PERCEPTIONS OF THE IMPACT OF QUALITY PROFESSIONAL DEVELOPMENT ON THE SUSTAINABILITY OF A ONE-TO-ONE COMPUTING INITIATIVE AT THE HIGH SCHOOL LEVEL

By

KERRY MORRISON

Secondary English and Science Instruction, Vance County Schools, Henderson, North Carolina, USA.

ABSTRACT

It has been said that education is the key to success, and today's youth are tomorrow's human resources. This is the 21st century; and students, who will be the human resources of tomorrow, are being prepared for jobs that may not even exist today. Legislators, policy makers, and researchers have encouraged methods to ensure teachers deliver high quality instruction, including requiring that teachers complete specific training, possess a minimum level of content knowledge, and use curriculum materials and professional development resources available from schools and districts. As a result, teachers need to be exposing students to lessons that are technologically enhanced as they prepare students for the future. This study is a qualitative analysis of a survey and interviews that seek to examine the impact of quality professional development and teacher exposure to technology on the sustainability of one-to-one computing initiatives. This study is supported by the following theories: the Technological Pedagogical Content Knowledge (TPACK) framework and Bandura's self-efficacy theory. This study discussed the impact of the TPACK framework and Bandura's self-efficacy theory on the sustainability of a one-to-one computing initiative. The key findings in this study were that content-driven professional development, clear expectations for technology use in classrooms, and the availability of school-based instructional coaches can impact the sustainability of a one-to-one computing initiative. As is defined by Bandura's self-efficacy theory, teachers are more likely to implement technology in the classroom that can sustain a one-to-one computing initiative if they are confident in their ability to use technology. This study also discussed recommendations for practice that school districts can use as they sustain a one-to-one computing initiative.

Keywords: Professional Development, One-to-One Computing Initiative, Sustainability, Impact Initiative, Traditional High Schools, Nontraditional High Schools, TPACK, Self-efficacy.

INTRODUCTION

Today's students, known as digital natives, net-generation, the Google generation or the millennial are radically different from those of the past. Born into an era of instant connectivity and networking, they explore the world in an entirely new way (Sutherland, 2016).

Students today interact differently, and they want instant feedback for they are a "generation of students that grew up with technologies. The internet, cell phones, and Facebook, allows them to connect with the world instantly" (Sutherland, 2016). While learners in the past "valued face-to-face meetings, today's students prefer to connect via email and text messages" (Sutherland, 2016). Technology has allowed us to "get the same information and value from a digital meeting, that the previous generation got from an office meeting" (Sutherland, 2016).

It has been said that education is the key to success, and today's youth are tomorrow's human resources. This is the 21st century; and students, who will be the human resource of tomorrow, are being prepared for jobs that may not exist today. Legislators, policy makers, and researchers have encouraged methods to ensure that teachers deliver high-

quality instruction.

This includes requiring teachers to complete specific training, possess a minimum level of content knowledge, and use curriculum materials and professional development resources available from schools and districts (Hill et al., 2015). As a result, teachers need to be exposing students to lessons that are technologically enhanced as they prepare students for the future.

There are a number of ways to do this, which include the use of computers and other technology resources in the classroom. It was once considered too expensive for public high schools to have computing devices assigned to each student who attends the school (Ferguson, 2012); however, the availability of lower cost computer technology has made it possible for schools to consider investing in computing devices and to dispense the technology into students' hands daily (USDOE, U.S. Department of Education, 2013a).

No Child Left Behind Act of 2001 (2002) stressed the importance of technology in the classroom. Goals listed in the legislation included "the improvement of student achievement through the use of technology in elementary and secondary schools" (No Child Left Behind Act, 2002, p. 1) and to "integrate technology resources and systems with teacher training and curriculum development, in an effort to establish research-based instructional methods that can be widely implemented as best practices" (No Child Left Behind Act, 2002, p. 2). The Elementary Secondary Education Act "provides incentives for states to adopt academic standards that prepare students to succeed in college and the workplace" (USDOE, 2013b, p. 1).

Additionally, the Every Student Succeeds Act of 2015 reauthorized the Elementary Secondary Education Act which strengthens the view of including technology in the classroom as teachers teach their pedagogy. It is imperative that teachers are using technology in their classrooms, but this integration has to be intentional and geared towards improving student achievement.

At the state level in North Carolina, teachers in all grades are expected to incorporate computer skills throughout their subject area; therefore, technology integration into lessons should be seamless. The model that is used in North

Carolina is the TPACK (Technological Pedagogical Content Knowledge) model. TPACK is a theory that came about from a seminal piece that was written by Mishra and Koehler (2006). Mishra and Koehler stated that their idea came from Shulman's (1987) work. Shulman stated that teachers should not only teach their content but should also be able to teach using specific teaching methods. Shulman felt that teachers must use pedagogical content knowledge or PCK to teach their content to students. Mishra and Koehler, after 5 years of research, created a new framework that would be cognizant of the benefits of technology in the classroom. They felt that technology should be included into the pedagogical content knowledge for all teachers.

North Carolina State Board of Education (2017) stated, "There shall be a comprehensive state implementation plan for the use of funds from the state school technology fund and other sources to improve student performance in the public schools through the use of learning and instructional technologies" (p. 1); thus, schools are expected to use the funds that are afforded to them by the state to ensure that the TPACK model is followed in schools. The result of the use of technology is to ensure that, as North Carolina State Board of Education continued, "the use of technologies challenges State, federal, and local educational performance" (p. 1). The ultimate aim is to "effectively integrate technologies that are compatible with the standard course of study, the State assessment program, and related student data management" (North Carolina State Board of Education, 2017, p. 1).

Additionally, North Carolina teachers are expected, since they are employing the TPACK model, to create lesson plans that have activities that address both technology, and one or more content objectives (TPACK Org, 2012). By doing this, the ultimate aim is to connect learning for students; thus, North Carolina teachers are expected to use technology to foster learning in their classroom. North Carolina teachers, according to state law, must use technology to enhance the teaching and learning environment as well. The General Assembly of North Carolina (2013) in House Bill 23 stated, "the State Board of Education must develop and implement digital teaching

and learning standards for teachers and school administrators" (p. 1). As a result, it is an expectation that teachers not only use technology in their classroom but also ensure the technology boosts student understanding of the pedagogy being taught.

Along with the TPACK theoretical framework that supported this research is the North Carolina digital learning competencies. The North Carolina digital learning competencies for students and teachers are informed by the International Society for Technology in Education (ISTE) (North Carolina Department of Public Instruction, 2016). Classroom teachers and administrators must use digital learning competencies to improve pedagogical practices and to drive student learning in the classroom. The focus areas for digital learning competencies are leadership in digital learning, digital citizenship, digital content and instruction, and data and assessment. The digital learning competencies state that teachers must know and use the appropriate digital tools for instruction. Teachers are expected to model digital citizenship and support the creation of a positive school culture. Teachers are to use technology to make data more accessible, and they must meet the needs of a diverse learner population. Finally, teachers are expected to integrate digital teaching and learning pedagogies in their lessons. In a one-to-one learning environment, digital learning competencies can drive the implementation and sustainability of the initiative. Teachers and administrators are not only expected to use technology to enhance the teaching and learning environment, they are also expected to build a school culture that encourages a digital school culture.

Without a doubt, "our educational context has changed, and a new context demands new things" (Prensky, 2011, p. 2). Rather than try to insert knowledge into our students' brains, "today's teachers need to find ways to create 21st century citizens who parrot less and think more" (Prensky, 2011 pp. 2-3); however, as teachers attempt to find ways to create a class environment that will teach students to be ready for the future, they need the support that will show them how to incorporate lessons that are technologically enhanced. For the purpose instruction to be effective, lessons must be designed to address the needs of each individual student (Conole & Fill, 2005).

