT Initiative Research and Evaluation Team, 2011, p. 3). Phase one of implementation began in the fall of 2002 with over 17,000 seventh graders and their teachers in over 240 middle schools across the state of Maine receiving laptop computers (MLT Initiative Research and Evaluation Team, 2011). Phase 2, implemented the

following year, consisted of all eighth graders and their teachers receiving laptops (MLT Initiative Research and Evaluation Team, 2011). Each subsequent year thereafter, all seventh- and eighth-grade students and their teachers received laptop computers (MLT Initiative Research and Evaluation Team, 2011).

Shortly after the first rollout of laptops, the Maine Department of Education implemented a professional development program to help teachers integrate technology into the curriculum. Teacher training was of utmost importance to the success of the MLT Initiative. As a result, each middle school selected and trained a teacher leader and a technology coordinator to serve as building-level contacts and support for teachers. To promote transformative technology integration, positions were also created for curriculum and technology integration specialists (MLT Initiative Research and Evaluation Team, 2011).

In order to conduct unbiased research on the effectiveness of the 1:1 laptop initiative, the Maine Education Policy Research Institute (MEPRI), a nonpartisan agency, was hired by the Maine Department of Education to conduct ongoing evaluation of the MLT Initiative. The evaluation team utilized a mixed-methods approach that consisted of both qualitative and quantitative techniques to collect and analyze research and evaluation data and other evidence. Evidence was collected through online surveys, site visits and observations, and research studies designed to assess the impact of the MLT Initiative on student achievement in math, science, and writing (MLT Initiative Research and Evaluation Team, 2011). A more detailed description of the achievement studies is conveyed in the student achievement section.

1:1 laptops and student engagement. "Student engagement" has been a buzzword in education for several decades. As defined by The Glossary of Education

Reform (2014), "student engagement is predicated on the belief that learning improves when students are inquisitive, interested, or inspired, and that learning tends to suffer when students are bored, dispassionate, disaffected, or otherwise disengaged" (para. 1). As multiple research studies on learning revealed, a significant connection between cognitive results such as test scores and noncognitive skills or factors such as responsibility, curiosity, determination, and more, the term "student engagement" became more relevant to educators; however, what defines "student engagement" is subjective and varies from school to school, or even educator to educator. While one school might acknowledge behaviors such as attending class or turning in work on time as engaged, another school might observe more intangible behaviors such as curiosity, engagement, or motivation as indicators of student engagement (The Glossary of Education Reform, 2014).

Over the past 30 years, the concept of student engagement has continued to gain the interest of educational psychologists, researchers, and practitioners (Kezar & Kinzie, 2006). Student engagement is considered a relevant topic with regard to all students, despite diversity (McGlynn, 2008). To some extent, the existing research literature exhibits difficulties and limitations. So how do we define student engagement collectively (Vibert & Shields, 2003)?

In education, student engagement refers to the level of attention, curiosity, interest, optimism, and passion a learner shows while the instruction is being delivered (Kezar & Kinzie, 2006). Some researchers believe that student engagement is dependent upon the culture that surrounds the body of people in question (Kezar & Kinzie, 2006). According to Vibert and Shields (2003), student engagement is a misnomer, suggesting that engagement is located within the student. Students, like educators and other

stakeholders, are engaged in schools when schools are engaging places to be (Smith, Donahue, & Viber, 1998).

This brief overview seeks to further identify key concepts within student engagement as described by Dolan (2006): academic rigor that challenges the intellectual and creative work central to student success; student participation in active and collaborative educational opportunities; student interaction with educators in all capacities; enrichment educational opportunities held both in and outside of the classroom that augment the academic curriculum; and student perception of the learning institution's commitment to everyone's success and whether the working environment is positive (Dolan, 2006).

Massachusetts and student engagement. Among the targeted outcomes of the BWL Initiative was increased student engagement. When Bebell and Kay (2010) analyzed the impact of 1:1 laptop immersion in five Massachusetts middle schools, teacher surveys revealed that they believed student engagement and motivation increased during the laptop program (McLeod & Sauers, 2012). The results of the final survey administered to teachers in the BWL Initiative pilot in June 2008 presented strong evidence of increased student engagement across various student groups. Eighty-three percent of teachers reported increased student engagement in traditional students; 84% reported increased student engagement in low-achieving and at-risk students; and 71% reported increased student engagement in high-achieving students. Principal feedback mirrored the positive reports made by teachers; nearly all BWL Initiative principals reported increased engagement, attentiveness, and motivation when students used the laptops. During classroom observations, the BWL Initiative research and evaluation team members observed behaviors that indicated increased student engagement. For

example, students would walk in and ask the teacher if the laptops were available. When teachers responded yes, the students cheered and smiled. Student engagement was so evident that it became a frequent practice at BWL Initiative schools to invite policymakers, including Senator John Kerry, to observe the students (Bebell & Kay, 2010). Students also reported increased engagement when teachers used "cool" technology presentations to present curriculum (Bebell & Kay, 2010).

Texas and student engagement. Although the TIP goal was to increase student achievement, reports of increased student engagement were widespread. Administrators, teachers, and students in every single immersion school stated that the 1:1 laptops increased student engagement. Principals stated that "students sought every free minute that they get in class" to use the laptops (Texas Center for Educational Research, 2006, p. 93). Teachers said that students were more interested and engaged when activities involved the laptops, even citing specific indicators of engagement such as being on task more, complaining less, and participating more, especially in the case of shy students, English Language Learners, and "troublemakers." Students also echoed the opinions of administrators and teachers, stating increased enjoyment, interest, and self-esteem when learning with the laptops (Texas Center for Educational Research, 2006).

Maine and student engagement. MLT Initiative evaluators reported more engaged students who were more actively involved in their own learning. Furthermore, higher levels of engagement were witnessed in critical student groups such as special needs students, students with disabilities, and at-risk, and low-achieving students. Maine students echoed the sentiments of the teachers, expressing "an increase in interest in their school work and an increase in the amount of work they were doing both in and outside of school" (Argueta et al., 2011, p. 7). Maine students even commented that, despite the

additional work and time required on technology-rich projects, the projects were more engaging (Argueta et al., 2011).

In summary, the case studies reviewed in this chapter seem to show positive outcomes for student engagement and was a constant positive outcome in multiple case studies of 1:1 laptop initiatives in public middle schools throughout America. To be clear, however, what student engagement "looks like" is very subjective and often differs from school to school or teacher to teacher, thus making it difficult to adequately and accurately measure this phenomenon. While some schools use indicators such as attendance or turning work in on time as student engagement, others look for more intangible indicators such as motivation and curiosity. Nonetheless, the widespread belief that 1:1 laptops increase student engagement serves as a promising indication that they can be tools that drive meaningful academic gains in students. Case studies of some of America's largest 1:1 laptop initiatives from Texas to Massachusetts may indicate that support of student engagement was "one of the most substantial benefits" of 1:1 laptops (McLeod & Sauers, 2012, p. 4).

1:1 laptops and student achievement. Quoting W.E.B. Du Bois in *Unfit to Be a Slave: A Guide to Adult Education for Liberation*, Greene (2014) wrote, "Of all the civil rights for which the world has struggled and fought for over 5,000 years, the right to learn is undoubtedly the most fundamental" (p. 145). Despite decades of innovation and improvement, student achievement levels remain at intolerable levels (Kuh, 2009). In particular, a large number of students of color, students with limited English proficiency, and students with disabilities continue to perform below grade level (Mickelson, 1990). Researchers note that current strategies will not suffice as stakeholders work to achieve a lengthy set of ambitious goals for America's students (Swidler, 1986); however, using

substantial longitudinal evidence, a comprehensive set of school practices, and positive school and community conditions can encourage improvement (Bryk, Sebring, Allensworth, Luppescu, & Easton, 2010). Schools that adequately implemented instructional initiatives into their classrooms or schools noticed a significant positive impact on student achievement rates (Brown, Jones, LaRusso, & Aber, 2010).

According to Goodwin (2011), when 1:1 laptop immersion initiatives emerged over a decade ago, increased student achievement was consistently cited as a goal of the programs. Unfortunately, case studies of some of the largest 1:1 middle school initiatives do not reveal positive data regarding increased student achievement. Despite the data presented, a 2008 survey of 364 principals and leaders in large districts with 1:1 initiatives still believed laptops affected student achievement. Thirty-three percent of the principals surveyed felt the laptops had a significant effect on student achievement, while 45% believed the laptops had a moderate effect on student achievement (Goodwin, 2011), yet some school districts have gone so far as to cancel their 1:1 initiatives because of the lack of evidence of achievement gains, unconvinced that the costliness of the laptop initiatives are worth the investment (McLeod & Sauers, 2012).

Stakeholders on both sides of the 1:1 debate revealed the ambiguity of the impact of 1:1 devices on student achievement. For every statistic revealed about the ineffectiveness of 1:1 laptop initiatives in terms of increased student achievement, another statistic was available to reveal the academic benefits of 1:1 computing. Academic gains in writing, literacy, science, exam scores, and grade point averages have been noted in multiple research studies of 1:1 initiatives. One consistent area of academic gains associated with 1:1 computing is student writing, with writing growth indicated in several case studies, particularly the Maine case study. Despite the varying

gains or losses incurred by a variety of 1:1 immersion schools, case studies revealed some commonalities that surfaced repeatedly when studying the effect of 1:1 computing on student achievement. First, student home use of the laptops was a strong indicator of growth in reading and math scores. Secondly, access to technology use was positively associated with academic growth; the more access students had to and the more often students used the laptops, the greater the achievement gains. Lastly, the majority of studies revealed that academic gains occurred after 3 years of laptop immersion (McLeod & Sauers, 2012). Detailed research regarding the effectiveness of 1:1 laptop initiatives and student achievement was conducted and published on three of the largest middle school initiatives: the BWL Initiative in Massachusetts, the TIP in Texas, and the MLT Initiative in Maine.

Massachusetts and student achievement. As stated previously, one of the targeted outcomes of the BWL Initiative pilot was to enhance student achievement. Researchers followed three pilot middle schools and two control schools with similar demographics from 2005 to 2008. Methods employed to measure the effectiveness of the 1:1 pilot in relation to increased student achievement included a nonequivalent comparison group design study of Massachusetts Comprehensive Assessment System (MCAS) test data for the three pilot schools and two control schools as well as an additional student writing assessment given to seventh graders in the spring of 2008 (Bebell & Kay, 2010).

In order to explore the impact of 1:1 computing on student achievement, researchers analyzed the trends in overall MCAS scores for pilot schools over time and compared the results to the control schools and state trends during the same time period. In addition, researchers examined which, if any, student technology use at home or at

school related to performance on various MCAS measures while statistically controlling for students' pre-BWL Initiative MCAS performance. MCAS results and performance indicators for all schools for 1998-2008 were retrieved from the Massachusetts Department of Education. Participating schools provided students' individual MCAS data for 2005-2008. The research team used the MCAS data, demographic information, and information from the BWL Initiative student survey on technology use and practices to create a new data set. The team then analyzed the data to determine the relationship between various technology uses and practices and student achievement outcomes for all students in Grades 7 and 8 who completed the survey and the MCAS (Bebell & Kay, 2010).

In spring of 2008, the final year of the BWL Initiative, eighth-grade students completed MCAS testing in language arts, math, and science. These tests were administered after most students had been in the laptop program nearly 2 full years. Using a linear regression model, the research team chose the students' spring 2008 MCAS scores as the dependent variable and students' sixth-grade MCAS scores (pre-BWL Initiative) as the independent or controlled variable for students' prior achievement levels (Bebell & Kay, 2010).

A writing test was another previously referenced measure employed by the research team to study the effect of 1:1 computing on the achievement. Students in Massachusetts took the open-ended writing assessment in Grade 7 with paper and pencil. Since research suggests that the paper and pencil test modality may actually hinder the writing ability of students who are accustomed to composing and editing text digitally, the research team developed a mock MCAS open-ended writing assessment to gather data. In the spring of 2008, students in Grade 7 in all of the participating schools were

randomly assigned either by classroom or by student, dependent upon the school, to complete the mock writing assessment using either the BWL Initiative laptops or the traditional state method of paper and pencil. Students were given a publicly released MCAS prompt from 2006. Since all of the students would soon be taking the real MCAS writing assessment with paper and pencil in the near future, all factors remained the same for every student except that two thirds of the students used laptops. All spell checking, grammar checking, and other automated features of Microsoft Word were turned off, and laptop and paper-pencil students were held to the same time, scoring criteria, directions, and resource standards (Bebell & Kay, 2010).

In an effort to eliminate scorer bias in the study, the research team recruited, trained, and employed six undergraduate students in the field of education to electronically input the 141 paper essays, typos and spelling errors included, into Microsoft Word. After all of the papers were converted into an electronic format, a second team of eight education undergraduate students were formally trained and completed reliability testing utilizing the state's coding rubric to prepare for scoring the student essays. Each member of the scoring team was assigned a random sample of student essays to score on two dimensions, topic development and standard English conventions. Additionally, two other scorers evaluated each student essay on both dimensions (Bebell & Kay, 2010).

