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Effective iPad Instruction: A Qualitative Study Comparing Classroom Practices to the Technology Integration Matrix

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EFFECTIVE IPAD INSTRUCTION: A QUALITATIVE STUDY COMPARING CLASSROOM PRACTICES TO THE TECHNOLOGY INTEGRATION MATRIX

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Approved by
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APPROVAL OF DISSERTATION

We, the faculty supervising the work of **Bridget Phillips**, affirm that the dissertation, *Effective iPad Instruction: A Qualitative Study Comparing Classroom Practices to the Technology Integration Matrix*, meets the high academic standards for original scholarship and creative work established by the EdD Program in Curriculum & Instruction and the College of Education and Professional Development. This work also conforms to the editorial standards of our discipline and the Graduate College of Marshall University. With our signatures, we approve the manuscript for publication.

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DEDICATION

This dissertation is dedicated to my husband, children, and my parents. Brian, I thank you for your patience and understanding during this process. It has been a long five years and you have been there to listen, encourage, and many times read and edit my work. You picked up the slack and took good care of our boys when I was not able to be there. I appreciate you more than words can express. Braden and Blake, you are the most important things to me. I hope this accomplishment shows you that you can do anything you want when you make up your mind to do it and put in hard work. There were many times I wanted to give up, but thinking about the both of you and what message that would send kept me going. Mom, you and dad raised me to know that nothing in life comes easy, and with the grace of God you can accomplish anything. To my father, I know you have been with me through this whole endeavor and are looking down from heaven. I hope I have made you proud.

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ABSTRACT

Technology has become a natural part of our students' lives. The use of iPads in classrooms has increased, and educators are becoming more experienced using them during instruction. Research needs to focus on providing educators with examples of effective instructional practices with iPads. To provide samples of effective instruction, this qualitative study used evidence from classroom observations and aligned the lessons to the Technology Integration Matrix (TIM). Lessons were observed and aligned to the Adoption, Adaptation, and Infusion levels of the TIM with Active, Collaborative, Constructive, and Authentic learning attributes. In addition this study investigated the perceptions teachers and principals had about their journey with iPads and the impact on their schools, classrooms, and students. Three elementary schools in West Virginia were chosen by means of purposeful sampling, and classroom observations and interviews were used as methods of data collection. Four main themes emerged from the data: lessons that fall higher on the TIM created more student ownership of their learning; iPads increased student engagement and provided more opportunities for collaboration; effective student-centered instructional practices led to more effective implementation of iPad integration versus teacher-centered instruction; and strong leadership in a school contributed to the effective implementation of iPads.

CHAPTER 1

INTRODUCTION

It is no secret that technology is taking the world by storm. Computers, cell phones, and other kinds of devices have had a tremendous impact on our personal and professional lives. These have also crept into our classrooms and for many have changed the way tasks are accomplished. Since its creation in 2010, the iPad has become an integral part of many classrooms. No other device has grown at a quicker pace than the Apple iPad; in fact, there have been 4.5 million iPads sold to schools in the United States (Paczkowski, 2013). According to Ed Tech Review (2016), educators throughout the world purchased over eight million iPads in 2012, and that number has grown. Molnar (2015) stated by 2016 over half (54%) of elementary students and teachers in the United States would have access to a school-issued tablet. This number (54%) is an increase from 23% in 2012. Several school districts throughout the United States have replaced print textbooks with digital textbooks or at least have mandated legislation stating digital textbooks must be one available option for students (Fletcher, Shaffhauser, & Levin, 2012). According to Fletcher et al. (2012), states such as California, Texas, Virginia, and Indiana, to name just a few, have spent millions of dollars and changed state policy in order to support local school districts in their mission to go from print to digital textbooks. Educators need to come to the realization that technology has transformed the way we live and work in a short time and, even though it has been slower to become a part of K-12 education compared to the business world, educators should challenge themselves to learn what they can so they can provide students with everything needed to meet their diverse needs (Digital Textbook Collaborative, 2012).