As we ask teachers to teach students who are referred to as digital natives and the net-generation, it is imperative that support be given to teachers in order to ensure they are able to incorporate technology seamlessly into their lessons. Without a doubt, we must also be cognizant that teachers were not taught in the way they are being asked to teach. All these terms are being used to highlight the significance and importance of new technologies within the lives of young people (Gibbons, 2007). When elementary school teachers use and model different forms of technologies, they actively engage their students and create a stimulating work environment (Kenney, 2011). Technology is definitely just a tool that can be used to restructure and redesign the classroom to produce an environment that promotes the development of higher order thinking skills (Girgin, Kurt, & Odabasi, 2011); thus, the way in which education is approached is different in comparison to how the teachers were taught when they were in school.

Therefore, as school districts look at using more technology in lessons teachers are teaching, accommodations must be made to ensure that school teachers are able to model different forms of technology for students. "Unfortunately, even our younger 'Digital Native' teachers do not automatically know how to best use pedagogies which they didn't experience in their own education, to teach the students that sit in front of them" (Prensky, 2011, p. 19).

Strategic, targeted professional development that is specific to the teacher's need could allow teachers to effectively teach their pedagogy utilizing technology which students are exposed to in society. One solution that has emerged for dealing with the increasing technology needs of students is to consider "the classroom of the future as one that we are building one step at a time" (Prensky, 2011, p. 1). Thus, it becomes a challenge for teachers who are in a school district that has a one-to-one program for students, yet they are unable to communicate effectively with the students they teach.

The third theoretical framework that supports this study is Bandura's (1977) self-efficacy theory. Bandura's self-efficacy theory adheres to the principle that people may

engage in activities if they perceive that they are competent in those areas. Teachers may use technology more effectively if they perceive that they are competent in that area. Bandura is of the view that if an individual feels competent in a given activity, they may confidently implement and attempt to sustain the activity. In this case, if teachers feel confident in their technological ability, they may attempt to sustain a one-to-one computing initiative.

1. Literature Review and Discussion

1.1 Overview

One-to-one computing initiatives have become widespread in the country and are evident in many school districts. School districts are looking for ways to ensure that students are technologically savvy as they try to keep abreast of the technological advances in society. The one-to-one learning initiative is defined in this study as a computing device that school districts have students using in their classrooms during school hours. Many districts also offer students the opportunity to take the computing device home, so students have access to the computing device after school hours. Of course, one-to-one computing initiatives do involve a financial investment on the part of the school district.

This study was conducted to examine teacher perspectives of the professional development on the sustaining of a one-to-one computing initiative at the high school level. This research provides a glimpse of the ways in which professional development can help sustain a one-to-one computing initiative. This study also discussed some of the instructional changes that must be considered in order to sustain one-to-one computing initiatives. The time allotted for professional development for teachers prior to the implementation of a one-to-one computing initiative, the professional development that was afforded to teachers during implementation, and teacher perceptions of the worth of the professional development they were given were examined. This research provides qualitative data that can be used to lay the foundation for what may be needed in order to sustain one-to-one computing initiatives as it relates to professional development of the teachers. This research also provides data that may assist school districts to ensure that teachers use the TPACK

model while they teach their pedagogy and integrate technology into their classroom. There will be recommendations for not only ways to sustain a one-to-one computing initiative, but also for future research.

"Not only does technology offer a variety of instructional options to teachers it also motivates students who are accustomed to electronic devices in their everyday lives" (Borthwick & Pierson, 2008, p. 11). "It is unclear that students will have access to teachers who know how to use that technology well to support 21st century learning and teaching" (Lawless & Pellegrino, 2007, p. 578). Without a doubt, "America is caught in the grip of a crisis in education that threatens the ability of an entire generation of young Americans to achieve success in life and work" (Apple Classrooms of Tomorrow–Today (ACOT2), 2008, p. 4). In response to this, "one-to-one computing initiatives have emerged as one of the most common educational reforms" (Bebell & Kay, 2010, p. 5).

The Texas legislature in 2003 created the Technology Immersion Pilot which led to the immersing of Texas public schools into technology. A study was conducted by Shapely, Sheehan, Maloney, and Caranikas-Walker (2009) of 21 middle schools in Texas in order to examine the success of the technology immersion model that was implemented in 2003. They found that "teachers cited the lack of preparation was a major barrier to effective implementation of the computing initiatives" (Shapely et al., 2009, p. 45). "The authors of Project Red listed that giving the devices to teachers, and later to students, ensures that teachers maintain control over their own learning and can develop integrative practices for teaching on a developmental basis" (Greaves, Hayes, Wilson, Gielniak, & Peterson, 2010, p. 43).

ACOT2 "is a collaborative effort with the education community to identify the essential design principles for the 21st century high school" (ACOT2, 2008, p. 4). ACOT2 (2008) "assumes as its starting point that time-honored yet outmoded approaches to education and education reform must be replaced with new and creative ways of thinking about designing learning environments for this generation of students" (p. 4). "It is not really about the laptops. It is about what the laptops enable in terms of new

ways of teaching and learning" (Dunleavy, Dexter, & Heinecke, 2007, p. 451). One thing that should be taken into account is the fact that "technology is just a tool; unless a teacher is shown how to use it effectively, then technology use will not lead to changes in teaching and learning" (Annable, 2013, p. 167).

In North Carolina, educators are expected to use the TPACK theoretical framework that should assist teachers in being able to use technology effectively in their classroom. The three content areas to consider are technology, pedagogy, and content knowledge. Figure 1 illustrates the four areas that are created in Mishra and Koehler's (2006) framework.

The TPACK model illustrated in Figure 1 shows how technology influences a teacher's content. Figure 1 also illustrates how pedagogy and technology influence each other and that it is important to incorporate technology into the classroom. Finally, all three sets of knowledge outlined in Figure 1 influence each other. The TPACK framework supports this study for it stresses the coming together of all the components as they overlap. It is imperative that teachers are able to use technology, know their content, and interweave pedagogical knowledge seamlessly as they teach their content. For an effective teaching environment, a classroom must have all components.

Figure 1. Technological Pedagogical Content Knowledge

Mishra and Koehler (2006) stated that technology should not be seen as a separate component in the classroom, it should be integrated with the lesson so students can learn more effectively.

PBS (2013) conducted an online survey of K-12 teachers and cited that 74% of educators believe that technology gives them the ability to reinforce and expand their content. Raulston and Wright (2010) concluded that a one-to-one computing initiative that is complemented with effective professional development could be beneficial to students as they learn in the 21st century. This research looked at the quality of the professional development that was afforded to teachers prior to and during implementation of a one-to-one computing initiative. Additionally, USDOE (2010) indicated that "episodic and ineffective" (p. 5) professional development must be replaced by learning opportunities that are "collaborative, coherent, and continuous" (p. XII).

"Not only do teachers need to become familiar with hardware and software, but they need time to review available resources that would be relevant to their classroom" (Greaves et al., 2010). "Teachers will be more likely to use technology in their classrooms if they feel comfortable and confident with it, and if they see a purpose to use it" (Annable, 2013, p. 174).

According to ISTE, who released the National Education Technology Standards for Teachers (NETS-T), teachers who continuously improve their professional practice, model lifelong learning, and exhibit leadership in their school and professional community felt comfortable with technological tools. Teachers also "contributed to the effectiveness, vitality,and self-renewal of the teaching profession of their school and community" (USDOE, 2010, pp. 1-2).