What were the results of these carefully planned and executed achievement studies? After 3 years of 1:1 laptop implementation, there was evidence of positive affect on student achievement based upon a variety of approaches. One indicator was teacher and school leadership beliefs that the laptops had a positive effect on student achievement. Overall, 71% of BWL Initiative teachers felt that the students "benefitted

greatly" from the laptops, while only 4% disagreed with the statement. Furthermore, when teachers were surveyed in June of 2008 on specific student groups regarding 14 types of student behaviors, attitudes, and activities, the majority of teachers reported an improvement in the quality of student work during the pilot. Seventy-one percent of teachers reported improved work quality for traditional students; 69% reported improved work quality for low-achieving or at-risk students; and 61% reported improved work quality for high-achieving students. When questioned specifically on improved writing quality for 1:1 laptop students, almost 60% of surveyed teachers reported improved writing quality for all student groups, traditional, low/at-risk, and high performing (Bebell & Kay, 2010).

Principal responses to the surrey about student behaviors and activities were similar to the teachers. One hundred percent of principals completing the survey reported that students were more willing to write second drafts when using the laptop. One hundred percent of the principals also concurred that the laptops helped students grasp difficult concepts and create more attractive presentations. The principals unanimously agreed that the laptops would be utilized more in the absence of pressure to perform on high stakes standardized tests (Bebell & Kay, 2010).

In an analysis of school MCAS achievement trends, both seventh- and eighth-grade student pass rates on the MCAS were weighted and averaged for the three 1:1 pilot schools and compared to the combined MCAS performance of the two control schools and statewide student MCAS performance trends. MCAS pass rates in Grade 8 math were compared to the pilot, control schools, and state average of students for each year from 1998 to 2008. In 1998, the average pass rate was 50% for both pilot and control schools, 8% below the state average that year. This performance gap was eliminated by

the control schools during the next 7 testing years which were still prior to the implementation of the BWL Initiative; however, during this same time period, the scores of BWL Initiative schools increased so slowly that they were lagging considerably behind the average pass rates of the control schools and the state by 2005-2006. For example, in 2006, the overall math MCAS pass rate for BWL Initiative schools was 59% as compared to 74% for the control schools and 71% for the state. In the spring of 2007, the math MCAS assessment was administered to the Grade 8 cohort. At that time, the BWL Initiative students had utilized the laptops for the entire eighth-grade year in addition to at least half of the seventh-grade year. This cohort of BWL Initiative students demonstrated improved pass rates of 5% each year. This unprecedented growth brought the BWL Initiative math MCAS average up to 70% by 2008 (Bebell & Kay, 2010).

Other positive achievement gains were noted in 2007 for seventh-grade math and language arts MCAS pass rates, the first full year of laptop implementation. This was the year that both students and teachers self-reported the most frequent and widespread use of the laptops. According to teacher and student survey results, "Grade 7 student performance in the BWL Initiative settings reached its highest historical levels on record for both the ELA (since 2001) and MCAS math (since 2006) during the year when BWLI implementation and use was at its peak" (Bebell & Kay, 2010, p. 33). Examination of eighth-grade MCAS results in science, math, and language arts for 2007 and 2008 revealed that the highest levels of student achievement occurred after 2 years of laptop implementation, again when students and teachers self-reported the most widespread implementation and use of the BWL Initiative laptops (Bebell & Kay, 2010).

What was the root cause of these dramatic achievement gains? Was it the mere implementation of 1:1 computing or a combination of factors? Researchers believe one

possible explanation could be that during this time period, 1:1 participation and use was complementary to instructional practices that promoted performance improvements in testing; however, this explanation is purely hypothetical in the absence of a randomized experimental study. The research team could only examine individual student performance prior to and after 2 years of 1:1 computing. Individual student sixth-grade MCAS scores available before the BWL Initiative were compared to the eighth-grade scores 2 years after participation in the BWL Initiative. Researchers broke down performance data for each student who took the BWL Initiative instructional survey and the MCAS assessment by demographics, including students who received free or reduced lunch, non-White students, and special education students (Bebell & Kay, 2010).

Furthermore, the research team conducted exploratory data analysis to see if the frequency of various teacher and student uses of technology as reported by the student survey compared with the historical 2008 achievement results. The researchers employed a principle component analysis that yielded six scales representative of various technology uses such as writing and research, solving problems, presenting information, class-related activities, communicating, and teacher use of technology. Four additional scales were then created based on student survey results of home computer use including writing and research, multimedia, communication and social use, and recreational use. Finally, two additional scales were created from a summary of student attitudes and beliefs toward 1:1 computing from student survey results. These two scales were student beliefs toward 1:1 computing and student self-perception of technological abilities (Bebell & Kay, 2010).

While this research design was not intended to nor capable of measuring the effectiveness of 1:1 computing, it provided an opportunity for the researchers to measure

whether specific teacher and/or student technology use related to positive, neutral, or negative effects on test scores. In addition, students in the control settings who were not included among those who had been given 1:1 devices were included in the design. The research results revealed some positive and some negative indicators of test achievement, with some related and some unrelated to 1:1 computing. Frequency of technology use in core area classes was statistically related to higher achievement scores on the 2007-2008 math and science Grade 8 MCAS tests. However, student use of computers in science and social studies BWL Initiative classes negatively related to MCAS language arts scores (Bebell & Kay, 2010).

In the control schools, the relationship between student computer use in core classes and MCAS scores in all content areas was negative, suggesting that computer use in non-1:1 settings did not increase student achievement. To further blur the lines between 1:1 computing and student achievement, significant positive student achievement gains in 2008 math and science MCAS scores were related to students' in-school use of technology for communication. On the other hand, student use of technology in school to present information or to complete in-class activities in science showed a negative relationship to 2008 language arts and math scores. The data were not consistent when the researcher tried to establish the value of 1:1 computing to increased student achievement (Bebell & Kay, 2010).

Upon analysis of the relationship between student home use of technology and student achievement in both 1:1 and control settings, more challenges surfaced. For BWL Initiative students, the frequency of home computer use for "recreational purposes" was a positive indicator for language arts and math MCAS scores. In the control schools, student home use of computers for multimedia purposes was a negative predictor for

language arts and math MCAS scores. In the 1:1 settings, the students' perceived technological abilities yielded a significantly positive relationship to MCAS performance in all tested areas, leading the researchers to believe that personal perception is important (Bebell & Kay, 2010).

Where does this myriad of inconsistencies in student achievement data lead in determining the effect of 1:1 computing on student achievement, the primary outcome desired by most districts? Given that prior student achievement on MCAS assessments was the single most powerful indicator for future student achievement, what were the achievement results for BWL Initiative students after taking prior achievement out of the equation? When researchers compared the sixth-grade MCAS scores of BWL Initiative students to their eighth-grade MCAS scores, they averaged an increase of 2.7 points. When the same scores were compared for the control school students, they too showed improvement but to a lesser degree with an average 1.3 point increase; but the control students still outscored BWL Initiative students on both assessments. In addition, more BWL Initiative students passed the MCAS math assessment in 2008 than in 2006; 11% more to be exact. However, the mean average score of the students decreased 1.7 points in 2008. Important to note, however, is that the average for all students, both BWL Initiative and control, on the 2008 math MCAS test was 1.4 points lower than the average for the same students on the sixth-grade MCAS test. Statistics regarding test scores with the exclusion of special education student scores revealed larger gains in both 2006 and 2008 test scores in both language arts and math in the 1:1 settings. While this may lead one to believe that a relationship exists between 1:1 computing and achievement gains for special education students, the fact that 2006 scores were also higher with the scores of these students included does not lend credibility to that hypothesis (Bebell & Kay, 2010).

In an effort to statistically assess the net change in 2008 MCAS scores that were negative for math in control and 1:1 settings and positive for language arts in both settings, the research team created student-level regression models for 2008 language arts and math scores using nearly all eighth grade 1:1 and control school students. The ELA regression model used the raw 2008 ELA MCAS score as the dependent variable, BWL Initiative status as an independent variable, and the 2006 ELA MCAS score as a control variable. The BWL Initiative status independent variable was one for 1:1 Initiative students and zero for control school students. The results revealed that, in addition to prior achievement, the increase in language arts scores was statistically significant for 1:1 students as compared to control school students. When the research team further explored relationships, if any, between BWL Initiative students' computer use and 2008 language arts scores, they found two student technology use predictors to be statistically significant. Student computer use in science class related negatively to the 2008 MCAS language arts scores for BWL Initiative students, while BWL Initiative students' recreational use of computers at home to search the Internet for fun, download music, or shop online positively related to 2008 MCAS language arts scores (Bebell & Kay, 2010).

BWL Initiative researchers also created regression models for math scores in 2008. The only indicator that was found to be statistically relevant to math scores for BWL Initiative students was prior achievement. While the student level regression model analysis revealed some positive associations between MCAS performance and 1:1 computing, the results were not conclusive, suggesting that the MCAS might not be the most appropriate measure of true student achievement in 1:1 settings. Accordingly, the BWL Initiative research team created, administered, and analyzed the results of the realistic extended MCAS mock-writing assessment in the spring of 2008 (Bebell & Kay,

2010).

Researchers administered the mock writing assessment to all seventh-grade students in the BWL Initiative schools in two 45-minute sessions after randomly assigning students to complete the assessment with the laptops or paper and pencil. Three hundred eighty-eight students wrote essays on the computers, and the remaining 141 paper essays were transcribed and converted into Microsoft Word as described previously. After being independently rated by two different scorers, the results indicated that seventh-grade students in the pilot schools wrote longer and more highly scored essays using the laptops than students addressing the same prompt but using paper and pencil. In an additional effort to eliminate any idiosyncrasies between the students who took the mock writing assessment via laptop versus paper and pencil, the researchers used the scores from the official open-response writing assessment that all students had to take via paper and pencil in the spring as a covariate. The results of the study were encouraging regarding 1:1 computing and improved writing. The BWL Initiative students had significantly higher scores on topic development when they used their laptops to write versus when they used pencil and paper. Standard English convention scores as well as the word count increased when students used the digital format. Not only did students write better using the laptops, they also wrote more. While the BWL Initiative study revealed varying outcomes across schools and content areas, it revealed the potential 1:1 computing has for achievement outcomes. In addition, it also exposed what appears to be some key indicators for 1:1 computer use and gains in student achievement, primarily frequency of computer use and rich learning experiences that foster increased learning (Bebell & Kay, 2010).

Texas and student achievement. Upon being employed by the Texas Immersion

Pilot Program as an unbiased evaluation team, the Texas Center for Educational Research (2006) outlined its purpose:

> The overarching purpose of the study is to conduct a scientifically based evaluation at the state level to test the effectiveness of technology immersion in increasing middle school students' achievement in core academic subjects as measured by the Texas Assessment of Knowledge and Skills. (p. 2)

Clearly, this statement articulated that the primary goal of the TIP program was to increase student achievement as a result of implementing a 1:1 laptop initiative.

The primary indicator used by the research team to determine the relationship of 1:1 computing with core area achievement gains was the TAKS, an assessment that measured student mastery of the state's content standards known as the TAKS. Texas students take TAKS each year while in middle school for reading and math, writing during the seventh grade, and science and social studies during eighth grade. When researchers evaluated TAKS scores of pilot school students, they utilized the following scores: met standard, which meant satisfactory academic performance; commended performance, which meant high academic achievement well above state expectations; and below standard, which meant achievement below state expectations (Texas Center for Educational Research, 2009).

In addition to TAKS scale scores provided by the Texas Education Agency, researchers generated *z* scores for each student, testing situation, and content area. These scores could be used to compare student progress on TAKS across grade levels. To make the scores easier to comprehend, they were normalized into what is known as a *t* score, which indicates that they have a mean of 50 and a standard deviation of 10. For example, a student who met standards or scored average on the TAKS would have a *t* score of 50,

while a score of 40 would be below state average (Texas Center for Educational Research, 2009).

When researchers controlled for both student and school poverty, there were no statistically significant effects of one-to-one laptop immersion on TAKS reading scores for student cohorts 2 and 3. However, positive mean growth trajectories indicated that students who were economically disadvantaged and students in schools with above average poverty levels grew in reading achievement at faster rates than their "wealthier" peers. On the surface, this appears that 1:1 laptop immersion might have been a catalyst in closing the achievement gap between economically advantaged and disadvantaged students. The math scores of students immersed in the 1:1 technology showed even more promise; the math scores increased while control school math scores decreased. In regards to science, social studies, and writing, immersion students did not experience any significant gains or losses when compared to control students (Texas Center for Educational Research, 2009).

When students and teachers in the TIP program were surveyed and interviewed regarding perceptions of the impact of 1:1 laptop immersion on learning, the answers varied. While teachers overwhelmingly agreed that the laptops increased student engagement, most teachers were reluctant to connect the laptops with increased student achievement. However, most students self-reported being better learners and showing improvement in academic performance using the laptops. As two thirds of sixth-grade students in TIP schools reported the academic benefits of laptop immersion, teachers reported that the distractions enabled by laptops such as playing games and messaging actually hindered learning (Texas Center for Educational Research, 2009).