The increase in technology means a major pedagogical shift in a time when state educational budgets are stretched thin. School districts do not have funding to provide adequate professional development to assist with this transition so it often falls upon the teachers to learn and make changes on their own (Burns, 2010; National Education Association [NEA], 2008). When technology training is provided either face-to-face or online, there still is a faction of teachers who feel it does not fit their current needs (Adams-Becker, Freeman, Giesinger-Hall, Cummins, & Yuhnke, 2016). In fact, in a report by the NEA (2008) only 43% of the 1,934 teachers surveyed felt the technology professional development they received throughout the year was "useful" or "very useful." Teachers surveyed stated that training was too focused on how to use the software or learning about the technology, and not enough on how to incorporate the technology into the curriculum. Fifteen years ago, this type of professional development would have been sufficient, but as more and more teachers have increased their personal use of devices and have grown comfortable with figuring out how to access digital content, many districts have incorporated a "learn-by-doing" approach to professional development (Fletcher et al., 2012). Also, with the ease of use of most devices the types of guidance needed by educators has changed. Burns (2010) addressed this issue by stating, "After 25 years of having computers in schools, we still lack an approach that ensures teachers truly understand the benefits and appropriate uses of computers for instruction and that teachers actually use technology as part of teaching and learning" (p. 1).

This study sought to take a closer look at instructional practices used by teachers that have adapted their teaching styles to include technology as part of their classroom curriculum. The overarching goal was to identify concrete examples of how educators used iPads effectively

and to give the readers a sense of how the teachers and principals perceived their journey with using iPads in the classrooms and schools.

BACKGROUND

Although specific research on iPads is not abundant, there have been some studies completed in the areas of teacher and administrator perceptions of iPad use (Pew Research Center, 2017), student engagement (Pressey, 2013), professional development (Bayar, 2014), and similar areas. As research builds, it is important to widen the body of research to include findings on how curriculum is impacted by the changes in how today's students learn; with an accompanying need for teachers to begin to shift their thinking toward more constructivist views of teaching which will impact what is being done in the classroom (Oblinger & Oblinger, 2007). The following section includes examples of previous studies on iPads conducted in the areas of student engagement, increased academic success, teacher and student perceptions of iPad use in curriculum, and professional development.

How Students of Today Learn

John Dewey once said, "If we teach today as we taught yesterday, then we rob our children of tomorrow" (as quoted by Cummins, 2013, p.2). Today, the digital age is upon us. Brill and Park (2008) described the current times as the "Interaction Age," defined as the age where it is expected students use digital content to engage with their peers to construct meaning rather than just gaining information. The authors contend that it is no longer necessary for teachers to focus solely on providing information that can be discovered by the students with one or two clicks. Children sitting in our classrooms have had common technology tools in their hands since they were very young (Apple Inc., 2008). According to Rosin (2013), a study completed by the Joan Ganz Cooney Center revealed at least two-thirds of the children in the

study ages four through seven have been exposed to an iPhone. Students of today have grown up with technology like iPods, computers, tablets, and cell phones as part of their everyday life; educators should not expect students to leave their devices at the door when they enter school to a classroom where traditional, passive, one-size fits all practices are taking place (Digital Textbook Collaborative, 2012). Research shows student achievement increases when they are active and engaged in their learning, offered different styles of learning, and allowed to learn at their own pace (Apple Inc., 2008; Dwyer, 1994; Glowa & Goodell, 2016; Greaves, Hayes, Wilson, Gielniak, & Peterson, 2012; Mango, 2015). iPads can be an instructional tool that assists in providing these opportunities.

Some research demonstrates students are more engaged in classrooms that use iPads (Deimer, Fernandez, & Streepey, 2012). A study by ProCon (2016) shows an increase in reading and math scores when iPads are used to support instruction. Houghton Mifflin Harcourt collected data in the California Riverside Unified School District. They found students using a digital version of an Algebra I textbook scored 20% higher on a standardized test than those who used the print version (ProCon, 2016). Deimer, et al., (2012) discovered the perceptions of teachers and students when it comes to the impact of iPads on academic success. The results of their study showed iPads had a positive effect on perception of learning in their classrooms and students' active engagement. Other studies have addressed the impact iPads have in the classroom and the effectiveness of professional development (An & Reigeluth, 2011; O'Malley, Lewis, Donehower, & Stone, 2014; Pickney & Shaughnessy, 2013).