Teachers who have positive self-efficacy can be effective users of technology and can assist with sustaining of a one-to-one computing initiative. Bandura's (1977) self-efficacy theory discusses four components: performance accomplishments, vicarious experience, social persuasion, and physiological and emotional states. Performance accomplishments are based on an individual's personal accomplishments; therefore, a teacher who has not used technology in their classroom
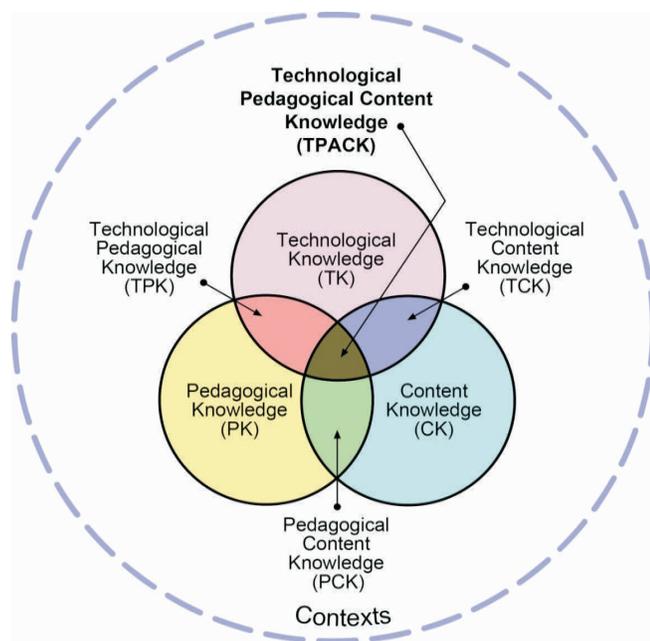
may not have self-efficacy that is based on personal accomplishments. Vicarious experience refers to what is observed as others perform an activity successfully. Teachers who have not been exposed to professional development that shows how to effectively use technology for their content or have not seen others in their department using technology effectively may not have self-efficacy that is based on vicarious experiences. Social persuasion belief is based on activities that lead people into believing they can successfully complete certain tasks. Teachers who do not have coaches who can give them evaluative feedback based on what the teacher has done in regard to technology use may not develop self-efficacy that is based on social persuasion. Physiological and emotional belief states that an individual can influence their self-efficacy judgments when it comes to certain tasks. A teacher who does not have a physiological or emotional state that can positively influence their ability to incorporate technology into their classroom may not display this level of self-efficacy. As a result, teachers may not want to use technology in their classroom, even though TPACK, legislators, and school districts may stress the incorporation of technology with their content. They may not perceive themselves to be competent in these areas.

Effective teaching is the result of continual development that is designed to inspire teachers and encourage buy-in for the district's technology program (Shapely et al., 2009). As stated by USDOE (2010), "the best form of technology professional development [is one that allows] teachers to experience technology firsthand" (p. 5). In order for professional development to be of high quality, it must provide long durations, have follow up sessions, provide access to new technologies for teaching and learning, actively engage teachers in meaningful and relevant activities for their individual contexts, promote peer collaboration and community building, and have a clearly articulated common vision for student achievement. (Lawless & Pellegrino, 2007, p. 579)

Therefore, it is imperative that effective school leaders provide ongoing, embedded professional development in order to ensure best practices for new century education. Federal, state, and local policies should support the expectation that principals will actively seek, develop, and implement robust professional learning for themselves and their teachers. (Greaves et al., 2010, p. 52)

Professional development should include various experiences that not only include the familiarizing of oneself with hardware and software but also focuses on ongoing professional development for teachers. This will assist teachers to "learn through the on-the-job application of best practices, reflection with peers, and collaboration on how to implement theories in the classroom" (Greaves et al., 2010, p. 52).

1.2 Impact of TPACK Professional Development on Teacher Self-Efficacy with Technology

It is important that teachers have pedagogical and technological knowledge of their content. In a study conducted by Foulger, Wetzel, Lindsey, Buss, and Pasquel (2016) of the integration of technology at Mary Lou Fulton College, they concluded that the use of TPACK was effective. Teachers at the college were exposed to professional development that assisted them to use TPACK in their classroom. Foulger et al. (2016) also stated that teacher self-efficacy improved since they were able to feel competent in their ability to use technology in their classes.

Corkin, Ekmekci, White, and Fisher (2016) surveyed 80 K-12 mathematics teachers from urban school districts in Florida before and after a 3-week professional development program about TPACK. They concluded that "not only do teachers need knowledge of how to incorporate technology for instruction, but they also need to believe that they have the ability to use technology effectively" (Corkin et al., 2016, p. 101). Corkin et al. stated that teachers wanted to use technology in their classrooms, but they wanted to develop self-efficacy about its use in order to confidently incorporate technology into their lessons. Corkin et al. also stated that modeling for teachers is needed in order to incorporate technology into their lessons.

Knapp (2017) conducted a case study that involved the documentation of the experience of three teachers who participated in "TPACK focused professional development workshops that were designed to improve their understanding of how to effectively use technology to teach Social Studies and whether participation in the

workshop influenced teachers' technology efficacy" (p. iii). Knapp indicated that the teachers studied believed that "seeing technology modeled in meaningful applications paired with the opportunity to practice or become a student was very useful to them" (p. 88). Knapp went on to state that teachers stated that the professional development that they had with TPACK assisted them to be able to improve their self-efficacy as it relates to technology integration in their classes. This study also highlighted Bandura's (1977) theory of self-efficacy, in particular the importance of modeling technology use in the classroom for teachers.

1.3 Background and Justification

Prensky (2011), Tapscott (2009), Howe and Strauss (2000) have all stated in their various writings that students of today learn in a different way when compared with past generations. "It is claimed that today's generation of young people have been immersed in a world infused with networked and digital technologies, [as a result,] they think differently, they learn differently… and have different expectations about life and learning" (Jones & Shao, 2011, p. 3). Of note too is that "interactive technology – in this case, video games – can change the brain, and in particular, the way we perceive things" (Tapscott, 2009, p. 98).

It is important that "technology is used for some practical purpose, and not for the sake of using technology … when people focus too much on technology, they lose sight of the true purpose of technology, which is to facilitate learning in the classroom" (Oblinger & Oblinger, 2005, pp. 4.9-4.10); therefore, "faculty and administrators today must not only establish the infrastructure for learning technology in the classroom … but it will also take great effort … to learn and use technology effectively" (Oblinger & Oblinger, 2005, p. 4.10).

As school districts adapt to an ever-changing society, it is important to ensure that students are being exposed to the technology to which they innately gravitate. In order to prepare teachers for the environment in which they must now work, it becomes important that teachers are given the professional support that will serve to assist with honing their craft.

It is inevitable … that change would finally come to our

young people's education as well, and it has. But there is a huge paradox for educators: the place where the biggest educational changes have come is not our schools; it is everywhere else but our schools (Prensky, 2011, p. 1).

"The educational establishment is utterly confused about what to do about the impact of technology on learning" (Palfrey & Gasser, 2011, p. 238); thus, "education has to change because there has been a generational shift caused by a process of technological change" (Jones & Shao, 2011, p. 8). As was previously stated, in order to prepare teachers for the environment in which they now must work, it becomes important that teachers are given the professional support that will serve to assist with honing their craft. This will also give them the tools to use technology in the appropriate way that will serve to enhance the teaching and learning environment they provide daily for students.

1.4 Summary

The one-to-one computing initiative is changing the manner in which students are instructed in the classroom (Storz & Hoffman, 2013). Effective one-to-one computing initiatives require a student-centered rather than a teacher-centered approach to instruction (Bebell & Kay, 2010). This is a paradigm shift for many teachers who are accustomed to teaching via lectures. Teachers will have to adapt a new mindset in order to cater to the needs of their students.

Rather than trying to insert knowledge into our kids' heads, as in the past (and then to measure how much of it got there), today's teachers need to find ways to create 21st century citizens (and workers) who parrot less and think more. This requires fully integrating into our teaching "meta" skills like critical thinking, problem solving, video and programming, just as we now integrate reading and writing (Prensky, 2011, p. 3).

Teachers have been exposed in some ways on how technology can be incorporate into their lessons. Some have made an attempt to incorporate technology in a way that they believe can work. "Yet even as teachers become motivated to adapt and move forward, it is not always obvious how to change old habits" (Prensky, 2011, p. 3). This is where intentional professional development will come to the

fore.

2. Purpose of the Study

The purpose of this study was to ascertain the impact of professional development on teacher instructional practices in order to sustain the one-to-one computing initiative at the high school level. It should be noted that sustain here means to look at ways to develop and sustain teamwork, in particular the standards and individual development that will serve to enhance teacher abilities to embrace technology in their classrooms (Hitt, 2011; Holcomb, Holmes, & Connelly, 2009; Zucker & Light, 2005). This study also acknowledges the fact that professional development will play a key role in this process. If a school district is willing to invest in one-to-one computing initiatives, it must want that investment to have a positive impact on student learning. This study discusses some of the instructional changes that must be considered in order to sustain one-to-one computing initiatives.