While these data present a recurring theme, no clear picture of the effect of 1:1

computing on student achievement emerged: Some Texas schools that were part of the immersion pilot reported astounding results. Brady Middle School was a low-performing middle school in a small rural community in central Texas at the onset of the immersion pilot. They had failed to make AYP and were testing below the state average in 2004 before the pilot commenced. By 2006, they were testing above the state average and were a "recognized" campus that met AYP. Across the board gains were made in math, reading, writing, and social studies. Outstanding achievement gains were recorded in the sixth and seventh grades, with the percentage of seventh-grade students passing the TAKS for language arts increasing 17 points in 2 years and the percentage of seventh-grade students passing the math TAKS increasing 13 points in 2 years. School administrators and teachers credit 1:1 laptops as a key factor in these achievement gains. Notice, they did not credit the laptops as the reason for the gains but as a key factor, thus tying into earlier arguments about changing the way 1:1 laptops are perceived and used by teachers and students. Brady administrators noted that curriculum alignment was the key to tapping into the power of the resources 1:1 technology offered. After this epiphany, teachers started planning together and collaborating to address the specific needs of each student, thus differentiating and being purposeful with instruction and technology integration (Givens, 2007).

Maine and student achievement. The MLT Initiative was the first statewide 1:1 laptop initiative and one of the highest profile ones (Weston & Bain, 2010). Fully implemented initially in the 2002-2003 academic year, every seventh- and eighth-grade student and teacher in Maine had access to a laptop and other necessary supports such as wireless access and professional development. MEPRI was contracted to conduct the ongoing evaluation of the wireless initiative. For over 8 years, MEPRI employed a

mixed-methods approach to collect and analyze research and evaluation evidence on the effectiveness of the MLT Initiative. Researchers collected evidence with online surveys, site visits, and research studies (MLT Initiative Research and Evaluation Team, 2011).

In terms of measuring the effect of 1:1 laptops on student achievement, MEPRI conducted a variety of small- and large-scale studies. The first study, the Maine Affect Study of Technology in Mathematics Achievement, was designed to determine the effect of sustained technology-infused professional development on student math achievement. The study's basic foundation was that ongoing and robust professional development would result in increased content knowledge and pedagogical skills that effectively integrated technology. Consequently, these teacher transformations would positively affect student math achievement. In this randomized control study, 56 schools were randomly assigned to either an experimental or control group. Professional development was designed to increase teacher content knowledge of numbers and operations and patterns. Teachers completed blended learning professional development, both face to face and virtual, and participated in peer coaching, mentoring, and site visits. In addition, they were assessed on content and pedagogy. The results revealed that the students of teachers who fully participated in all aspects of the robust professional development for 20 months outscored their peers in control groups, especially on the two content focuses of numbers and patterns (MLT Initiative Research and Evaluation Team, 2011).

An analysis of student writing scores also revealed promise. Researchers focused on student test scores on the Maine Educational Assessment (MEA), the annual statewide test, in the year 2000 before 1:1 computing and 2005 after the program had been implemented for a few years. The average writing score increased by 3.44 points during that time period; furthermore, key findings were discovered regarding the relationship

between how the laptops were used for writing and the increased achievement. Students who reported never using their laptops for writing had the lowest scores on the scale; students who used their laptops for all aspects of the writing process had the highest scores. Researchers analyzed if the students just became better writers while using the laptops or if they became better writers in general and noted a finding that was unanticipated. During a random writing assessment, some students used a computer, while others used pencil and paper. Researchers found that the scale scores from the earlier writing assessment were almost identical. The students who used the laptops frequently and consistently in all aspects of writing had better scores, regardless of how they took the test, digitally or traditionally (MLT Initiative Research and Evaluation Team, 2011).

The myriad of results, both positive and negative, in terms of the effectiveness of 1:1 laptops and student engagement were inconsistent, but the results provided clues and guidance for utilizing laptops as cognitive tools that can indeed drive systemic and sustaining academic growth. All of these case studies revealed pertinent information that educators could use to implement 1:1 computer initiatives that are well designed, purposeful, and research-driven to promote student academic gains.

Synthesis and Critique of Literature

The data varied on the affect that 1:1 laptop initiatives have on student engagement and achievement. However, certain similarities surfaced among the successes and failures documented in the case studies of three major 1:1 programs: the BWL Initiative, the TIP, and the MLT Initiative. These similarities provided an opportunity to design an effective and systemic educational reform initiative that

employed laptops as tools to promote meaningful change, not the magic bullet that will erase all educational woes.

These case studies indicated that meaningful educational reform occurs when "change" is accepted and implemented "by educators, not to them" (Weston & Bain, 2010, p. 9). In other words, the change must be bottoms-up, not top-down so all stakeholders in the community have buy-in to a shared vision with clear drivers developed by the community in pursuit of a common goal. Furthermore, the laptops must be viewed as a cognitive tool that teachers and students use in conjunction with teaching and learning practices that are proven to yield high-achievement gains such as cooperative learning, differentiation, and problem-based learning. Additionally, the students must have true ubiquitous access to the laptops, meaning they can take them home daily and should use them daily in all classes and at home to deepen knowledge and engage in meaningful student-centered learning activities.

Finally, teachers must be supported at all levels when implementing a 1:1 laptop program. They must be provided clear expectations for the seamless integration of technology use daily in all classes. They must be supported by ongoing and robust professional development that provides them with critical knowledge of how to integrate technology into their lessons. The reform must have a shared purpose and go beyond substituting an online quiz for a paper worksheet. Classroom teachers must be taught how to develop transformational educational opportunities that utilize technology to create, collaborate, communicate, and think critically. They must have building-level support that creates a cocoon that encourages them to take risks with technology, knowing that someone will always be there to help them when things do not go as planned. Finally, the case studies highlighted the importance of school administrators in

the success of a 1:1 initiative. Principals should model effective technology integration and praise teachers who use the laptops as cognitive tools that drive student achievement. The review of related literature provided knowledge on a variety of perspectives and theories on best practices for the use of technology, especially 1:1 technology. The varied findings from the case studies served as a backdrop for the researcher who sought to describe the use of technology and perceptions of the importance of the 1:1 technology to learning for the students in District Z. The frequency of use in this rural eastern North Carolina school district was the *unknown* and the *priority* of this study. Without consistent, effective, and efficient use of technology, improved student engagement and achievement becomes a moot point.

Conclusion

This chapter reviewed three major case studies of three large 1:1 technology initiatives: the BWL Initiative in Massachusetts, the TIP, and the MLT Initiative. Context from the research on student engagement and student achievement was provided, and the findings varied. This chapter was organized with an overview of the background and methodology for each of the three studies, findings on student engagement for each of the three studies, and findings on student achievement for each of the three studies. Chapter 4 presents the descriptive data from the survey according to the three research questions. Chapter 5 summarizes the findings and the professional perspective of the researcher.

Chapter 3: Methodology

Introduction

Some school systems in this country spend thousands of dollars each year purchasing new and innovative technology. Low wealth school districts, however, can ill afford to continue investing large sums of money without solid proof of positive returns for the dollars spent. By definition, these districts reside in counties that cannot generate enough local revenue to adequately support public schools. In 2014-2015, District Z, the school system designated for this study, embarked on a 1:1 technology initiative that provided each middle school student with a Chromebook. According to Microsoft's 1:1 guidebook, 1:1 technology can be defined as "an environment in which students use computing devices such as wireless laptops or tablet PC computers in order to learn anytime and anywhere" (Microsoft, 2005, para. 3). The intent of the 1:1 initiative in District Z was to harness the power of technology for student engagement and ultimately effect student achievement. Nonetheless, in order to reap the benefits of technology, not only does it have to be used consistently and with educational legitimacy by both the teachers and students, technology must be perceived as an important educational tool.

The purpose of this quantitative study was to clarify and describe to the policymakers and stakeholders of School District Z the frequency of use of the 1:1 technology, the frequency of use of other technological devices on the part of the teachers and students, and finally the middle school students' perceptions of the importance of technology access to their learning. Politicians, policymakers, and other educational stakeholders expect efficient and effective spending of district dollars. They deserve to know if these huge technological expenditures are producing the desired academic

results.

Thus, the following three questions guided this research study.

1. How frequently do middle school students in District Z use 1:1 technology?
2. Do the middle school students in District Z believe that technology access is important to learning?
3. How frequently do middle school teachers and students in District Z use other technological devices?

Methodology

Descriptive research, the method used in this study, is characterized by the deliberate and systematic articulation and analysis of issues lacking clarity (Butin, 2010). Survey research was chosen because it is one of main methods used in descriptive studies. Upon answering survey questions, the researcher used descriptive statistics to describe the responses given. It is important to note that descriptive research can only describe the data collected (Hale, 2011). Bickman and Rog (1998) believed that descriptive studies can answer questions such as what is and what was. To obtain the frequency of use data, the researcher administered a survey comprised of 15 questions that was adapted from other survey instruments or developed by the researcher based on the themes of the literature review in Chapter 2 (see Appendix A). In accordance with copyright law, the researcher contacted the owners of the original survey for permission to use survey questions (see Appendix B).

Since students were involved, permission from the Institutional Review Board was requested and granted. The researcher obtained permission to conduct the study from the superintendent and the Board of Education. Next, the middle school director

and the middle school principals granted permission (see Appendix C). On April 18, 2016, the Director of Middle Schools presented the proposed research study to all middle school principals in order to garner support. To facilitate the process, the researcher provided a packet of materials that included the purpose of the study, the manner in which the survey would be administered, and the data anticipated from the survey instrument. The researcher also explained to the middle school principals how the anticipated data might benefit teachers and students (see Appendix D). The writer included in the packet of materials a copy of the debriefing statement and the survey.

Next, the researcher conducted a pilot study to gain insight into the possible weaknesses of the study instrument. In 2001, Van Teijlingen and Hundley noted that pilot studies are essential to a well-designed study and may increase the success of the actual study. In this research, the pilot study included approximately 120 students in District Z's five middle schools. The students in the pilot study represented only two schools. The pilot study was designed to assist the writer in validating the research instrument prior to administering the survey at multiple sites (see Appendix E). The school provided Chromebooks to each student who was then instructed to proceed to the Google Classroom in order to access the link to the validation survey. The researcher explained to the subjects that the survey should take approximately 15 minutes. Further, the researcher emphasized to the subjects that their participation was voluntary and that they could choose to stop participating in the study at any time. In addition, the researcher stressed the confidentiality of the survey results and stated that all responses would be compiled and analyzed as a group. The researcher explained that the 1:1 initiative meant that a technological device was available to each student before, during, and after class. After being instructed to select the identifier (i.e., "School A") for the

school attended (a system devised to protect confidentiality of participant results), the students took approximately 15 minutes to complete the survey. After completion of the online survey, the students were given a hard copy of the survey and instructed to highlight words that they did not understand or that they felt needed further clarification (see Appendix F). After all students finished the survey and highlighted items needing further clarification, the researcher thanked them for completing the survey. The researcher also instructed the participants to use the e-mail provided if they had further questions about the research study.

Participant feedback was used to revise the survey before it was administered to the other middle school students. The researcher analyzed the collective highlights from the pilot groups and discovered considerable trouble with the terms 1:1, Elmo, and Promethean. The analysis of the data revealed sporadic confusion over terms such as Edmodo, incorporate technology, and the confidential school identifier. Using feedback from the pilot participants, the researcher made revisions and modifications to the instrument and clarified the directions.

Administrators at each of the participating schools chose the dates and location of the formal survey administration. The researcher emailed administrators the day before the administration of the survey as well as the morning and afternoon of the survey (see Appendix G) to ensure that the Technology Coordinator put the link up just prior to survey administration and took the link down immediately after the survey was administered. This communication was necessary to ensure that students involved in the pilot did not take the survey and skew the results. Students were given the choice to opt out of participating in the survey per board policy. Parents or guardians had to return a signed form provided by the researcher (see Appendix B). Upon being provided

technological devices and reading directions to the survey, students accessed the secure survey powered by Survey Monkey via a provided link. Students with unresolved questions regarding the survey were encouraged to email the researcher.

Data Analyses

Because the survey was online, the results were available quickly. Survey Monkey provided the tables, graphs, and/or charts needed for data analysis for each survey question. In order to report the meaning of the survey results and draw conclusions, the researcher analyzed percentages, mean, and ordinal rankings per survey question to determine meaning and if common or recurring themes could be extracted from the numbers. Frequency and percentages helped tell the story of the survey data. Descriptive analysis was used to describe opinions, characteristics, and population (Creswell, 2014). Tabulated descriptions (tables), graphical descriptions (graphs and charts), and statistical commentary (discussion of the results) helped to summarize data from the research study. For questions 2, 4, 5, and 6, the researcher calculated the standard deviation. The standard deviation provided a more detailed estimate of the dispersion or the spread of numbers from the mean. In order to compute the standard deviation from the mean, Survey Monkey data files were opened in Excel. Next, the data were reformatted and coded by giving numeric values to the answer choices for each survey question. The Excel files were uploaded in SPSS 24, a popular statistical software package used by many statisticians that is capable of performing highly complex data manipulation and analysis. In SPSS 24, values were assigned to numeric codes before the descriptive statistics were run. The output from SPSS 24 revealed mean and standard deviation. The output added additional clarity to the response data. The researcher

describes the SPSS 24 output in Chapter 4.