As with every age, changes in technology have led to changes in learning. The current educational system was developed in the early 1900s for a society and economic system that no longer exists (Glowa & Goodell, 2016). Prensky (2001) found evidence of today's students

thinking differently, looking at visual images as one would look at text, and exhibiting different thinking patterns. He referred to today's digital age as a "singularity," which is "an event that changes things so fundamentally that there is absolutely no going back" (p. 1). Educators must provide students with a means of learning that fits their generational needs and prepares them for what they are to face in the future. Without a shift from the traditional approach to teaching, this cannot be accomplished.

Constructivist Theory of Teaching

Many classrooms across the United States still function in traditional teacher-centered ways. Although it appears students are learning in this type of setting because they are passing tests and receiving grades, Sion (1999) frames this teacher-centered approach as children being taught instead of children learning, which tends to favor student disengagement. Disengagement in school has been connected to student dropout rates (Finn, 1989). In a 1998 speech, Seymour Papert, a well-known cognitive constructivist said students are realizing

> that the pace of school and the mood of the school culture is out of sync with the society in which they live. And so it becomes harder and harder to get them to buy in to the idea that school is satisfying their needs. (as quoted by Bloemsma, 2013, p.2)

This traditional approach often gives our students the perception that there is not a connection with their school learning and their outside interests, which leads many to drop out at the secondary level (Cothran & Ennis, 2000).

There have been strong debates throughout the years over the traditional (teacher-centered) versus constructivist (student-centered) methods of teaching. Morrison's (2014) description of teacher-centered instruction shows the teacher's role is to be the giver of information, sometimes referred to as "a sage on the stage" (p. 1). The students' roles are to

receive the information as passive listeners. The focus here is on the teaching, whereas, in the student-centered learning environment the focus is on the learning. Glowa and Goodell (2016) describe the teacher's role in the student-centered classroom as a facilitator, while students' take ownership of their own learning with guidance from the teacher. Collaboration with other students is an integral part of instructional time. Further discussion will follow, but it is important to acknowledge the differences in teaching methods because of the impact it has on student learning.

Teachers in the traditional mindset have had success in the past, so they will need evidence to prove they can have success teaching in another manner to change the way they teach. Research from Vrasidas and McIssac (2001) shows most teachers take their pedagogical beliefs about teaching from the manner in which they were taught. When presented with the idea of using technology as part of their curriculum, those traditional teachers show hesitation. They cite reasons for their hesitation such as: little to no professional development, lack of confidence in using the devices, a shortage of devices in their classrooms, or not having the support from their administrators (Wells & Lewis, 2006). A study released by the Department of Education in 2000 found 82% of teachers in the United States said the biggest barrier they encounter to using the Internet and computers in their classrooms is the lack of release time for professional development (Vrasidas & McIssac, 2001). A more recent study by Schuck, Aubusson, Kearney, and Burden (2013) reiterated this idea of a lack of professional development cited by educators as a barrier to technology integration. Using technology, even in small steps, may be the answer to help teachers make the shift so they can provide their students with the learning that is needed to get them ready for college or a career in the twenty-first century.

Technology Standards

Teachers are increasing their personal and professional use of technology, breaking down some barriers of technology use in their classrooms. There are many teachers, though, that still feel they lack appropriate training as supported by a survey cited by the National Education Technology Plan (2017), which showed two-thirds of the teachers surveyed felt they still needed more support and training; close to half described the lack of training as one of the barriers to incorporating technology into their teaching. As more teachers use computers and tablets in their classrooms, they begin to see a shift in their teaching practices, providing opportunities for their students to learn in new and innovative ways (Dwyer, 1994). With this in mind, it is important to have guidelines for educators and school administrators so there is an understanding about what students should know about technology, what they should know about the world around them, and how to get them there.