The time allotted for professional development for teachers prior to the implementation of one-to-one initiatives to students, the professional development that was afforded to teachers during implementation, and teacher perceptions of the worth of the professional development they were given were examined. This research provides data that were used to lay the foundation for what may be needed in order to sustain one-to-one computing initiatives as it relates to professional development of the teachers.

3. Methodology

The primary purpose of this study was to examine the impact of quality professional development on the sustainability of a one-to-one computing initiative. As a result, a qualitative design was utilized to examine the one-to-one computing initiative that was currently being used at three nontraditional high schools in North Carolina, USA. Each of the three schools has implemented a one-to-one computing initiative, which is a learning initiative by which students are given a computing device for use during learning, be it at school or outside of regular school hours (Bebell & O'Dwyer, 2010; Castle, 2012). This study utilized an online survey and interviews in order to provide a rich and in-depth study of the sustainability of one-to-one computing initiatives that the three nontraditional high schools have implemented. All teachers and administrators were asked to complete the online survey; however, only three principals and six teachers, two from each school, participated in the interviews for which they were randomly selected based on volunteering.

This study considered the impact of time spent to prepare teachers for the one-to-one laptop initiative, the time allotted to teachers with their laptops prior to student implementation, and how teachers valued the professional development they were afforded prior to roll out. The focus was on the types of professional development teachers were exposed to during their implementation and subsequent sustainment of the one-to-one laptop initiative.

3.1 Statement of the Problem

The question in need of an answer is, "how can professional development and exposure of teachers to technology prior to implementation assist with sustaining a one-to-one computing initiative?"

The cause of this problem is the easy access and influx of technology that improves daily. The ease with which one can have access to a mobile device has further served to compound this problem. Mobile devices often offer the same access computers would provide. Many of our phones today are referred to as "hand held supercomputers that could do anything one could do on a laptop, fueled by vast digital media collections and app stores" (Birch, 2017, p. 1). The portion of young people who use technology is higher than the older population (Cheong & Cheung, 2008; Dutton & Helsper, 2007). Additionally, there are significant differences in how and why young people use these technologies and how effectively they use them (Livingston & Helsper, 2008).

3.2 The Research Problem

It was once thought that it was too expensive to integrate one-to-one computing initiatives in public schools; however, the purchase of these laptop devices is now more affordable, thus making implementation for one-to-one computing initiatives far more worthy of consideration (Greaves, Hayes, Wilson, Gialniak, & Petersen, 2010). Consequently, if school districts are going to invest the needed money into implementing a one-to-one

computing initiative at their schools, "we must look at what teachers are doing in their classrooms, and how the laptops have had an influence on the teaching and learning that takes place" (Annable, 2013, p. 71). "Effective teaching is an outcome of preparing and continually training teachers and leaders to guide the type of learning that we want in schools" (USDOE, 2010, p. 5).

If students love technology, it is thought that it should be easy to teach using this technology; however, "adapting to this new context of change, variability and uncertainty is the biggest challenge we are now facing-as educators and as people" (Prensky, 2011, p. 1). The problem is that putting a laptop into a student's hand does not equate to teaching the lesson.

School districts, if they plan on implementing and ultimately sustaining one-to-one computing initiatives, must look at the needs of teachers, so school districts can best facilitate the implementation and ultimately the sustainability of the computing initiative. "The changes toward the way today's students learn best must drive the technology we acquire and use, rather than having our future classrooms be driven by any technology's feature set, bandwidth, availability or price" (Prensky, 2011, p. 3).

It has been recommended that future research involving one-to-one computing initiatives include the examination of teacher practices before laptop implementation along with any change that occurred after laptop implementation (Annable, 2013). Tweed (2013) echoed the need for conducting research on pre- and post-laptop implementation effects on classroom instruction. Tweed also talked about the need for further research on technology based professional development and the impact it had on teacher instruction. "There were insufficient studies to reach conclusions about the following issues related to professional development" (Sell, Cornelius-White, Chang, McLean, & Roworth, 2012, p. 31).

4. Findings

There were a number of findings that were evident when the data were analyzed. The findings and analysis of the data for this research are discussed based on the research questions that guided this study.

4.1 Research Question 1

What are teacher perceptions of the quality of professional development after the implementation of a one-to-one computing initiative?

"Professional development refers to many types of professional experiences that are related to an individual's work" (Mizell, 2010, p. 3). The data in this study indicate that teachers were provided with professional development prior to and during implementation. The data also indicated that only 21.06% of the teachers who participated in the survey had less than 1-2 years of being a certified teacher. With 42.11% teachers stating they had 11-15 years of teaching experience, it was found that only 2.63% of participants stated they were a novice when it came to using technology. Half of the teachers stated they were at the intermediate level when it comes to computer usage, with 44.74% indicating that they were at the advance level. In a study that was designed to examine the relationship between professional development in literature and self-reported change in teachers, Garet, Porter, Desimone, Birman, and Yoon (2001) found that the notion that external ideas alone will result in changes in the classroom and school is deeply flawed as a theory of action.

Similarly, it would be deeply flawed to think that because teachers self-reported they are intermediate or advanced when it comes to technology, they are able to incorporate technology seamlessly into their instruction.

Additionally, ISTE, who released NETS-T, believed that teachers who continuously improve their professional practice, model lifelong learning, and exhibit leadership in their school and professional community, felt comfortable with technological tools as stated earlier. Teachers also "contributed to the effectiveness, vitality, and self-renewal of the teaching professional of their school and community" (USDOE, 2010, pp. 1-2). In this study, it was evident that even though teachers self-report being proficient with technology, they needed additional support when it came to utilizing technology in their classroom. Content specific professional development was one of the ways teachers in this study felt that the quality of the professional development after implementation of a one-

to-one computing initiative can be improved and ultimately sustained.

4.1.1 Content Specific Professional Development

Research Question 1 in this study brought to the fore that teachers believed quality professional development specific to the content being taught would aid in developing their pedagogy. Interview question 6 asked the participants to indicate the value of specific professional development in preparation for the one-to-one computing initiative. The data for survey question 6 illustrated that 44.74% of the participants indicated that learning to implement the technology within instruction was significant to their preparation as it relates to the professional development that was offered as the district prepared for the one-to-one computing initiative. Survey question 6 also illustrated that learning to use hardware applications, learning to use the software applications, and learning to use a content management platform were all rated as being good to the teachers' value as their school prepared for the one-to-one computing initiative; however, respondents were of the view that in order to sustain the one-to-one computing initiative, it would be imperative that professional development be content specific.

Even though only nine of the participants participated in the interview question 6 asked participants to identify what type of professional development would be more beneficial as the school sustains a one-to-one computing initiative. A common response for the interviewees was that there was a need to have quality professional development that focused on showing teachers how to use the technology that was specific to their pedagogy. These data further support Research Question 1, for teachers were asked to indicate their perception of the quality of professional development of a one-to-one computing initiative. School districts that have a one-to-one computing initiative that has been or will be implemented may want to ensure that professional development is content specific, so teachers are able to see how they can incorporate technology for their pedagogy. As stated by the USDOE (2010), "the best form of technology professional development is one that allows teachers to experience technology firsthand" (p. 5).

Firsthand experience is one that ensures that professional development is based on the teacher's content. As Greaves et al. (2010) stated, "effective school leaders provide ongoing, embedded professional development in order to ensure best practices for new century education" (p. 52). Participant perceptions of quality professional development after the implementation of a one-to-one computing initiative were that in order for their district's one-to-one computing initiative to be sustained, it would be extremely beneficial to have pedagogy-driven professional development. As a result, teachers would be able to relate the information shared in the professional development with their pedagogy.