Research Context and Subjects

The setting of the study was a rural, eastern North Carolina public school system comprised of 1,200 students from diverse racial and socioeconomic backgrounds who attended the five middle schools in the county. The researcher worked with school administrators in order to collect the quantitative data necessary to answer the research questions. At the time of the study, the researcher was an assistant principal at one of the middle schools included in this study.

Creswell (2005) suggested that the general statute regarding the size of a sample population for a research study "is to select as large a sample as possible for the population" (p. 149) to counterweigh for potential error or prejudice. The researcher utilized convenience sampling in the selection of participants. According to Suen et al. (2014),

> Convenience sampling is a non-probabilistic sampling technique applicable to qualitative or quantitative studies, although it is most frequently used in quantitative studies. In convenience samples, subjects more readily accessible to the researcher are more likely to be included. Thus, in quantitative studies, the opportunity to participate is not equal for all qualified individuals in the target population and study results are not necessarily generalizable. (p. 105)

Convenience sampling was used because the researcher was a member of the community in which the study was conducted and the subjects were readily accessible.

A dedicated portal ensured participant confidentiality; students signed on to their assessment portals using a school/classroom identifier. Neither names nor personal

identification numbers were required to sign on and complete the survey. To ensure confidentiality of the selected classrooms and the participants, the assigned code that indicated the location of the classrooms was placed in a secure location for researcher use only. To encourage honest responses on the survey instrument, the researcher guaranteed anonymity to participants. The research posed no risk to student subjects at any time and did not involve deception of any kind.

Summary

This descriptive, quantitative study was designed to clarify and describe to the policymakers and stakeholders of School District Z, the frequency of use of the 1:1 technology, the frequency of use of other technological devices by teachers and students, and finally the middle school students' perceptions of the importance of technology access to their learning. District Z, like many schools in North Carolina and the nation, operates on a limited budget; and the 1:1 technology implementation was a major budgetary investment that had not been challenged by evaluating the return on that investment. Politicians, policymakers, and other stakeholders deserve to know if massive expenditures such as the 1:1 technology are producing the desired academic results. To answer the research questions, the researcher collected data by surveying students from the five middle schools in the county. Survey Monkey was used to administer the survey and structure the raw data. Descriptive statistics, frequency, and percentages helped clarify and add meaning to the survey data. Tabulated descriptions (tables), graphical descriptions (graphs and charts), and statistical commentary (discussion of the results) helped to summarize data from the research study. For questions 2, 4, 5, and 6, the researcher computed the standard deviation from the mean using SPSS 24 software. The standard deviation provided a more detailed estimate of the dispersion or the measure of

the spread of numbers from the mean. The findings of the data analyses are reported in Chapter 4. The researcher presents the conclusion and the professional perspective in Chapter 5.

Chapter 4: Results

Introduction

Low-wealth school districts such as District Z cannot afford to invest in expensive initiatives without hard data to prove that the educational gains are worth the expenditure. Technology has consistently been a high-dollar line item in many districts, but the evaluative data to show the effects may neither exist nor align with the degree of spending. Although some experts such as Akyürek and Afacan (2012) believe that 1:1 technological initiatives can significantly influence test scores and other student achievement data, other experts disagree. In 2014-2015, District Z, a low-wealth school district in North Carolina, allocated funding to implement a 1:1 technology initiative in its five middle schools with the expectation of influencing student achievement. Prior to this study, no empirical data were available to the stakeholders and policymakers that described the frequency of use of all technological devices or clarified the importance of technology access for the middle school students' learning.

The purpose of this study was to clarify and describe to the policymakers and stakeholders in School District Z the frequency of student use of the 1:1 technology, whether students believe that technology access is important to learning, and the frequency of use of all technological devices by teachers and students.

The following questions guided this research study.

1. How frequently do middle school students in District Z use 1:1 technology?
2. Do the middle school students in District Z believe that technology access is important to their learning?
3. How frequently do middle school teachers and students in District Z use other

technological devices?

Description of Methodology

The middle school students took a 15-item electronic survey using SurveyMonkey which provided the tables, graphs, and charts needed to analyze the data for each survey question. To report the meaning of the survey results and draw conclusions, the researcher analyzed percentages, means, and ordinal rankings per survey question to determine whether common or recurring themes could be extracted from the numbers. Frequency and percentages helped tell the story of the survey data. The researcher used descriptive analysis to describe opinions, characteristics, and population (Creswell, 2014). Tabulated descriptions (tables) and statistical commentary (discussion of the results) helped to summarize data from the research study. For questions 2, 4, 5, and 6, questions that specifically answered the research questions, the researcher calculated the standard deviation. The standard deviation provided a more detailed estimate of the dispersion or the measure of the spread of numbers from the mean. To compute the standard deviation from the mean, the researcher opened SurveyMonkey data files in Excel and then reformatted and coded the data by giving numeric values to the answer choices for each survey question. The researcher then uploaded the Excel files to SPSS 24, a popular statistical analysis software used by statisticians in many different fields that is capable of performing highly complex data manipulation. In SPSS 24, the researcher assigned values to numeric codes before computing the standard deviation.

Results by Research Question

Research Question 1. How frequently do middle school students use 1:1 technology in District Z? Exactly 1,108 participants responded to survey question 6, and

14 participants abstained. The students' responses, shown in Table 1, were as follows: 9.57% of students responded that technological devices were used regularly in one class, 13.81% of students said the devices were used regularly in two classes, 23.56% of students stated that technological devices were used regularly in three classes, 29.51% of students responded that technological devices were used regularly in four classes, and 23.56% of students reported use of technological devices regularly in five or more classes.

Table 1

Combined Responses to Survey Question 6

How many of your classes use the 1:1 devices regularly?	
Number of classes using 1:1 devices	% of Respondents
1	9.57
2	13.81
3	23.56
4	29.51
5 or more	23.56

Note. $N = 1{,}108$ (14 nonrespondents).

As part of the methodology, the researcher chose to calculate the standard deviation from the mean in question 6 using the SPSS 24 software to determine the dispersion of the answers from the mean. The answer choices were coded as follows: 1 (coded in SPSS as 1), 2 (coded in SPSS as 2), 3 (coded in SPSS as 3), 4 (coded in SPSS as 4) and 5 or more (coded in SPSS as 5). The SPSS output revealed that the average value of the mean was 3.44 with a standard deviation of 1.3. The responses to question 6 predominately concentrated around answer choice 3 and a fragment beyond. The standard deviation of 1.3 shows a small spread across the answers to question 6.

Survey question 7 asked participants in which class they used the 1:1 devices most often. Table 2 shows the responses of the 1,105 students who answered this question. Participants responded as follows: 19.19% responded that the 1:1 devices were used most often in language arts, 21.72% stated that the devices were used most often in math, 37.19% reported using 1:1 devices most often in science, 17.65% responded that 1:1 devices were used most often in social studies, and 4.25% responded that the 1:1 devices were used most often in enhancements.

Table 2

Combined Responses to Survey Question 7

Which classes do you use the 1:1 devices for most often?	
Classes using 1:1 devices	% of Respondents
Language arts	19.19
Math	21.72
Science	37.19
Social studies	17.65
Enhancements	4.25

Note. N = 1,105 (17 nonrespondents).

When asked in survey question 8 whether they sought to use the 1:1 devices during their free time, Table 3 shows 1,103 students responded, and 19 students skipped it. The results were fairly evenly divided, with 51.04% of students noting that they used the 1:1 devices after finishing their work, whereas 48.96% responded that they did not seek to use the 1:1 devices during free time.

Table 3

Combined Responses to Survey Question 8

When you finish your work, do you seek free time to use the 1:1 device?	
Free-time use of 1:1 device	% of Respondents
Yes	51.04
No	48.96

Note. $N = 1{,}103$ (19 nonrespondents).

Research Question 2. Do the middle school students in District Z believe that 1:1 technology access is important to their learning? Survey question 4 asked the respondents the following question: How important do you feel that having access to technology is to your learning? Only 1,092 participants responded; 30 participants skipped it. As shown in Table 4, the respondents' answers revealed the following: 40.57% reported access to technology as very important to learning, 50.09% reported access to technology as pretty important to learning, 8.52% reported access to technology as not very important to learning, and 0.82% reported access to technology as not important at all to learning. Thus, over 90% of the students indicated that access to technology was important to learning.

Table 4

Combined Responses for Survey Question 4

How important to your learning do you feel having access to technology is (i.e., do you learn better from the use of technology)?	
Importance to learning of access to technology	% of Respondents
Very important	40.57
Pretty important	50.09
Not very important	8.52
Not important at all	0.82

Note. N = 1,092 (30 nonrespondents).

Because the answers from survey question 4 (How important to your learning do you feel having access to technology is?) explicitly supplied data for answering research question 2, the researcher chose to calculate the standard deviation from the mean using the SPSS 24 software to determine the dispersion from the mean. The answer choices to survey question 4 were as follows: very important (coded in SPSS as 4), pretty important (coded in SPSS as 3), not very important (coded in SPSS as 2), not important at all (coded in SPSS as 1), and other (coded in SPSS as 0). The SPSS output revealed that the average value of the mean was 3.30 with a standard deviation of 0.66. The responses to survey question 4 predominately hovered over answer choice 3, *pretty important* (3); therefore, the middle school students felt that having access to technology is *pretty important* to learning. With the standard deviation of 0.66, there was less spread across the respondents' answers to survey question 4; therefore, it is safe to say that the answers are closely aligned.

The results from survey question 9 as shown in Table 5, which asked participants if they make better grades when using the 1:1 device, received positive responses from

most of the students (1,101 students, or 84.29% of the respondents). These students indicated that their grades improved using a 1:1 device. Twenty-one students skipped the question. The remaining nine students, or 15.71% of the participants, indicated that using the 1:1 device did not affect grades.

Table 5

Combined Responses for Question 9

Do you make better grades when using the 1:1 device?	
Improved Grades	% of Respondents
Yes	84.29
No	15.71

Note. $N = 1{,}101$ (21 nonrespondents).

Survey question 11 asked participants to describe experiences using the 1:1 device; they could select all answers that applied from the four given. Twenty-two students skipped this question on the survey. The remaining 1,100 participants answered this question as follows: 13.82% described their experience using the 1:1 device as playtime or game time, 7.55% described their experience using the 1:1 device as unstructured or were unsure of expected learning outcomes, 61.45% described the experience using the 1:1 device as applicable to what was covered in class, and 68.55% described the experience with the 1:1 device as appropriate for current classes and important for required/anticipated future skills. Therefore, roughly two thirds of the students described experiences while using the 1:1 devices as appropriate for material covered in class and/or important for future skills. Table 6 displays the data findings.

Table 6

Combined Responses for Question 11

How do you describe your experience using your 1:1 device?	
Experience using 1:1 device	% of Respondents
Playtime or game time	13.82
Unstructured, not sure of expected learning outcomes	7.55
Applicable to what you are covering in class	61.45
Appropriate for current classes and important for required/anticipated future skills	68.55

Note. N = 1,100 (22 nonrespondents).

Nineteen participants skipped survey question 12, which asked how they felt about learning when using the 1:1 devices in class and instructed them to select all applicable answers. The remaining 1,103 survey participants responded to question 12 as follows: 59.75% reported feeling engaged in the activities, 35.63% reported feeling inspired by the activities, 68.36% reported feeling interested in the activities, 9.79% reported feeling bored by the activities, and 1.99% reported feeling disengaged from the activities. The data indicated that almost 60% of the students felt engaged in activities and that over one-third felt inspired. The interest level that the students using the 1:1 devices felt exceeded that of two thirds of the respondents to question 12. Table 7 displays the data findings.

Table 7

Combined Responses for Question 12

How do you feel about your learning when using the 1:1 device in class?	
Reaction to use of 1:1 device	% of Respondents
Engaged in the activities	59.75
Inspired by the activities	35.63
Interested in the activities	68.36
Bored by the activities	09.79
Disengaged in the activities	1.99

Note. N = 1,103 (19 nonrespondents).

The survey results for question 13, in which participants were asked to select all that apply regarding what best described them when using the 1:1 device in class, was answered by 1,108 students, and 14 skipped it. Table 8 shows that the participants responded as follows: 40.70% self-described as curious learners, 62.91% self-described as hardworking learners, 11.91% self-described as bored learners (i.e., their minds were on other things), 47.47% self-described as engaged learners, 60.38% self-described as interested learners, and 1.9% self-described as disengaged learners. The number of students who self-described as interested is exceeded only by the number who self-described as hardworking. The interest level noted in question 13 supports that reported in question 12, and respondents' answers support the level of engagement.

Table 8

Combined Responses for Question 13

Which of the following best describes you when using the 1:1 device in class? (Select all that apply.)	
Learner Type	% of Respondents
Curious learner	40.70
Hardworking learner	62.91
Bored (my mind is on other things)	11.91
Engaged in learning	47.47
Interested in learning	60.38
Disengaged in learning	1.90

Note. N = 1,108 (14 nonrespondents).