The International Society for Technology Education (ISTE) (2016c), created a set of standards in 1998 called the National Educational Technology Standards (NETS), with support from extensive research. ISTE has recently revamped the standards to meet the transformation of pedagogical development and technology growth. The current standards include a set of overarching goals and performance indictors and are separated into three sets - students, teachers, and administrators - and describe everything each group needs to master the standard (Morphew, 2012 as cited by Simsek & Yazar, 2016). The technology standards adopted by the West Virginia Department of Education (2018) have similar goals to the ISTE standards and are broken down into grade bands so educators at each grade band can focus on the specific standards for students within the grades they teach (West Virginia Board of Education Content

Standard Policies (WVBECSP), 2017). Further discussion on student standards will follow in Chapter 2.

Technology Integration Matrix

The ISTE technology standards for students, teachers, and administrators and the WVBECSP give educators a clear understanding of a framework upon which to base their integration and model their end goals. There are several different tools available for teachers to refer to that will assist them in reflecting on their practices with technology such as the SAMR Model (Romrell, Kidder, & Wood, 2014), Technological Pedagogical and Content Knowledge (TPACK) (Koehler & Mishra, 2009), and the Grapplings Technology and Learning Spectrum (Porter, 2001; Skoretz & Childress, 2013). For the purpose of this study, the researcher has chosen to use the Technology Integration Matrix (TIM). A copy of the TIM Summary Descriptors can be found in Appendix B. To assist teachers in developing their instructional practices so they can determine how to use technology tools in a meaningful way, the Florida Center for Instructional Technology (FCIT) (n.d.a) and the Florida Department of Education created a tool that teachers can use to determine if their use of instructional technology is moving their practice forward and enhancing student learning (Bartoschek & Carlos, 2013; Welsh, Harmes, & Winkelman, 2011). The TIM was created with the purpose of providing a framework for teachers to evaluate the use of technology within their instructional environment (Bartoschek & Carlos, 2013; Welsh, et al., 2011).

The TIM is a model K -12 educators use that evaluates and describes their level of technology integration in their classroom (Welsh, 2013, 0:23- 0:30). The matrix set-up includes consideration of five aspects of the learning environment: active, collaborative, constructive, authentic, and goal-directed; and five levels of technology integration: entry, adoption,

adaptation, infusion, and transformation. Further descriptions of each attribute of the learning environment and levels of technology included on the TIM, along with descriptions of other technology matrices will follow in Chapter 2.

PROBLEM STATEMENT

Research is beginning to emerge in the area of iPad use during classroom instruction. More research needs to be done to assist teachers on their journey to create a classroom environment that allows for technology to be used as a student-learning tool. As iPad integration begins to increase and educator experiences transform, it is necessary to continue researching instructional practices with iPads that deepen the educator's understanding of effective practices.

As previously stated, funding is not always available to provide appropriate and effective professional development for teachers, even though millions of dollars across the country are being spent on infrastructure, equipment, and support personnel (Vrasidas & McIssac, 2001). It often becomes the responsibility of teachers to learn on their own, which warrants further investigation into not just how people perceive the effectiveness of iPads, but specific examples of iPad use that effectively promotes constructivist pedagogy in classrooms. Additional research is needed to show evidence of effective instructional practices when utilizing iPads for collaborative instruction. Providing a snapshot of effective iPad instruction will let teachers move their practice forward and allow them to compare their instruction to that of other professionals.

PURPOSE OF THE STUDY

The intention of this study was to contribute to the body of research, providing examples of effective instructional practices that promote student engagement in the classroom with the

use of iPads. The purpose of this study was twofold: one was to identify and align instructional practices with the Technology Integration Matrix (TIM); and two was to gather data during classroom observations and individual interviews that told a story of how teachers and principals perceived their journey with iPads, how they and their schools got to the level they are, and how their one-to-one initiative got them there regarding their students, classrooms, and instructional practices.

Educators throughout the country are at different stages when it comes to having and using iPads in their classrooms. Using the TIM to align the observations provided several examples of best practices for educators to compare their own instruction. It was important to give concrete examples of classroom practices that used iPads at different levels. It was also important to get the message to educators that iPad integration is more than just the tool. Findings from this study painted a picture of the journey and experiences these educators had with iPad integration.