"Teachers are more likely to use technology in their classrooms if they feel comfortable and confident with it, and if they see the purpose for it" (Annable, 2013, p. 174); thus, as we attempt to sustain a one-to-one computing initiative, professional development for teachers needs to be "ongoing on the job application of best practices, reflection with peers, and collaboration on how to implement theories in the classroom" (Greaves et al., 2010, p. 52). In order to ensure that teachers are comfortable with technology in their classroom, the data for this study show that teachers are of the perception that content specific professional development would be beneficial (Bandura 1977). Content specific professional development may also assist teachers to be able to effectively use the TPACK model as they incorporate technology into their lessons.

4.1.2 Willingness to Use Technology

It can be inferred based on the data that respondents were willing to use technology in the classroom. A number of the survey responses illustrated that if the respondent was using technology prior to implementation, there was an increase in the use of technology after implementation. The data for survey question 13 indicated that prior to the implementation of the one-to-one computing initiative, 8.11% of the respondents created a learning activity designed to challenge students to think critically once or twice a semester; 13.51% indicated once or twice a month; 45.95% indicated once or twice weekly; and 29.73% indicated daily. After the implementation of the one-to-one computing initiative, 2.63% indicated that they

created a learning activity designed to challenge students to think critically once or twice a semester; 7.89% indicated once or twice a month; 50% indicated once or twice a week; and 39.47% indicated daily. While the overall percentage of the creation of a learning activity designed to challenge students to think critically increased during implementation, the daily use increased by nearly 10%. Similarly, prior to the one-to-one computing initiative implementation, teacher participants indicated for survey question 14 that 29.73% never used a class web page or used a content management platform where students can access learning materials and/or turn in assignments in a digital format; 2.70% indicated once or twice a year; 10.81% indicated once or twice a semester; 10.81% indicated once or twice a month; 21.62% once or twice a week; and 24.32% indicated daily. During the implementation of the one-to-one computing initiative, the data indicate that teachers had increased their use of technology to create a web page or content platform that students can use to access class materials and/or submit their assignments. The daily use of technology to create a web page or content platform that students can use to access class materials and/or submit their assignments increased by 13.52% during implementation.

Once or twice a week also increased by 8.11%. In a study of one-to-one programs in western Massachusetts, Bebell and Kay (2010) found that "it is impossible to overstate the power of individual teachers in the success or failure of one-to-one computing initiatives" (p. 47). This study indicated that respondents wanted to incorporate technology into their classroom and showed several teachers increased usage during implementation. As we consider the data, 95% of the teachers indicated that they had a positive self-efficacy when it came to their competency with technology. This is further supported by their willingness to use technology during implementation.

4.1.3 Value of Professional Development

Research Question 1 allowed teachers to indicate their perception of the quality of professional development after the implementation of a one-to-one computing initiative, in particular their value of the various types of professional development they were given.

Respondents indicated that learning to use software applications and programs was good to their value as they prepared for the one-to-one computing initiative. Learning to use content, management, and delivery platforms for their instruction was given the highest percentage as it being good to the respondent's value. Interestingly, it was professional development that taught participants how to implement technology within instruction that received the highest value rating by participants. Respondents stated that learning to implement the technology within their classroom instruction was significant to their value as the district prepared participants for the one-to-one computing initiative. Yoon, Duncan, Lee, Scarloss, and Shapely (2007) reviewed over 1,300 studies to ascertain how professional development affected student achievement, and they found that the advancement of teacher understanding of their pedagogy is achieved through professional development. On the other hand, teachers should not only "become familiar with hardware and software [related to their computing device], but they need time to review available resources that would be more relevant to their classroom" (Greaves et al., 2010, p. 52).

Penuel (2006), who synthesized the findings from 30 separate studies of one-to-one initiatives which included Henrico County in Virginia, Cobb County in Georgia, and the SRI International Researchers who were under contract with the USDOE, went on to state that teachers reported that their technology professional development sessions typically focused on the procedural use of the software. On the other hand, learning how to effectively use the hardware for classroom instruction was more critical (Penuel, 2006). This further supports the findings in this study that teachers perceived there would be value to professional development that is content specific. Penuel's findings indicated it was more critical to learn how to effectively use the hardware for classroom instruction, which is parallel with the findings in this study. It gives credibility to what respondents in this study have indicated. Interviewees stated that learning how to use the hardware as it relates to their content should be done in professional development. Interviewees also felt that using the

technology for testing and accountability was useful to them but felt that professional development that focused on content specific instruction would be more beneficial.

Similarly, in this study, teachers also indicated that much of the professional development prior to and during implementation of the one-to-one computing initiative focused greatly on showing teachers how to use technology for testing purposes. While teachers did see the value in this, they also indicated there was a greater need to ensure that, as high school teachers, they have professional development that focuses more on using the technology by content; therefore, teachers want to be able to teach students how to "acquire and apply new knowledge" (Trilling & Fadel, 2009, p. 9). Thus, "teacher preparation through quality [content specific] professional development can be statistically significant" (Shapely et al., 2009, p. 33). This is definitely the case in this study, because the common trend for respondents was that they would like to see professional development that is content specific. As we consider the data, respondents indicated that vicarious experiences discussed by Bandura (1977) would be extremely beneficial to them, and they would improve their self-efficacy if they were shown how to use technology based on their content.

4.2 Research Question 2

What were teacher perceptions of the time spent on professional development and its value for the teaching of their lessons?

Survey question 6, which asked respondents to rate the value of specific types of professional development that prepared them for the one-to-one computing initiative, indicated that participants felt that learning to use hardware, software, and content management platforms was good to their value. The data indicated that respondents found the time that was spent on professional development valuable for the teaching of their lessons. Teachers who participated in the interviews stated that they felt that the time that was spent in professional development prior to implementation was valuable for the teaching of their lessons (Bandura 1977). The data also indicated that the respondents sought to make adjustments to their instructional practice and brought to

the fore a greater role for instructional coaches. Survey question 7, which asked how often respondents used technology to plan instruction, illustrated an increase in the daily use from 51.35% prior to implementation to 68.42% during implementation. Similarly, survey question 8, which asked how often did respondents use technology to deliver instruction, indicated that daily use increased from 56.76% prior to implementation to 71.05% during implementation. Survey questions 7 and 8 both indicated increases in the use of technology based on the time that was spent in professional development prior to implementation. On the other hand, survey questions 7 and 8 also indicated there were respondents who used technology once or twice a year to plan and deliver instruction. Respondents are willing to make adjustments to their instructional practice; however, instructional coaches may be useful to assist all teachers to use technology effectively in their classroom since they can offer professional development that caters specifically to the planning and delivering of instruction based on content.

4.2.1 Adjustments to Instructional Practice

Research by Drayton, Falk, Stroud, Hobbs and Hammerman (2010) indicated that "a lack of professional development, especially in the form of teacher collaboration to develop best practices within a school, becomes a barrier to effective integration of computer and web resources in the classroom" (p. 41). There are a lot of factors that would affect the sustainability of one-to-one computing initiatives; however, "a number of teachers changed the practices to accommodate the opportunities of increased technology access" (Bebell & Kay, 2010, p. 6; Drayton et al., 2010; Shapely et al., 2009; Suhr, Hernandez, Grimes, & Warschauer, 2010). The respondents in this survey did indicate a willingness to adjust their instructional practices in the classroom. The leaders who were a part of this study also indicated they model technology use for their teachers during faculty and staff meetings. Research Question 2 focused on teacher perceptions of the time spent on professional development and its value for the teaching of their lessons. Teachers saw a value for professional development. The data illustrated that respondents made adjustments after

implementation in many instances that led to an increased use of technology in their classroom. The data show that respondents valued the time that was spent on professional development. Participants indicated there was a need to sustain the professional development they were getting and ensure that professional development was content specific.

Respondents indicated they used technology to plan their instruction on a daily basis, which increased from 51.35% prior to one-to-one computing implementation to 68.24% after implementation. Respondents also indicated that technology was used to deliver instruction, which also saw an increase from 56.76% prior to implementation to 71.05% during implementation. There was also an increase in the use from 45.95% prior to implementation to 65.79% when it came to the daily use of digital resources to supplement the existing textbook and/or curriculum that was available to respondents.