Research Question 3. How frequently do middle school teachers and students in District Z use technological devices? When asked in survey question 2 how often they used computers (not solely 1:1 technology) in school, 1,077 survey participants responded as follows: 78.18% reported daily computer use, 19.96% reported weekly computer use, 0.74% reported using a computer twice monthly, 0.84% reported using a computer once a month, and 0.28% reported never using a computer. Of the 1,122 participants, 45 skipped question 2. The majority, over three quarters of the students, reported using computers daily. Another almost 20% reported weekly use of computers. A negligible number of students, less than 1%, reported using computers weekly, monthly, or never.

Table 9

Combined Responses for Survey Question 2

How often do you use a computer in school?	
Frequency of computer use in school	% of Respondents
Daily	78.18
Weekly	19.96
Twice monthly	0.74
Once monthly	0.84
Never	0.28

Note. N = 1,077 (45 nonrespondents).

Because the data from survey question 2 are key to answering Research Question 3, the researcher calculated the standard deviation for survey question 2 using SPSS 24 to determine the dispersion of the responses from the mean. The answer choices to question 2 were as follows: daily (coded in SPSS as 180, depicting 180 days in an academic year), weekly (coded in SPSS as 36, depicting 36 weeks in an academic year), twice a month (coded in SPSS as 18, depicting 9 months in an academic year multiplied by 2), and once a month (coded in SPSS as 9, depicting 9 months in a school year). The SPSS output was a mean of 148.12, and the standard deviation was 0.61. The interpretation of the statistics showed that, on average, most students selected *daily* as the answer to question 2.

Question 3 asked the respondents how often teachers use technology such as computers, iPads, projectors, document cameras, and Smart Boards for classroom instruction. As shown in Table 10, the findings from question 3 reveal that the majority of students (82.75%) reported that their teachers use technology integration daily. Again, a negligible number of participants (1.02%) reported that teachers never used technology for classroom instruction.

Table 10

Combined Responses for Question 3

How often does your teacher use technology for classroom instruction, such as a computer/iPad and projector, Elmo (document camera), or Promethean (Smart Board)?	
Frequency of technology use for classroom instruction	% of Respondents
Daily	82.75
Weekly	14.17
Twice monthly	1.30
Once monthly	0.65
Never	1.02

Note. N = 1,080 (42 nonrespondents).

Question 5 asked students about the extent to which they agreed or disagreed that their teachers did a good job of incorporating technology into instruction. As shown in Table 11, of the 1,105 participants who responded to question 5, the results were as follows: 43.35% strongly agreed that the teachers do a good job of incorporating technology into lessons, 51.49% agreed that the teachers do a good job of incorporating technology into lessons, 3.8% disagreed that the teachers do a good job of incorporating technology into lessons, and 1.36% strongly disagreed that the teachers do a good job of incorporating technology into lessons. Seventeen survey participants skipped question 5. Given four choices of agreement ranging from “strongly agree” to “strongly disagree,” almost 95% of the students agreed that teachers do a good job of incorporating technology into lessons.

Table 11

Combined Responses for Question 5

Overall, my teachers do a good job of incorporating technology into their lessons.	
Level of agreement regarding teacher incorporation of technology into lessons	% of Respondents
Strongly agree	43.35
Agree	51.49
Disagree	3.80
Strongly disagree	1.36

Note. N = 1,105 (17 nonrespondents).

Because the data from survey item 5 were fundamental to answering Research Question 3, the researcher calculated the standard deviation from the mean using the SPSS statistical software. As stated earlier, the answer choices were as follows: strongly agree (coded as 4), agree (coded as 3), disagree (coded as 2), and strongly disagree (coded as 1). SPSS 24 output revealed a mean of 3.37 and a standard deviation of 0.63. Therefore, the answers predominately hovered over answer choice 3 (agree). On average, most students agree that teachers do a good job of incorporating technology into lessons. With a standard deviation of 0.63, it is safe to say that the answers align closely with a small spread across the answers. The implication from the data is that the incorporation of technology is standard for teachers. In other words, teachers routinely incorporate technology into the lessons.

Survey question 10 asked respondents for what purpose they most often used computers. As displayed in Table 12, the data showed that 1,122 survey participants responded to question 10 with the following results: 52.14% of participants reported Internet use, 85.20% of participants responded that they used computers for research,

49.73% of participants reported using computers at school for writing papers, 70.14% of participants reported using computers at school for learning material, 29.86% of participants used computers at school for watching videos, and 17.29% of participants reported using computers at school for playing games.

Table 12

Combined Responses for Question 10

What do you use computers for the most?	
Computer usage	% of Respondents
Internet	52.14
Research	85.20
Writing papers	49.73
Learning material	70.14
Watching videos	29.86
Playing games	17.29

Note. $N = 1{,}122$.

In survey questions 14 and 15, the researcher specifically targeted frequency of teacher and student use of technological devices, asking participants how frequently their instructors used specific methods to communicate with them. The students selected from the following options: face-to-face either before or after class, face-to-face using teacher's planning time, phone, personal/individual e-mail, mass e-mail or announcement to the whole class, updates/announcements on course websites/Schoology website/Edmodo, or instant messaging. Table 13 reveals that 24 students declined to answer the question, leaving 1,098 participants who responded. Participants could also select one of the following frequencies for each of the preceding communication methods: daily, a couple of days per week, weekly, a few times per semester, or never.

Students responded as follows regarding the frequency of the communication method face-to-face either before or after class: 40.99% replied daily, 22.50% replied a few times per week, 7.47% replied weekly, 14.01% replied a few times per semester, and 15.03% replied never. Students responded as follows regarding the frequency of face-to-face communication during the teacher's planning time: 18.18% replied daily, 13.83% replied a few times per week, 11.99% replied weekly, 17.5% replied a few times per semester, and 38.49% replied never. Students responded as follows regarding the frequency of communication by phone: 8.41% replied daily, 6.48% replied a few times per week, 7.35% replied weekly, 19.05% replied a few times per semester, and 58.7% replied never. Students responded as follows regarding the frequency of communication by personal/individual e-mail: 15.72% replied daily, 15.12% replied a few times per week, 13.53% replied weekly, 20.60% replied a few times per semester, and 35.02% replied never. Students responded as follows regarding the frequency of communicating with mass e-mails or announcements to the whole class: 29.29% replied daily, 20.61% replied a few times per week, 16.89% replied weekly, 16.22% replied a few times per semester, and 16.98% replied never. Students responded as follows regarding the frequency of the communication by updates/announcements on course websites/Schoology website/ Edmodo: 31.02% replied daily, 22.11% replied a few times per week, 15.28% replied weekly, 13.57% replied a few times per semester, and 18.03% replied never. Finally, students responded as follows regarding the frequency of the communication by instant messaging: 8.74% replied daily, 8.74% replied a few times per week, 7.47% replied weekly, 12.38% replied a few times per semester, and 62.67% replied never.

Table 13

Combined Responses for Question 14

Please tell us how frequently your instructors use each of the following methods to communicate with you. (Select one per row.)					
Communication method	Daily	A few times per week	Weekly	A few times per semester	Never
Face-to-face either before or after class	40.99%	22.50%	7.47%	14.01%	15.03%
Face-to-face using teacher's planning time	18.18%	13.83%	11.99%	17.50%	38.49%
Phone	8.45%	6.48%	7.35%	19.05%	58.70%
Personal/individual e-mail	15.72%	15.12%	13.53%	20.60%	35.02%
Mass e-mail or announcement to the whole class	29.29%	20.61%	16.89%	16.22%	16.98%
Update/announcement on course website/Schoology site/Edmodo	31.02%	22.11%	15.28%	13.57%	18.03%
Instant messages	8.74%	8.74%	7.47%	12.38%	62.67%

Note. N = 1,098 (24 nonrespondents).

Twenty-three students skipped survey question 15, which asked participants how often they used the following communication methods when communicating with their classmates about courses or coursework: face-to-face, phone/cell phone, e-mail, or instant messaging. Students could select one of the following frequencies for each of the preceding methods of communication: daily, a couple days per week, weekly, a few times per semester, or never. Of the 1,099 participants who answered question 15 in response

to the face-to-face communication method, 66.76% responded daily, 14.26% a few times per week, 6.67% weekly, 4.63% a few times per semester, and 7.69% never. In response to using the phone or cell phone, the students responded thus: 25.58% daily, 16.02% a few times per week, 11.29% weekly, 10.42% a few times per semester, and 36.68% never. In response to the question of whether they communicated by e-mail, the students responded thus: 18.29% daily, 14.92% a few times per week, 10.49% weekly, 18.67% a few times per semester, and 37.63% never. In response to using instant messaging, the students responded thus: 24.76% daily, 13.68% a few times per week, 9.63% weekly, 11.18% a few times per semester, and 40.75% never. Table 14 displays the findings.

Table 14

Combined Responses for Question 15

How often do you use the following when communicating with your classmates about courses or coursework? (Select one per row.)

Communication Method	Daily	A few times per week	Weekly	A few times per semester	Never
Face-to-face	66.76%	14.26%	6.67%	4.63%	7.69%
Phone/cell phone	25.58%	16.02%	11.29%	10.42%	36.68%
E-mail	18.29%	14.92%	10.49%	18.67%	37.63%
Instant messages	24.76%	13.68%	9.63%	11.18%	40.75%

Note. N = 1,099 (23 nonrespondents).

Summary of Results

An analysis of the data revealed that although students self-reported using computers daily, the responses regarding 1:1 technology did not reflect consistent daily use of the devices. The majority of the students believed that access to computers was important to learning. Additionally, when using 1:1 technology, students self-described

as hardworking, interested, and engaged. What the data suggest is that the use of 1:1 technology can be a precursor to more student engagement and enhanced student achievement.

Conclusion

Chapter 4 presented the descriptive statistics used to answer the three research questions. The survey data were presented by research question. In Chapter 5, the researcher describes the meaning of the data and provides the result conclusions. Chapter 5 also provides the researcher's professional perspective and recommendations for further research.

Chapter 5: Discussion

Introduction

District Z, a low-wealth rural school system, does not have the resources to invest large sums of money in technology initiatives without hard data to justify the expenditure to stakeholders and politicians. Although some educators have confirmed the positive results of integrating technology into the instructional day, many stakeholders, including some taxpayers, still need convincing. Politicians' campaign platforms often include the call for better schools. If elected, the candidates promise to improve education as it is defined at the moment, knowing that many Americans are dissatisfied with the performance of public schools; yet sustained local funding for technology may depend on the availability of data to verify positive results from the use of educational technology. In 2014-2015, District Z allocated funding to implement a 1:1 initiative in all five of the middle schools with the goal of affecting student achievement. Prior to this study, no empirical data were available to the stakeholders and policymakers in District Z that described the frequency of use of technological devices or clarified the importance of technology access in the teaching of middle school students.

The purpose of this study was to describe to the policymakers and stakeholders in School District Z the frequency of use of the 1:1 technology; whether students believed that technology access in school was important to their learning; and finally, the frequency of use of all technological devices by teachers and students. Descriptive research, the method used in this study, allowed the researcher to focus on the current state of 1:1 technology use through the eyes of students in District Z and to describe the students' perceptions of the importance of personal access to technology. The data

collection process involved surveying a convenience sample of approximately 1,100 middle school students from five middle schools in the district. The research instrument was a 15-question survey developed and refined by the researcher. Prior to administering the survey to the participants, the researcher conducted a pilot study using approximately 10% of the total population. Students who participated in the pilot study did not participate in the final data collection phase. The researcher used the results from the pilot study to revise the research instrument, thus creating a clearer, more comprehensible instrument for use in the formal research study.

The researcher analyzed percentages, mean, and ordinal rankings of the survey questions that specifically answered the three research questions stated below. This analysis allowed the researcher to assign meaning to the data and to identify common or recurring themes that could be extracted from the numbers. Frequency and percentages helped tell the story of the survey data. A descriptive analysis illustrated the opinions and characteristics of the population (Creswell, 2014). Tabulated descriptions (tables) and statistical commentary (discussion of the results) helped to summarize the data from the study. Descriptive data explained the state of affairs that existed at the time of the research.

The following questions guided this research study.

1. How frequently do middle school students in District Z use 1:1 technology?
2. Do middle school students in District Z believe that technology access in school is important to learning?
3. How frequently do middle school teachers and students in District Z use other technological devices?

In this chapter, the researcher presents the descriptive data. The findings are

presented according to the research questions. Finally, the researcher offers implications and recommendations for future research.

Summary of Results Organized by the Research Questions

The first research question considered by the researcher regarding how frequently middle school students in District Z use 1:1 technology was integral to this study. However, no clear answer surfaced. Several responses emerged when the respondents described the frequency of use of the 1:1 technology, with approximately 10% of students responding that they used 1:1 technology devices in only one class and approximately 24% of participants indicating that they used the 1:1 devices regularly in five or more classes. This finding differed from responses to survey question 2, in which nearly 80% of participants reported using computers daily at school.

Respondent descriptions of the frequency of use in core classes revealed that the 1:1 devices were used fairly evenly across core subjects, with the largest percentage of students, 37.19%, self-reporting use of the 1:1 devices most often in science classes. The data did not provide a clear picture of whether the respondents sought to use the 1:1 devices during their free time. Respondents were given a choice of yes or no, and the statistical data for that particular question were about the same for each option. Overall, the findings revealed inconsistency in usage by class period and by subject area, coupled with a lack of clarity as to whether students sought to use the devices during their free time. The review of related literature highlighted the significance of uniform technology integration in all classes. According to Weston and Bain (2010), systemic and ubiquitous—not spotty and inconsistent—use of technology is essential in creating a new paradigm in which technology integration becomes embedded in the school culture.