RESEARCH QUESTIONS

This qualitative study addressed the following research questions:

1. How are the various levels of the Technology Integration Matrix – entry, adoption, adaptation, infusion, and transformation, and the classroom attributes of active, collaborative, constructive, authentic, and goal-directed – represented as instructional practices in classrooms of elementary teachers within schools identified as part of a one-to-one cohort?
2. What are the perceptions that elementary teachers and principals participating in a one-to-one cohort have about their experiences with iPads regarding their students?

3. What are the perceptions teachers and principals have about their experiences with iPads regarding their classroom or school?
4. What are the perceptions that elementary teachers and principals participating in a one-to-one cohort have about their experiences with iPads in regards to their instructional or leadership practices?

OPERATIONAL DEFINITIONS

The following are operational terms defined for use in this study:

- **Technology Integration Matrix** - also known as TIM, was created to help educators evaluate their level of technology integration within their classroom. This theoretical framework is based on a constructivist learning theory (Bartoschek & Carlos, 2013). The main purpose of the TIM is to evaluate a lesson looking at both levels of integration and different attributes of the classroom with a total of 25 different cells included in the table. The levels of integration are: entry, adoption, adaptation, infusion, and transformation. The attributes of the learning environment are: active, collaborative, constructive, authentic, and goal-directed (Welsh, et al., 2011). The alignment of the instructional practices was identified through classroom observations and matched to the 25 cells of the TIM using the *Phillips Observation Guide* found in Appendix C.
- **Perceptions of Experiences with iPads Regarding Students -** These experiences included the teacher's and principal's perceptions about the impact, if any, on their students, including but not limited to, impact on learning, impact on struggling learners, or any difference in academic achievement influenced by the use of iPads, and any other perceptions they have developed since implementing iPads in their instruction. The

teacher and principal perceptions of student experiences were gathered through face-to-face interviews with each participant and the school principal.

- **Perceptions of Experiences with iPads Regarding Classroom or School -**These experiences included the teacher's and principal's perceptions, if any, about the culture of the school, including but not limited to, the influence on their use of iPads, the changes observed in the school due to iPad use, the supports and barriers they encountered within their schools, the impact iPads have had on their classroom management, student behavior, set-up and design of the classroom, and any other perceptions they have developed since implementing iPads in their instruction. The teacher and principal perceptions of the impact on their classrooms and schools were gathered through face-to-face interviews with each participant and the school principal.
- **Perceptions of Experiences with iPads Regarding Instructional or Leadership Practices -** These experiences included the teacher's and principal's perceptions, if any, about the balance between using iPads and how they ensured they were meeting the district requirements of teaching the standards, including but not limited to, their thoughts on the impact iPads have had on their pedagogical beliefs, instructional practices or evaluation of those practices, collaborative efforts with peers and staff, professional learning and growth, and any other perceptions they have developed since implementing iPads in their instruction. The teacher and principal perceptions of their instructional or leadership experiences were gathered through face-to-face interviews with each participant and the school principal.

SIGNIFICANCE OF THE STUDY

New ideas and technology can have a positive impact on teaching and learning (Digital Textbook Collaborative, 2012; Jonassen, 2000; Vrasidas & McIssac, 2001), but some educators have a fear of using technology because they believe they will lose authority in their classrooms since they may not be experts with the technology tools being used (Hammonds, Matherson, Wilson, & Wright, 2013). Too often teachers intend to use technology to enrich the learning taking place in the classroom, but get caught up in the bells and whistles of the device and resort to completing menial tasks not related to the standards (Ertmer, 2005). In other instances, teachers that do not receive sufficient professional development may end up using the device to replace instruction that can be accomplished with pencil and paper instead of finding ways to use the iPad to promote student engagement (Quillen, 2011). The researcher provided examples for educators to alleviate the fears of using iPads, provided examples of lessons they can mimic that engage their students, and acted as a form of professional development to show teachers that they can use iPads to reach students in meaningful and engaging ways.