Respondents indicated that students were asked on a daily basis to complete classroom learning assignments which indicated growth from 32.43% prior to the implementation of the one-to-one computing initiative to 59.46% after the one-to-one computing initiative. The data in this research indicate there is a need for teachers to clearly know how to use technology in terms of their district's expectations. It would also be beneficial for teachers to be given ongoing surveys so districts can ascertain teacher needs and address them accordingly.

4.2.2 Role of Instructional Coaches

All the school leaders at the different schools also indicated that teachers have instructional coaches who model for them. The problem in one school was that the instructional coach had to facilitate the entire district. Another school leader stated that the instructional coach serves all the teachers, but all teachers teach different subjects. The instructional coach could speak to the use of technology but could not specifically look at the pedagogy of the teacher and relate the use of technology to a specific course. This confirms there is a need for instructional coaches who are not only able to focus on the school that has implemented the one-to-one computing initiative, but also are trained in specific pedagogy and are able to offer

professional development that focuses on implementation of technology based on specific courses. As Research Question 2 discussed, participants saw a value for the time spent on professional development and its role in teaching their lessons. They went on to stress that professional development must cater to their specific needs by being pedagogically driven.

Corkin et al. (2016) surveyed 80 K-12 mathematics teachers from urban school districts in Florida before and after a 3-week professional development program about TPACK. Corkin et al concluded that not only do teachers need knowledge of how to incorporate technology for instruction, but it is imperative that believe they have the ability to use technology effectively (Bandura, 1977; Corkin et al., 2016). Corkin et al. stated that teachers wanted to use technology in their classrooms, but they wanted to develop self-efficacy about its use in order to confidently incorporate technology into their lessons. Corkin et al. also stated that modeling for teachers is needed in order to incorporate technology effectively in their classrooms (Bandura, 1977).

If teachers have instructional coaches to whom they are assigned based on content, this may also improve the self-efficacy of teachers. Bandura (1977) talked about the importance of social persuasion to build self-efficacy. As a result, teachers with instructional coaches who can offer professional development that focuses on the content of the course may provide feedback on performance that may improve teacher self-efficacy and improve the integration of technology into the teachers' content. "Teacher preparation through quality professional development can be statistically significant" (Shapely et al., 2009, p. 33). Research by Drayton et al. (2010) indicated that "a lack of professional development, especially in the form of teacher collaboration to develop best practices within a school, becomes a barrier to effective integration of computer and web resources in the classroom" (p. 41). In an effort to sustain a one-to-one computing initiative, it is important that teachers have an opportunity to work with instructional coaches or instructional technology specialists who can offer professional development that focuses on the content of

the course. In an effort to sustain a one-to-one computing initiative, it would be beneficial to a school district if they spent time to ensure that teachers are able to effectively use TPACK and the North Carolina digital learning competencies. This could ensure that teachers are able to integrate technology effectively in their classroom, which can be modeled for them by an instructional coach.

4.2.3 Teacher Expectation Contracts

Respondents also felt that the time that was spent on professional development prior to implementation was good, as is indicated in the data for survey question 6. Respondents also felt that the time spent on professional development during implementation needed to be content specific, as was stated in the interviews. Principals who participated in the interviews stated that they modeled technology use for teachers during staff meetings as a professional development session during implementation. None of the principals stated how this was modeled, but teachers stated in their interviews that the modeling done for them during staff meetings by their school principal was inadequate. A teacher went on to state that they would have preferred that the time spent on professional development during implementation be content specific in order to assist them with how technology should be used for their pedagogy.

Students and parents in all schools were expected to sign a contract with the school district that governs the expectations for the repairs of computing devices. It is also important that teachers not only sign a contract that states what they are responsible for when it comes to the repair for their computing device, but they should also sign a contract that directly outlines the expectations of teachers as they use the computing device in their classroom. Many principals, who participated in the interviews for this study, may think that modeling technology use during staff meetings is useful; however, teachers stated during interviews that their principal modeling technology use was not adequate. Therefore, it may be useful for school districts to have an expectation for the use of the computing devices once they are in the hands of the teachers and principals. Teachers and principals should be clearly aware of the fundamentals of what is expected in the classroom

and schools once they have signed for their computing device.

It is important that the availability of learning materials for the classroom for all students, parents, and stakeholders expectations be clearly outlined. Contracts should clearly outline that not only should teachers use Rapid Identity or any other district specified web platform, but they must also set up a class web page in Canvas if the school district pays for that service, or Google classroom, or any other recommended web page for the district. When teachers are aware of the expectations for the use of technology in their classroom, the likelihood of the inappropriate use of technology or no use at all may diminish. Marzano and Waters (2009) talked about the fact that ensuring uniform integration of technology in every class implies a clearly articulated, district-wide approach to instruction. They went on to state that this is a key trait of high-performing districts as well. The signing of a contract that clearly outlines expectations at a one-to-one computing school would be beneficial to a school that is implementing and sustaining a one-to-one computing initiative.

4.3 Research Question 3

What were teacher perceptions of the value of the time allotted to teachers to have access to their devices prior to students having access to a similar device?

The data show that respondents did place a significant value on having access to their devices prior to students. An interviewee indicated that having access to their device prior to students was beneficial but was also of the belief that students could have had their device as well. Storz and Hoffman (2013) conducted a study that focused on a Midwestern urban middle school that had "emphasis on how teachers can use technology in their teaching" (p. 13). Their study found that some teachers believed it would have been great if "they had access to their laptops prior to students" (Storz & Hoffman, 2013, p. 13). Respondents in this study preferred to have professional development that was content specific and felt that this would have been more beneficial than having access to their devices before students.

Majeski (2013) examined middle school teacher and

principal perspectives as they relate to the use of technology in the classroom and schools. He found that "there needed to be greater access to laptops prior to the using of the technology in their schools" (Majeski, 2013, p. 56). "It is important that teachers engage with the technology prior to them being asked to incorporate the technology in their classroom with students" (Gulamhussein, 2013b, p. 1). The data in this study agree with research by Gulamhussein (2013a). Respondents were of the belief that they needed professional development that served to offer pedagogically driven professional development; however, participants did not think that simply having the computing devices prior to students would be beneficial.

Similarly, Higgins and Russell (2003), who conducted a survey into the types of professional development that teachers thought were beneficial in integrating technology in the classroom, reported that the majority of the high school teachers in their study indicated that basic professional development designed to teach teachers to manage their computers was not necessary because they preferred to be taught how to use the devices in their lessons.

Participants in this study did find the value of learning to use the hardware and software to be of good value as was stated in the data for survey question 6. Interviewees also stated that professional development that focused on showing them how to use the technology in their classroom was of significant value to them. As was stated earlier, this was quite evident when one looks at the response for survey question 6 which indicated that respondents stated that professional development that focused on learning to implement that technology within instruction to be the greatest value to teachers.

5. Recommendations for Sustaining a One-to-One Computing Initiative

Based on the data collected in this study, there are a number of recommendations school districts should consider as they implement and ultimately sustain a one-to-one computing initiative. The recommendations are not prioritized, and they are as follows:

- Offer professional development prior to and during implementation of a one-to-one computing initiative that is pedagogically driven. Teachers will need to be exposed to professional development that is based on incorporating the technology into their instruction based on the course they teach.

- Offer professional development to administrators and teachers about the hardware and software components of the computing device.

- Conduct surveys of teachers prior to and during implementation of a one-to-one computing initiative in order to ascertain their ability to use the hardware, software, and technology for their instruction and to identify any needs teachers may have.

- It is recommended that schools that have a one-to-one computing device have instructional coaches who are able to provide course specific professional development to teachers. It would be preferred that the coach or coaches be someone who is assigned to that school.

- Ensure that teachers sign contracts for not only their computing device but also contracts that clearly outline expectations of technology use for classroom instruction.

- Encourage professional development that will allow teachers at the school to collaborate irrespective of their pedagogy. This could ensure that best practices for the use of technology for instruction can be shared.

- Offer professional development for school administrators at schools with a one-to-one computing initiative, so they are able to determine if technology is being implemented with fidelity in the classrooms at their school.