In summary, while the findings of this study showed a lack of uniform, consistent use and time application of the 1:1 devices, students seem to use the 1:1 devices to some degree during the instructional day. Therefore, the researcher could not conclude that use of the 1:1 devices was frequent enough to describe it as embedded in the school culture to the point that teaching, learning, and technology are integrated and inseparable (Weston & Bain, 2010).

The second research question asked whether the middle school students in District Z believed that technology access was important to their learning. The descriptive data showed that the students believed that access to technology, including 1:1 devices, was important to learning. Approximately 91% of participants held a positive perception of access to technology and learning. Almost 41% responded that access to technology was very important, and 50.09% responded that technological access was pretty important to learning. The findings parallel the findings of TIP, which revealed the significance of student perception regarding access to 1:1 technology and academic achievement. Two thirds of sixth graders surveyed in TIP schools reported academic benefits as a result of laptop immersion (Texas Center for Educational Research, 2009).

Further, more than 90% of all students surveyed in District Z revealed a positive perception of access to technology and learning. When asked whether they made better grades using the 1:1 devices, the majority of survey participants, 84.29%, replied yes. Overall, most of the students in District Z described the 1:1 devices as a cognitive tool rather than a toy. A negligible percentage of the students described their use of the 1:1 devices as playtime or game time. Therefore, the majority of the student respondents noted that experience with the devices was applicable and appropriate to current lessons being learned in class.

Researchers who study the results of 1:1 technological initiatives have suggested that classrooms should replicate real-life application as much as possible (Spies et al., 2010). Through the utilization of 1:1 technological devices, respondents in District Z believed that what was being learned was relevant and applicable to real-life situations. The survey findings in this study revealed that almost 70% of students believed their experiences using the 1:1 devices were important to skills they would need in their future endeavors. Grinager (2006) believed that technology helps prepare students for a world where they will compete with the best and the brightest individuals globally. Further, based on the student responses in agreement with specific perceived advantages of access to technology (better grades, appropriate learning experiences, skills needed for the future), the researcher concluded that access to technology facilitates the learning process for middle school students in District Z and helps prepare them to be globally competitive. Therefore, in spite of the inconsistent data specifically regarding use of 1:1 devices, District Z is receiving a positive return on its investment in 1:1 technology.

When students were given six choices to self-describe and asked to select all that applied to learning while using the 1:1 devices in class, most students responded with positive self-identifiers, including almost 63% as hardworking; approximately 60% as interested learners; almost 50% self-labeled as engaged learners; and about 40% as curious learners. Of the 1,108 students who responded to question 13, only 1.9% self-described as disengaged and about 12% self-labeled as bored. These findings are comparable to the findings from one of the largest 1:1 technological initiatives studied: the BWL Initiative in Massachusetts. The majority of teachers and principals in BWL Initiative schools reported increased student engagement in all student groups. In education, student engagement refers to the level of attention, curiosity, interest,

optimism, and passion that a learner shows while the instruction is being delivered (Kezar & Kinzie, 2006). During classroom observations, the BWL Initiative research and evaluation team (Bebell & Kay, 2010) observed behaviors that indicated increased student engagement. For example, students frequently asked teachers whether they would be using the laptops. When teachers responded affirmatively, the students cheered and smiled (Bebell & Kay, 2010). Increased student engagement was widely noted in both the TIP and the MLT Initiative. Maine students commented that despite the additional work and time required on technology-rich projects, those projects were more engaging (Argueta et al., 2011). Therefore, it appears that students are willing to work smarter and longer when given the cognitive tools to accomplish the task at hand.

Results from case studies of some of America's largest 1:1 laptop initiatives from Texas to Massachusetts supported student engagement as "one of the most substantial benefits" of 1:1 laptops (McLeod & Sauers, 2012, p. 4). Although the data from the study of the 1:1 technology initiative in District Z failed to uncover consistent, everyday use of 1:1 devices, students in District Z perceived themselves as more productive and engaged when using the technology. Finally, it is important to note that in 2014-2015, one goal of launching the 1:1 initiative in District Z was to improve student engagement and achievement. Based on student perceptions, that and other goals were met for many of the middle school students in the district.

The third research question sought to describe the frequency of use of all technological devices (including 1:1 devices) by students and teachers in District Z. This question was fundamental considering that prior to this study, District Z stakeholders and decision makers lacked data to support decisions for future investments in technological devices. The findings of this study on the frequency of use of both the previously

purchased technology and the recently acquired 1:1 devices were designed to enable stakeholders and policymakers to formulate informed decisions in the future.

Respondents in this study reported everyday use of technological devices, especially computers, by students and teachers in District Z. For example, nearly 80% of the students reported daily computer use; however, the isolated data on the use of the 1:1 technological devices revealed less than everyday use, yet indications in response to other survey questions suggested that the frequency of use of 1:1 technology devices should be higher.

To support the quantitative data on computer use, the SPSS 24 output showed that, on average, most students selected daily when describing the frequency of use of computers in general. An additional finding is that 94.84% of students surveyed either agreed or strongly agreed that their teachers did a good job incorporating technology into lessons. The researcher's interpretation of the data is that teachers are not only using the technology (especially computers) but also effectively integrating it into daily lessons. Although the frequency-of-use data on the 1:1 devices could not be described as regular and customary, the data indicated that, when used, most students used the 1:1 devices for conducting research, writing, and accessing learning material. Therefore, the frequent and customary use of all technological devices by the teachers and students in District Z warrants the high dollar expenditures for technology. Overall, the data provided evidence that technology is an important component of the educational process in District Z.

Study Limitations

The researcher relied solely on descriptive statistics for data analyses. The questions, as presented on the survey, may have led to inaccurate responses or responses

that captured extraneous information. Additionally, the researcher served as an assistant principal in the school district. The middle school student participants at the researcher's school may have answered the survey items in a way they perceived to be acceptable to the writer rather than by providing truthful answers.

Recommendations for Further Study

Findings from this study of approximately 1,100 middle school students document perceptions of the use of technology in general and of the 1:1 devices in particular. Some of the answers to the survey questions that specifically queried the use of 1:1 devices differed from the answers given regarding the use of computers in school. Students may have confused computers that were previously purchased by the school district with the recently purchased 1:1 devices. Further exploration and research are needed to isolate the use of 1:1 devices. One recommendation is to conduct a similar study with a survey instrument designed to look specifically at the use of 1:1 devices. Additionally, adding a qualitative component to such a study could corroborate the findings of the quantitative section and add more reliability to the results.

Summary

District Z can state that the frequency of use of computers as reported by the students was regular and customary because, on average, the middle school students categorized the use of computers as a daily event. Students also perceived that the teachers do a good job of incorporating technology into the lessons. Although the data did not show consistent use of the 1:1 devices in all classes, it did show that, on average, the majority of the students believed that access to the technology is very important or pretty important to learning. When middle school students reported on the use of 1:1

devices, most of the respondents checked positive characteristics as related to interactions with the devices. Some students also reported getting inspired as they worked with the 1:1 devices. Further, when using 1:1 technology, the students perceived that such learning was appropriate and applicable to skills they would need for future endeavors.

Overall, based on the quantitative findings, District Z received a passing grade for technology usage; however, to fully integrate the 1:1 technology and ensure that the 1:1 devices are embedded in the school culture, the devices must be used more consistently. Weston and Bain (2010) stressed the significance of a school's demand for systematic and ubiquitous use of technology, not spotty and inconsistent use. For District Z to move its grade on frequency of use from passing to a grade of A+, the use of 1:1 devices must be consistently ingrained in and systemic to both teachers and students.

Students reported being both more studious and more engaged when using the 1:1 devices. Most educators would agree that those two descriptive behaviors are precursors to improved student achievement. The main reason District Z embarked on the 1:1 initiative in 2014-2015 was to achieve positive results in teaching and learning; therefore, District Z has taken a major step toward advancing academic improvement for middle school students.

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Appendix A

Student Survey

We appreciate your taking the time to complete the following survey. It should take about 15 minutes of your time. We are interested in how you use and need technology for your education and learning.
Please help us by completing this survey. Your responses are voluntary and will be kept confidential. Responses will not be identified by individual. All responses will be compiled together and analyzed as a group.

A few important things to know: You can choose to stop the survey at any time. When you see "1:1," it means having a device for each student, as with our Chromebook carts.

Students, when you arrive at question #1, your survey administrator will tell you which school to select. You should answer "School ____."

If you have any questions or concerns, please contact Mr. Tucker, Assistant Principal (email removed to protect anonymity of school system involved in research study).

Thank you.

1. Which school do you attend? (Select one.) *****

- ❑ School A(robers)
- ❑ School B
- ❑ School C
- ❑ School D
- ❑ School E

2. How often do you use a computer in school? (Select one.) *

- ❑ daily
- ❑ weekly
- ❑ twice a month
- ❑ once a month
- ❑ never
- ❑ Other (please specify)

3. How often does your teacher use technology for classroom instruction, such as a computer/iPad and projector, Elmo (document camera) or Promethean (smart board)? (Select one.) *

- ❑ daily
- ❑ weekly
- ❑ twice a month
- ❑ once a month
- ❑ never
- ❑ Other (please specify)

4. How important to your learning do you feel having access to technology is (Do you learn better from the use of technology)? (Select one.) *

- ❑ Very important
- ❑ Pretty important
- ❑ Not very important

- ❑ Not important at all
- ❑ Other (please specify)

5. Overall, my teachers do a good job of incorporating technology into their lessons. (Select one.) ***

- ❑ Strongly agree
- ❑ Agree
- ❑ Disagree
- ❑ Strongly disagree

6. How many of your classes use the 1:1 devices regularly? (Select one.) (1:1 means having a device for each student) *****

- ❑ 1
- ❑ 2
- ❑ 3
- ❑ 4
- ❑ 5 or more

7. Which classes do you use the 1:1 devices for most often? (Select one.) *****

- ❑ Language Arts
- ❑ Math
- ❑ Science
- ❑ Social Studies
- ❑ Enhancements

8. When you finish your work, do you seek free time to use the 1:1 device? (Select one.) *****

- ❑ Yes
- ❑ No

9. Do you make better grades when using the 1:1 device? (Select one.) *****

- ❑ Yes
- ❑ No

10. What do you use computers for the most? (Select all that apply.) *

- ❑ Internet
- ❑ Research
- ❑ Writing Papers
- ❑ Learning Material
- ❑ Watching Video
- ❑ Playing Games

11. How do you describe your experience using your 1:1 device? (Select all that apply.) ****

- ❑ Play time or game time
- ❑ Unstructured, not sure of expected learning outcomes
- ❑ Applicable to what you are covering in class

- ❑ Appropriate for current classes and important for required/anticipated future skills

12. How do you feel about your learning when using the 1:1 device in class? (Select all that apply.) *****

- ❑ Engaged in the activities
- ❑ Inspired by the activities
- ❑ Interested in the activities
- ❑ Bored by the activities
- ❑ Disengaged in the activities

13. Which of the following best describes you when using the 1:1 device in class? (Select all that apply.) *****

- ❑ Curious learner
- ❑ Hard-working learner
- ❑ Bored (my mind is on other things)
- ❑ Engaged in learning
- ❑ Interested in learning
- ❑ Disengaged in learning

14. Please tell us how frequently your instructors use each of the following methods to communicate with you. (Select one per row.) **

	Never	Daily	A few times per week	Weekly	A few times per semester
Face--to--face either before or after class	○	○	○	○	○
Face--to--face using teacher's planning time	○	○	○	○	○
Phone	○	○	○	○	○
Personal/individual Email	○	○	○	○	○
Mass email or					

announcement to the whole class

Updates/announcements on course website/Schoology site/Edmodo

Instant messaging

15. How often do you use the following when communicating with your CLASSMATES about courses or coursework? (Select one per row.) **

	Daily	A few times per week	Weekly	A few times per semester	Never
Face--to--face					
Phone /Cell phone					
Email					
Instant messaging					

References:

* 2012-13 Student technology survey. [Found online: https://www.surveymonkey.com/r/?sm-LdSA%2FLH5%2FXdT5PEX06FWg%3D%3D]

** Kerry, Cathy. Educational Technology Use Student Survey. University of Colorado at Boulder. Fall 2005.

*** Student Technology Use Survey. Glenwood City School District. [Found online: http://www.gcsd.k12.wi.us/cms_files/resources/Student%20Survey%20results.pdf]

**** Tamei, Lawrence (2001). The Technology Facade: Overcoming Barriers to Effective Instructional Technology. Allyn and Bacon, Publishers.

***** Gibson, Dr. Kathi and Tucker, William B. Personal Communication, November 13, 2015.

Appendix B

Permission to Use Survey Questions

From: William Tucker [mailto:wtucke[redacted]us]
Sent: Monday, November 23, 2015 [redacted] PM
To: Cathy Kerry <Cathy.Kerry@[redacted]EDU>
Subject: Permission Request to use Survey Questions

I am working on my dissertation and in doing so, am creating a survey instrument to use. I found your survey entitled **"Educational Technology Use Student Survey"** via the Internet and would like to use questions:

Please tell us how frequently your instructors use each of the following methods to communicate with you.
- Face-to-face either before or after class
- Face-to-face using office hours
- Phone
- Personal/individual email
- Mass email or annoucement to the whole class
- Updates/annoucements on course website/WebCT
- Instant messaging
- Voicemail

How often do you use the following when communicating with your CLASSMATES about courses or coursework?
- Face-to-face
- Phone/cell phone
- Email
- Instant messaging
- Voicemail
- Notes on door

In accordance with copyright law, I wanted to request permission prior to using these questions. I also wanted to be sure I cited the authors of this survey appropriately and accurately.

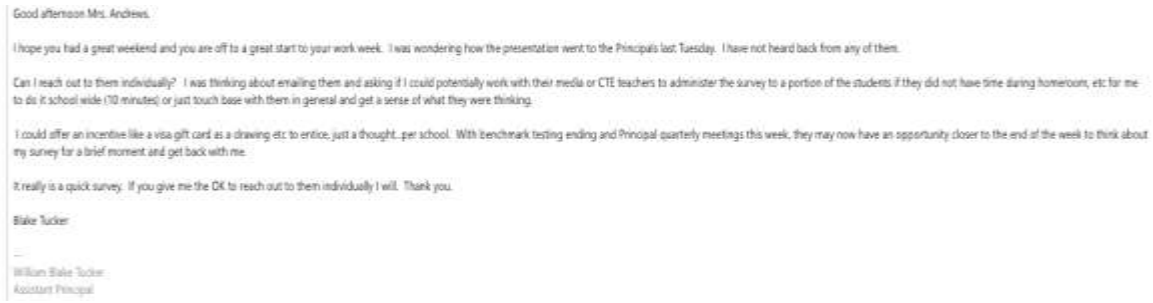
Thank you for your consideration.

Blake Tucker

--
William Blake Tucker
Assistant Principal

Appendix C

Communication to District for Survey Approval



Good afternoon Mrs. Andrews.

I hope you had a great weekend and you are off to a great start to your work week. I was wondering how the presentation went to the Principals last Tuesday. I have not heard back from any of them.

Can I reach out to them individually? I was thinking about emailing them and asking if I could potentially work with their media or CTE teachers to administer the survey to a portion of the students if they did not have time during homeroom, etc for me to do it school wide (10 minutes) or just touch base with them in general and get a sense of what they were thinking.

I could offer an incentive like a visa gift card as a drawing etc to entice, just a thought...per school. With benchmark testing ending and Principal quarterly meetings this week, they may now have an opportunity closer to the end of the week to think about my survey for a brief moment and get back with me.

It really is a quick survey. If you give me the OK to reach out to them individually I will. Thank you.

Blake Tucker

--

William Blake Tucker

Assistant Principal

From: William Tucker <wtucker@[redacted].us>
Date: July 12, 2015 at 5:41:03 PM EDT
To: Shawna Andrews <sandrews@[redacted].us>, William Tucker <wtucker@[redacted].us>
Cc: Ed Chase <echase@[redacted].us>, Kevin Cutler <kcutler@[redacted].us>
Subject: Blake Tucker- Survey for Dissertation
Mrs. Andrews,

Thank you for meeting with me and discussing/offering suggestions regarding the survey I need to administer for my dissertation. Your support over the past two years has been very instrumental in my success thus far both educationally and professionally.

I need to administer a survey (similar to the one I have attached to this email) to all middle school students in the county. Mr. Cutler provided the survey. The data collected can be sorted and sent to the Principals of each Middle School and provide insight on how the Chromebooks have influenced student achievement and engagement. I spoke with Mr. Chase and he is willing to have the survey created and assist me in the data analysis portion. I believe the data collected will provide insight on how our students learn and prefer to learn, which can assist stakeholders in increasing student engagement/student achievement.

[redacted] County Public Schools will not be mentioned in my dissertation. I will refer to our county as a rural Eastern North Carolina Public School system. No student or individual school will be named. Schools will be assigned a number. For the purpose of my dissertation, individual student responses are not needed or important, so overall percentages will only be reported.

Next Steps for Me

Obtain permission from senior staff and the board (I believe this is required) to administer the survey at the beginning of this upcoming school year. You have already pledged your support on getting buy-in from the Principals (Thank You). Once permission is granted, I will fill out the required forms for Gardner-Webb and submit them (I will need signatures from senior staff for the IRB process and for my dissertation committee).

Timeline

I defend my proposal of Chapters 1-3 on August 7th at Gardner-Webb University. I have been asked by my chair to have permission granted and to have all details worked out on when and how I can administer the survey once school begins. The survey will take no more than 15 to 20 minutes from start to finish. I would like to administer the survey by the first week of September. This will allow me to stay on track with the timeline provided by the University. It is my goal to defend my dissertation in March of 2016 and graduate in May of 2016. I complete my last semester of coursework this fall.

I have attached my draft of Chapters 1-3 for your review.

Purpose of the Study

The purpose of this quantitative methods study is to determine the correlation of one-to-one technological devices on instructional student engagement and student achievement. Quantitative data will be utilized such as standardized measures to separate statistical data that incorporates benchmark assessments, testing scores, discipline reports, classroom climate reports, and other archival data relevant to this proposed study, and to classroom climate and student achievement variables. This quantitative correlational study seeks to assess the impact one-to-one technological initiatives on student achievement and student engagement levels in a public school district within the eastern part of North Carolina. The researcher seeks to determine if the introduction of one-to-one technological initiatives may positively influence achievement and engagement in students. By using one-to-one technological initiatives, this research seeks to determine if the approach would significantly impact test scores and other student achievement statistical findings.

Thank you for your assistance!

On Sat, Jul 18, 2015 at 11:37 AM, William Tucker <wtucker@[redacted].us> wrote:
Hey Mrs. Andrews.

I hope you are doing well. I wanted to follow-up and see if there was anything else I need to send you regarding my request?

I am back from Las Vegas, so feel free to contact me via email or by phone if there are any questions, concerns, or extra information needed from me.
My cell is 919-[redacted].

Thank you and have a great weekend.

Blake Tucker

On Sat, Jul 18, 2015 at 11:37 AM, William Tucker <wtucker@[redacted].us> wrote: concerns, or extra information needed from me.
My cell is 919-[redacted].

Thank you and have a great weekend.

Hey Mrs. Andrews.

I hope you are doing well. I wanted to follow-up and see if there was anything else I need to send you regarding my request?

I am back from Las Vegas, so feel free to contact me via email or by phone if there are any questions,
Blake Tucker

On Jul 20, 2015, at 7:33 AM, Shawna Andrews <sandrews@[redacted]us> wrote:

Las Vegas??? I hope you had a wonderful time.

Let me follow up with your request. I'll be back in touch.
Shawna

On Thu, Jul 23, 2015 at 8:15 PM, Blake Tucker <wtucker@[redacted].us> wrote:

Were you able to find out anything?

Thank you

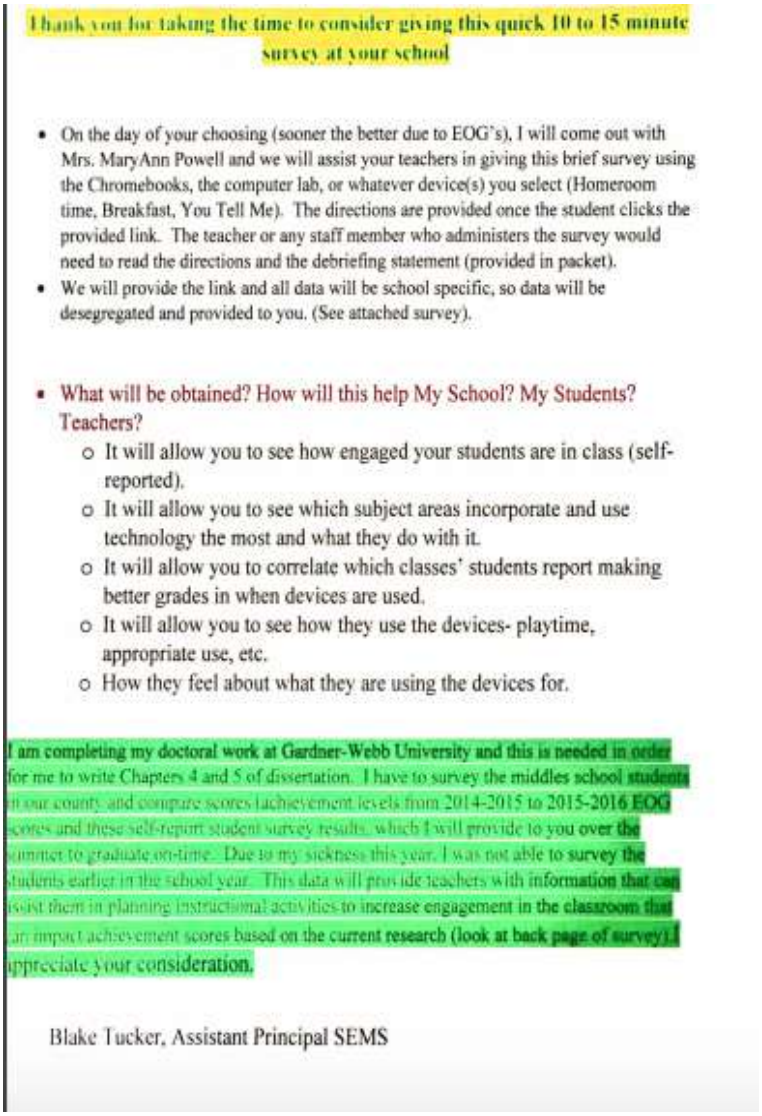
Blake Tucker

Sent from my iPhone
From: Shawna Andrews <sandrews@[redacted]us>xx
Date: July 27, 2015 at 6:58:41 AM EDT
To: Blake Tucker <wtucker@[redacted].us>
Subject: Re: Blake Tucker- Survey for Dissertation

Yes, I thought I emailed you back. I'm sorry. You are good to move forward.
Let me know if you need anything.

Appendix D

Information Presented to Principals



Thank you for taking the time to consider giving this quick 10 to 15 minute survey at your school

- On the day of your choosing (sooner the better due to EOG's), I will come out with Mrs. MaryAnn Powell and we will assist your teachers in giving this brief survey using the Chromebooks, the computer lab, or whatever device(s) you select (Homeroom time, Breakfast, You Tell Me). The directions are provided once the student clicks the provided link. The teacher or any staff member who administers the survey would need to read the directions and the debriefing statement (provided in packet).
- We will provide the link and all data will be school specific, so data will be desegregated and provided to you. (See attached survey).

- What will be obtained? How will this help My School? My Students? Teachers?
  - It will allow you to see how engaged your students are in class (self-reported).
  - It will allow you to see which subject areas incorporate and use technology the most and what they do with it.
  - It will allow you to correlate which classes' students report making better grades in when devices are used.
  - It will allow you to see how they use the devices- playtime, appropriate use, etc.
  - How they feel about what they are using the devices for.

I am completing my doctoral work at Gardner-Webb University and this is needed in order for me to write Chapters 4 and 5 of dissertation. I have to survey the middles school students in our county and compare scores (achievement levels from 2014-2015 to 2015-2016 EOG scores and these self-report student survey results, which I will provide to you over the summer to graduate on-time. Due to my sickness this year, I was not able to survey the students earlier in the school year. This data will provide teachers with information that can assist them in planning instructional activities to increase engagement in the classroom that can impact achievement scores based on the current research (look at back page of survey). I appreciate your consideration.