Conclusion

At the state level in North Carolina, USA, teachers in all grades are expected to incorporate computer skills into their classroom; therefore, technology skills should be seen as being a seamless integration. The model that is used in North Carolina is the TPACK model. Teachers in North Carolina are expected to ensure that as they teach their pedagogy, they use technology seamlessly.

North Carolina State Board of Education (2017) stated,

The NC State School Technology Plan shall be a comprehensive State implementation plan for the uses of funds from the State School Technology Fund and other sources to improve student performance in the public schools through the use of learning andinstructional technologies (p. 1).

Thus, schools are expected to use the funds that are afforded to them by the state to ensure that the TPACK model is followed in schools. The result of the use of technology is to ensure that, as North Carolina State Board of Education (2017) continued, "the use of technologies challenges State, federal, and local educational performance" (p. 1). The ultimate aim is to "effectively integrate technologies that are compatible with the standard course of study, the State assessment program, and related student data management" (North Carolina State Board of Education, 2017, p. 1).

Without a doubt, "our educational context has changed and a new context demands new things" (Prensky, 2011, p. 2). Rather than try to insert knowledge into our students' brains, "today's teachers need to find ways to create 21st century citizens who parrot less and think more" (Prensky, 2011, pp. 2-3); however, as teachers attempt to find ways to create a class environment that will teach students to be ready for the future, they need the support that will show them how to incorporate lessons that are technologically enhanced. In order for instruction to be effective, lessons must be designed to address the needs of each individual student (Conole & Fill, 2005).

As a result, it is important that we not only continue to implement one-to-one computing initiatives, but school districts must ensure that professional development is offered prior to and during implementation in order to ensure that the one-to-one computing initiative is sustained. As this study has shown, teachers want professional development that will assist them in being able to use technology appropriately in their classroom as their school district implements and sustains a one-to-one computing initiative.

References

[1]. **Annable, C. (2013).** *An investigation of laptop classrooms and the teaching and learning of mathematics* (Doctoral dissertation) University of Toronto, Canada. Retrieved from https://tspace.library.utoronto.ca/handle/1807/35766

[2]. **Apple Classrooms of Tomorrow–Today. (2008, April).** Apple Classrooms of Tomorrow— Today: Learning in the 21st century. Retrieved February 8, 2018, from http://cbl.digitalpromise.org/wp-content/uploads/sites/7/2017/07/ACOT2_Background.pdf

[3]. **Bandura, A. (1977).** *Self-efficacy: The exercise of control*. New York: W.H. Freeman & Co.

[4]. **Bebell, D., & Kay, R. (2010).** One to one computing: A summary of the quantitative results from the Berkshire Wireless Learning Initiative. *Journal of Technology, Learning, and Assessment,* 9(2)

[5]. **Bebell, D., & O'Dwyer, L. (2010).** Educational outcomes and research from 1:1 computing settings. The Journal of Technology, Learning, and Assessment, 9(1), 1-16. Retrieved February 15, 2018, from https://ejournals.bc.edu/ojs/index.php/jtla/article/view/1606/1463

[6]. **Birch, M. (2017).** *12 most important technologies since 1990.* Retrieved March 25, 2018, from https://www.alleywatch.com/2014/11/12-most-important-technologies-since-1990/

[7]. **Borthwick, A., & Pierson, M. (2008).** *Transforming classroom practice: Professional development strategies in educational technology.* Eugene, OR: International Society for Technology in Education.

[8]. **Cheong, C. M., & Cheung, W. S. (2008).** *Early childhood teacher research: From questions to results.* New York, NY: Routledge Online discussion and critical thinking skills: A case study in a Singapore secondary school. *Australasian Journal of Educational Technology,* 24(5), 556-573. https://doi.org/10.14742/ajet.1191

[9]. **Cheong, C. M., & Cheung, W. S. (2008).** Online discussion and criticalthinking skills: A case study in a Singapore secondary school. *Australasian Journal of Educational Technology,* 24(5), 556-573.

[10]. **Conole, G., & Fill, K. (2005).** A learning design toolkit to create pedagogically effective learning activities. *Journal of Interactive Media in Education,* (1), 1-16. Retrieved April 5, 2018, from https://oro.open.ac.uk/11725/1/conole-

2005-08.pdf

[11]. Corkin, D., Ekmecki, A., White, C., & Fisher, A. (2016). Teachers' self-efficacy and knowledge for the integration of technology in mathematics instruction at urban schools. In K. V. Adolphson & T. M. Olson (Eds.), *Proceedings of the 43rd Annual Meeting of the Research Council on Mathematics Learning* (pp. 101-108). Retrieved March 4, 2018, from https://rusmp.rice.edu/sites/g/files/bxs1546/f/teachers' self-efficacy.pdf

[12]. Drayton, B., Falk, J. K., Stroud, R., Hobbs, K., & Hammerman, J. (2010). After installation: Ubiquitous computing and high school science in three experienced high-technology schools. *Journal of Technology, Learning, and Assessment, 9*(3), 1-57.

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

[14]. Dutton, W. H., & Helsper, E. J. (2007). Oxford internet survey 2007 report: The internet in Britain. https://doi.org/10.2139/ssrn.1327033

[15]. Ferguson, T. B. (2012). *Technology expenditures: A policy analysis in a selected school and return on investment* (Doctoral dissertation) University of Florida. Retrieved from https://search.proquest.com/docview/1369522124

[16]. Foulger, T. S., Wetzel, K., Lindsey, L., Buss, R. & Pasquel, S. (2016). Using TPACK as a professional development framework: Benefits, limitations, and exploration of other possible frames. In G. Chamblee & L. Langub (Eds.), *Proceedings of society for information technology & teacher education international conference* (pp. 2842-2849). Savannah, GA: Association for the Advancement of Computing in Education (AACE).

[17]. Garet, M. S., Porter, A. C., Desimone, L., Birman, B. F., & Yoon, K. S. (2001). What makes professional development effective? Results from a national sample of teachers. *American Educational Research Journal, 38*(4), 915-945. https://doi.org/10.3102/00028312038004915

[18]. General Assembly of North Carolina. (2013, March 15). House Bill 23. Retrieved March 5, 2018, from https://www.ncleg.net/Sessions/2013/Bills/House/PDF/H23v5.pdf

[19]. Gibbons, S. (2007). *Redefining the roles of Information professionals in higher education to engage the net generation.* In EDUCAUSE, Australasia, Melbourne, 2007.

[20]. Girgin, U., Kurt, A., & Odabasi, F. (2011). Technology integration issues in a special education school in Turkey. *Cypriot Journal of Educational Sciences, 6*(1), 13-21.

[21]. Greaves, T., Hayes, J., Wilson, L., Gielniak, M., & Peterson, E. (2010). *Project RED key findings*. Shelton, CT: MDR.

[22]. Gulamhussein, A. (2013a). Teaching the teachers: Effective professional development in an era of high stakes testing. *Center for Public School Education,* 1-47. Retrieved January 20, 2018, from http://www.centerfor publiceducation.org/Main-Menu/Staffingstudents/Teaching-the-Teachers-Effective-Professional-Development-in-an-Era-of-High-Stakes-Accountability/Teaching-the-Teachers-Full-Report.pdf

[23]. Gulamhussein, A. (2013b). The core of professional development. *American School Board Journal, 7,* 36-37.

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

[25]. Hill, H.C., Blazar, D., & Lynch, K. (2015). Resources for teaching: Examining personal and institutional predictors of high quality instruction. *AERA Open, 1*(4), 1-23. https:doi.org/10.1177/2332858415617703

[26]. Hitt, M.A. (2011). Relevance of strategic management theory and research for supply chain management. *Journal of Supply Chain Management, 47*(1), 9-13. https://doi.org/10.1111/j.1745-493X.2010.03210.x

[27]. Holcomb, T. R., Holmes Jr, R. M., & Connelly, B. L. (2009). Making the most of what you have: Managerial ability as a source of resource value creation. *Strategic Management Journal, 30*(5), 457-485. https://doi.org/10.1002/smj.747

[28]. Howe, N., & Strauss, W. (2000). *Millennials rising: The next great generation*. New York, NY: Vintage Books.

[29]. Jones, C., & Shao, B. (2011). *The net generation and digital natives: Implications for higher education*. New York: Higher Education Academy.

[30]. Kenney, S. (2011). Teaching young children how to sing: One school's experience. *General Music Today,* 24(2), 52-56. https://doi.org/10.1177/1048371310385803

[31]. Knapp, W. (2017). *The impact of TPACK and teacher technology efficacy on social studies teachers' use of technology in the classroom* (Doctoral dissertation) University of Minnesota, USA. Retrieved from https://conservancy.umn. edu/bitstream/handle/11299/193425/Knapp_umn_0130E_18737.pdf?sequence=1

[32]. Lawless, K. A., & Pellegrino, J. W. (2007). Professional development in integrating technology into teaching and learning: Knowns, unknowns, and ways to pursue better questions and answers. *Review of Educational Research,* 77(4), 575-614. https://doi.org/10.3102/0034654307309921

[33]. Livingstone, S., & Helsper, E. (2007). Gradations in digital inclusion: Children, young people and the digital divide. *New Media & Society,* 9(4), 671-696. https://doi.org/10.1177%2F1461444807080335

[34]. Majeski, M. (2013). *Middle school teachers and principals perspectives on technology* (Doctoral Dissertation) University of Nebranka, Lincoln. Retrieved November 5, 2017, from https://digitalcommons.unl. edu/cgi/viewcontent.cgi?article=1155&context=cehsedaddiss

[35]. Marzano, R. J., & Waters, T. (2009). *District leadership that works:* Striking the right balance. USA: Solution Tree.

[36]. Mishra, P., & Koehler, M. J. (2006). Technological pedagogical content knowledge: A framework for teacher knowledge. *Teachers College Record,* 108(6), 1017-1054. Retrieved April 4, 2018, from http://one2oneheights. pbworks.com/f/MISHRA_PUNYA.pdf https://doi.org/10.1111/j.1467-9620.2006.00684.x

[37]. Mizell, H. (2010). *Why professional development matters.* Retrieved November 26, 2018, from https://learningforward.org/docs/default-source/pdf/why_pd_matters_web.pdf

[38]. No Child Left Behind Act. (2002). Public Law 107-110-JAN. Retrieved from https://files.eric.ed.gov/fulltext/ED556108.pdf

[39]. North Carolina Department of Public Instruction. (2016, June). *NC digital learning competencies for educators.* Retrieved May 4, 2018, from http://www.dpi. state.nc.us/dtl/digitallearningnc/competencies/

[40]. North Carolina State Board of Education. (2017). *Duty to propose a state school technology plan.* Retrieved February 12, 2018, from https://www.ncleg.net/enactedlegislation/statutes/html/bysection/chapter_115c/gs_115c-102.6.html

[41]. Oblinger, D. G., & Oblinger, J. L. [Eds] (2005). *Educating the net generation: Educause.* Washington: DC. Retrieved from https://www.educause.edu /ir/library/PDF/pub7101.PDF

[42]. Palfrey, J. G., & Gasser, U. (2011). *Born digital: Understanding the first generation of digital natives*. New York, NY: Basic Book.

[43]. PBS. (2013, February 4). *PBS survey finds teachers are embracing digital resources to propel student learning.* Retrieved May 16, 2018, from http://www.pbs.org/about/blogs/news/pbs-survey-finds-teachers-are-embracing-digital-resources-to-propel-student-learning/

[44]. Penuel, W. R. (2006). Implementation and effects of one-to-one computing initiatives: A research synthesis. Journal of Research on in Education, 38(3), 329-348. Retrieved August 20, 2017, from http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.461.7049&rep=rep1&type=pdf

[45]. Prensky, M. (2011). A huge leap for the classroom. *Educational Technology.* Retrieved February 4, 2018, from http://marcprensky.com/ writing/Prensky-EDTECH-LearningCatalytics-Nov-Dec-2011-FINAL.pdf

[46]. Raulston, C., & Wright, V. (2010). Teachers' perceptions and attitudes of one teacher laptop initiative: Connections toward 21st century learning. *Meridian: A Kindergarten Through High School Information and Communication Technologies Journal,* 13(1), 1-7.

[47]. Sell, G. R., Cornelius-White, J., Chang, C., McLean, A.,

& Roworth, W. R. (2012). *A meta-synthesis of research on 1: 1 technology initiatives in K-12 education*. Unpublished Postgraduate). Springfield/Missouri State University.

[48]. Shapely, K., Sheehan, D., Maloney, C., & Caranikas-Walker, F. (2009). Evaluation of the Texas Technology Immersion Pilot. *Texas Center for Educational Research,* 1-168. Retrieved March 5, 2018, from https://files.eric.ed.gov/ fulltext/ED536296.pdf https://doi.org/10.17763/ haer.57.1.j463w79r56455411

[49]. Shulman, L. (1987). Knowledge and teaching: Foundations of the new reform. Harvard Educational Review, 57(1), 1-22. https://doi.org/10.17763/haer.57.1. j463w79r56455411

[50]. Storz, M.G., & Hoffman, A.R. (2013). Examining response to a one-to-one computer initiative: student and teacher voices. Research in Middle Level Education, 36(6), 1-18. Retrieved January 20, 2018, from https://files.eric.ed. gov/fulltext/EJ995733.pdf

[51]. Suhr, K. A., Hernandez, D. A., Grimes, D., & Warschauer, M. (2010). Laptops and fourth grade literacy: Assisting the jump over the fourth-grade slump. The Journal of Technology, Learning and Assessment, 9(5). 1-45.

[52]. Sutherland, C. (2016). Digital natives: 4 ways technology has changes the' student. Explorance. Retrieved November 26, 2017, from https://explorance. com/2016/03/digital-natives-4-ways-technology-changed-student/

[53]. Tapscott, D. (2009). *Grown up digital: How the net generation is changing your world*. New York, NY: McGraw Hill.

[54]. TPack Org. (2012, September 24). *What is TPACK.* Retrieved May 5, 2018, from http://www.tpack.org/

[55]. Trilling, B., & Fadel, C. (2009). *21st century skills: Learning for life in our times.* San Francisco, CA: John Wiley and Sons, Inc.

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

[57]. USDOE. (2010). Transforming American education: Learning powered by technology. Retrieved from https://www.ed.gov/sites/default/files/netp2010.pdf

[58]. USDOE. (2013a). Expanding evidence approaches for learning in a digital world. Retrieved from https://tech.ed.gov/wp-content/uploads/2014/11/ Expanding-Evidence.pdf

[59]. USDOE. (2013b). Every student succeeds act. Retrieved May 5, 2018, from https://www.ed.gov/essa

[60]. Yoon, K. S., Duncan, T., Lee, S. W. Y., Scarloss, B., & Shapley, K. L. (2007). Reviewing the evidence on how teacher professional development affects student achievement. Retrieved January 20, 2018, from https://ies.ed.gov/ncee/edlabs/regions/southwest/pdf/REL _2007033.pdf https://doi.org/10.1126/science.1167705

[61]. Zucker, A. A., & Light, D. (2005). Laptop Programs for students. Science, 323(5910), 82-85. https://doi.org/10.1126/science.1167705

ABOUT THE AUTHOR

Dr. Kerry Morrison is a Secondary English and Science Instructional Coach in the Raleigh Durham area in North Carolina. She holds a PhD in Educational Leadership. She is also a licensed superintendent and principal. She is a member of Kappa Delta Pi Honor Society, and the Golden Key International Honor Society. She dedicates her life to the service of others. As a district level administrator she has positively impacted the lives of fellow administrators, teachers, students, and parents. She leads from the heart, and encourages all that she meets to be the best that they can be. She is a trained SREB Literacy Design Collaborative Coach, an MTSS Coach, and a trained technology coach. She is a firm believer that we are preparing students for jobs that we don't even know about, and believes that education is the key to success. As a result, she strives to show educators how technology can enhance the teaching and learning environment. She also strives to avail herself to school districts that may need help with not only the implementation of, but also the sustaining of their one-to-one computing initiatives.