Blake Tucker, Assistant Principal SEMS

Appendix E

Validation Study Given to Pilot Groups

Impact on Student Achievement and Engagement With 1:1 Technology Initiatives

1. Which school do you attend? (Select one.) *****
__School A
__School B
__School C
__School D
__School E
Other (please specify)_____

2. How often do you use a computer in school? (Select one.) *
__daily
__weekly
__twice a month
__once a month
__never
Other (please specify)_____

3. How often does your teacher use technology for classroom instruction, such as a computer/iPad and projector, Elmo or Promethean? (Select one.) *
__daily
__weekly
__twice a month
__once a month
__never
Other (please specify)_____

4. How important to your learning do you feel having access to technology is (Do you learn better from the use of technology)? (Select one.) *
__Very important
__Pretty important
__Not very important
__Not important at all

5. Overall, my teachers do a good job of incorporating technology into their lessons. (Select one.) ***
__Strongly agree
__Agree
__Disagree
__Strongly disagree

6. How many of your classes use the 1:1 devices regularly? (Select one.) *****
__1
__2
__3
__4
__5 or more

7. Which classes do you use the 1:1 devices for most often? (Select one.) *****
__Language Arts
__Math
__Science
__Social Studies
__Enhancements

8. When you finish your work, do you seek freetime to use the 1:1 device? (Select one.) *****
__Yes
__No

9. Do you make better grades when using the 1:1 device? (Select one.) *****
__Yes
__No

10. What do you use computers for the most? (Select all that apply.) *
__Internet
__Research
__Writing Papers
__Learning Material
__Watching Video
__Playing Games

11. How do you describe your experience using your 1:1 device? (Select all that apply.) ****
__Play time or game time
__Unstructured, not sure of expected learning outcomes
__Applicable to what you are covering in class
__Appropriate for current classes and important for required/anticipated future skills

12. How do you feel about your learning when using the 1:1 device in class. (Select all that apply.) *****
__Engaged in the activities
__Bored by the activities

__Inspired by the activities
__Interested in the activities
__Disengaged in the activities

13. Which of the following best describes you when using the 1:1 device in class? (Select all that apply.) *****
__Curious learner
__Hardworking learner
__Bored (my mind is on other things)
__Engaged in learning
__Interested in learning
__Disengaged in learning

14. Please tell us how frequently your instructors use each of the following methods to communicate with you. (Select one per row.) **

	Daily	A couple days per week	Weekly	A few times per semester	Never
Face-to-face either before or after class					
Face-to-face using teacher's planning time					
Phone					
Personal/individual email					
Mass email or annoucement to the whole class					
Updates/announcements on course website/Schoology site/Edmodo					
Instant messaging					

15. How often do you use the following when communicating with your CLASSMATES about courses or coursework? (Select one per row.) **

	Daily	A couple days per week	Weekly	A few times per semester	Never
Face-to-face					
Phone/cell phone					
Email					
Instant messaging					

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**** Tamei, Lawrence (2001). The Technology Facade: Overcoming Barriers to Effective Instructional Technology. Allyn and Bacon, Publishers.
***** Gibson, Dr. Kathi and Tucker, William B. Personal Communication, November 13, 2015.

Appendix F

Sample Student Highlights from Validation Study

Impact on Student Achievement and Engagement With 1:1 Technology Initiatives

1. Which school do you attend? (Select one.) *****
__School A
__School B
__School C
__School D
__School E
Other (please specify)_____

2. How often do you use a computer in school? (Select one.) *
__daily
__weekly
__twice a month
__once a month
__never
Other (please specify)_____

3. How often does your teacher use technology for classroom instruction, such as a computer/iPad and projector? (Select one.) *
__daily
__weekly
__twice a month
__once a month
__never
Other (please specify)_____

4. How important to your learning do you feel having access to technology is (Do you learn better from the use of technology)? (Select one.) *
__Very important
__Pretty important
__Not very important
__Not important at all

5. Overall, my teachers do a good job of incorporating technology into their lessons. (Select one.) ***
__Strongly agree
__Agree
__Disagree
__Strongly disagree

6. How many of your classes use the [redacted] devices regularly? (Select one.) *****
__1
__2
__3
__4
__5 or more

7. Which classes do you use the [redacted] devices for most often? (Select one.) *****
__Language Arts
__Math
__Science
__Social Studies
__Enhancements

8. When you finish your work, do you seek freetime to use the 1:1 device? (Select one.) *****
__Yes
__No

9. Do you make better grades when using the 1:1 device? (Select one.) *****
__Yes
__No

10. What do you use computers for the most? (Select all that apply.) *
__Internet
__Research
__Writing Papers
__Learning Material
__Watching Video
__Playing Games

11. How do you describe your experience using your [redacted] device? (Select all that apply.) ****
__Play time or game time
__Unstructured, not sure of expected learning outcomes
__Applicable to what you are covering in class
__Appropriate for current classes and important for required/anticipated future skills

12. How do you feel about your learning when using the [redacted] device in class. (Select all that apply.) *****
__Engaged in the activities
__Bored by the activities

Appendix G

Communication to Schools Regarding Survey

Mrs. Lampron,

Thank you so much for agreeing to administer my survey during homeroom next week at your school (Approximately 265 students). I will follow-up with you Monday. MaryAnn Powell will bring the Opt-out forms (send out 1 day ahead of time) and all materials needed (teacher scripts, debriefing forms, etc) when she comes to your school next week. Let me know **the day you would like to administer the survey (Not Monday please)** and I will **type it in the form** and make the copies for you in the required spaces.

It is very simple (students will use a link provided (Powell will take care of providing this that morning) and it will only take 10-15 minutes max.It would be good to do it on a morning that Mrs. Powell and the media coordinator (she has agreed to help) are both there.

Mrs. Powell helped me validate the instrument and can assist if there are any problems. I am hoping this will allow me access into the other middle schools now! Data will be shared with you and Mrs. Andrews only. When I use the data in my dissertation our county is not named and your school is not named. I refer to both as the following: rural eastern NC school system and School X (Not X, but a letter (I can't tell you which one or it would, but breaking confidentiality.

I truly appreciate you helping me collect this data! **You are awesome my friend (Colleague)!**

--
William Blake Tucker
Assistant Principal

When you speak with Mr. Archer, let me know that we have the go ahead (100%) and I will start getting materials ready for next Thursday's survey administration date.

I will need to know how many students are enrolled?
How many teachers will be administering the survey?

Just a reminder that no pull-out groups are needed, etc (Chromebox reads the survey).

I will send a more detailed email with specifics once you speak with Mr. Archer.

Thank you very much. I truly appreciate it!

--
William Blake Tucker
Assistant Principal

Mrs. Gregory

Below is a sample email you may want to use with your staff to share information the day of the survey. I found it helpful at my school. Also, my mother dropped off the materials at your school yesterday. My mother will deliver the cake the morning of the actual survey with forks, plates, etc. as a thank you to the teachers and you for allowing me to do this at your school. I appreciate all of you assisting me and your time! Please see below.

Live link for **you only**: https://www.surveymonkey.com/r/WhtacKer
Please Remove this message and link before emailing this message below to the teachers. Thank you.

Good morning teachers and staff!

Once again, thank you for agreeing to give this survey. I truly appreciate it.

Once students have their Chromebooks, you may proceed with the survey (very simple process).

The link for the survey will appear on your schools webpage Phillips not ECPS) under Quick Links. It will be titled 1:1 Student Survey Link.

******It will show up the morning of the survey!******

Once all students have completed the survey, an administrator needs to email MaryAnn Powell and let her know, so the link can be removed from the website.

If a student needs read aloud, let them use Chromebox.

Students who bring back an opt-out form can not take the survey. (If they brought it back because they thought they had to in order to participate, happens sometimes- you can call parent and they can take survey).

Last time during pilot study- same signed wanting them to participate.I had this happen at my school. They did not check the box for can not participate, so that allowed them to participate.

It is very important that you read the directions as printed. You are School E! It says that in the directions. **Your students need to select School E**. When they are done- You have to read the debriefing page- I have printed a copy of both for you.

(You sent out opt-out letters, so students who do not bring one back can take the survey. This is a good opportunity to explain to your students the importance of research, college, higher education, etc.

Thank you all for helping me. ***Please enjoy the dessert that was delivered for you this morning and accept it as a thank you from me for your time and assistance.*** The data collected from your school will be shared with administration.

Thank you again!

Email me or call me with questions or issues.

Blake Tucker

--
William Blake Tucker
Assistant Principal

Hello, MMA MS teachers!

Once again, thank you for agreeing to give this survey. I truly appreciate it.

Once students have their Chromebooks, you may proceed with the survey (very simple process).

The link for the survey will appear on your school's webpage (MMA not ECPS) under Quick Links. It will be titled 1:1 Student Survey Link.

******(It will show up the morning of the survey)******

If a student needs read aloud, let them use ChromeVox.

Students who bring back an opt-out form that specifically indicates that their parent has "opted out" cannot take the survey.

It is very important that you read the directions as printed. You are School D! It says that in the directions. Your students need to select School D!!! When they are done, you have to read the debriefing page- I have printed a copy of both for you.

Thank you all for helping me. ***Please enjoy the treats that will be delivered for you and accept them as a thank you from me for your time and assistance.*** The data collected from your school will be shared with administration.

Thank you again!
Mr. Tucker

Below is a sample email you may want to use with your staff to share information the day of the survey. I found it helpful at my school. Also, my father dropped off the materials at your school this morning. My mother will deliver the cake the morning of the actual survey with forks, plates, etc. as a thank you to the teachers and you both for allowing me to do this at your school. I appreciate all of you assisting me and your time! Please see below.

Live link for you two only: https://www.surveymonkey.com/r/wbtucker
Remove before emailing to teachers please.

Good morning teachers and staff!

Once again, thank you for agreeing to give this survey. I truly appreciate it.

Once students have their Chromebooks, you may proceed with the survey (very simple process).

The link for the survey will appear on your schools webpage [redacted] under Quick Links. It will be titled 1:1 Student Survey Link.

******(It will show up the morning of the survey)******

Once all students have completed the survey, an administrator needs to email MaryAnn Powell and let her know, so the link can be removed from the website.

If a student needs read aloud, let them use ChromeVox.

Students who bring back an opt-out form can not take the survey. (If they brought it back because they thought they had to in order to participate, happens sometimes - you can call parent and they can take survey).

Last time during pilot study- some signed wanting them to participate.I had this happen at my school. They did not check the box for can not participate, so that allowed them to participate.

It is very important that you read the directions as printed. You are School C! It says that in the directions. **Your students need to select School C!!** When they are done- You have to read the debriefing page- I have printed a copy of both for you.

(You sent out opt-out letters, so students who do not bring one back can take the survey. This is a good opportunity to explain to your students the importance of research, college, higher education, etc.

Thank you all for helping me. ***Please enjoy the desserts that were delivered for you this morning and accept it as a thank you from me for your time and assistance.*** The data collected from your school will be shared with Mr. Archer and Mrs. Denham.

Thank you again!

Email me or call me with questions or issues.

Blake Tucker

--
William Blake Tucker
Assistant Principal

Mr. Archer and Mrs. Denham,

Below is a sample email you may want to use with your staff to share information the day of the survey. I found it helpful at my school. Also, my father dropped off the materials at your school this morning. My mother will deliver the cake the morning of the actual survey with forks, plates, etc. as a thank you to the teachers and you both for allowing me to do this at your school. I appreciate all of you assisting me and your time! Please see below.

Good morning teachers and staff!

Once again, thank you for agreeing to give this survey. I truly appreciate it.

Once students have their Chromebooks, you may proceed with the survey (very simple process).

The link for the survey will appear on your school's webpage (West Edgecombe not ECPS) under Quick Links. It will be titled 1:1 Student Survey Link.

****It will show up the morning of the survey!****

Once all students have completed the survey, an administrator needs to email MaryAnn Powell and let her know so the link can be removed from the website.

If a student needs read aloud, let them use ChromeVox.

Students who bring back an opt-out form can not take the survey. (If they brought it back because they thought they had to in order to participate, happens sometimes- you can call parent and they can take survey).

Last time during pilot study- some signed wanting them to participate I had this happen at my school. They did not check the box (so can not participate, so that allowed them to participate.

It is very important that you read the directions as printed. You are School C! It says that in the directions. **Your students need to select School C!** When they are done- You have to read the debriefing page. I have printed a copy of both for you.

(You sent out opt-out letters, so students who do not bring one back can take the survey. This is a good opportunity to explain to your students the importance of research, college, higher education, etc.

Thank you all for helping me. ***Please enjoy the deserts that were delivered for you this morning and accept it as a thank you from me for your time and assistance.*** The data collected from your school will be shared with Mr. Archer and Mrs. Denham.

Thank you again!

Email me or call me with questions or issues.

Blake Tucker

--
William Blake Tucker
Assistant Principal

> I will provide all information in advance as discussed on the phone today and send very detailed instructions. The survey is very easy. A script will be provided to teachers (Start) and a link will be provided for the students. I will not be able to go and be there that day. However, I will still have a cake dropped off that morning for your middle school teachers/staff. With 4 schools administering the survey next week during the school day, it is best for me not to go while on the clock. Sorry for having to change this. I just spoke with Mr. Cutler. I understand if this means that you will not be inclined to still participate in the survey.
>
> Trust me- it is very simple and after you see what I have sent the other schools, you will see why you will not need me there (I will resend with more information later on after school hours).
>
> Please let me know if you will still consider giving the survey after reviewing the information I send. My survey topic is 1:1 devices and how they impact student achievement and student engagement. I truly appreciate your assistance!
>
> Let me know whether my attendance will hinder us moving forward or if your open to considering moving forward providing the option to say no after reviewing more details. I'm trying to get all middle school students surveyed by the end of next week!
>
> Thank you.
>
> --
> William Blake Tucker
> Assistant Principal

Subject: Survey this morning. Directions

Good morning teachers and staff!

> Please let me know how it goes today. I hope it goes as smoothly as it did here! Fingers crossed!
>
> Also, if you had any students return the opt-out forms, could you make a copy and send it to me via inner-office mail for me to keep with my records (in case I need proof for ECPS, etc).
>
> Thank you both.
>
> Blake
>
> --
> William Blake Tucker
> Assistant Principal

to validate this instrument I created.

Ms. DiRico, Ms. Johnson will double up and administer two groups on 7th grade and Mr. Garbisch will administer to his entire team at the beginning of his class. Thank you.

8th grade- Thank you for agreeing to administer on Tuesday (We have to send opt out letters home on Monday).

Thank you staff for helping me.

Blake Tucker

[redacted]