Examples of iPad use collected from this study provided models for educators to examine their own teaching practices, to determine what level of the TIM they are currently representing and consider how they may improve their own practice. Administrators benefitted from the data by using the evidence to guide teachers in their schools. Specifically, this study sought to provide teachers and administrators with a snapshot of classrooms labeled as innovative and provided data for classrooms and schools to compare themselves to others that are on the forefront of technology integration.

The evidence demonstrated the perceptions teachers and principals have about the use of iPads in their schools. Other educators and administrators got a sense of the experiences

teachers from the one-to-one cohort had in their classrooms, schools, and professional development. The data provided an understanding of the process those teachers have undergone to get to the comfort level at which they are currently practicing. What Coppola (2004) pointed out nearly fifteen years ago remains true: teachers will not incorporate new strategies if they do not see the benefit for their students' advancement.

District leaders can use the evidence from this study to assist in planning improvements of technology integration throughout their schools. The findings from classroom observations showed different levels of iPad integration to use as a plan for reaching all teachers no matter what level they are currently practicing. In situations where districts are considering implementing iPad instruction, this study provided positive evidence and a pathway of learning for all stakeholders. Evidence from both the observations and interviews showed leaders the systematic plan in place for this district, and the growth the educators involved in the study have taken throughout the process.

This study focused on strategies that will help teachers move their practice forward, administrators to move their school in the direction of appropriate use of iPads, and districts to have concrete examples of what their schools can strive for when using iPads in the classroom.

LIMITATIONS AND DELIMITATIONS OF THE STUDY

The researcher acknowledges the following limitations and delimitations:

1. This study is limited to three elementary schools that were chosen based on recommendations from county administrators and technology specialists; and two teachers at each school based on recommendations from the school principal. This is a qualitative study using purposeful sampling at both the county and school levels, which may not be representative of larger populations.

2. This study focused on teachers and administrators at the elementary level only; findings may not be generalized to middle and high school levels.
3. Circumstances of the technology tools available to the teachers may not be the same for other schools and districts due to funding and availability of iPads.
4. Observations and interviews were conducted within a period of approximately four weeks. As noted by Simon (2011), "A study conducted over a certain interval of time is a snapshot dependent on conditions occurring during that time" (p. 2). Findings do not represent different stages throughout the year.
5. Data collected during the observations were completed on the *Phillips Observation Guide* (Appendix C), which was the sole document used for observational data collection purposes. Certain observations proved to be difficult to document using this tool.
6. The data analysis is limited to the use of the TIM (Appendix B). There are other technology matrices that have been created for teachers to assess practice. The researcher feels the TIM was the most compatible tool for this particular study.
7. The data collected from the interviews relied on self-reported information. There is an assumption the participants were thoughtful and honest when answering questions about their experiences, but there is no guarantee all participants were forthright.
8. Due to the nature of qualitative research, findings can possibly be interpreted differently by readers in different positions and contexts.

CHAPTER 2

REVIEW OF THE LITERATURE

This chapter offers an investigation of current research with an area of focus related to the history of technology integration and its connection to teacher pedagogical practices and how students of today learn. The chapter includes a review of the literature relevant to the focus of the study. Themes that emerged during the review include: the influx of technology, shifts in teacher pedagogy, changes in student learning, and the next steps for teachers. These areas of focus and themes support the purpose of the study.

THE INFLUX OF TECHNOLOGY

Today's students are immersed in technology both inside and outside of school. A study conducted by Willingham (2010) shows the average American youth between the ages of eight and eighteen spends at least seven hours per day with hands on a computer, phone, watching television, or another electronic device. Prensky (2001) agrees:

> Our children today are being socialized in a way that is vastly different…over 10,000 hours of video games, over 200,000 emails and instant messages sent and received; over 10,000 hours talking on digital cell phones; over 20,000 hours watching TV, over 500,000 commercials seen – all before the kids leave college. And, maybe, at the very most, 5,000 hours of book reading. (p.1)

These numbers have certainly grown since the study was conducted in 2001. Technology has been a natural part of their lives, so much so that Prensky (2001) coined the term "Digital Natives" meaning that today's children have grown up surrounded by smart phones, video games, and other devices and do not know anything different. In fact, in a study completed by the software group Anti-Virus Guard (AVG) (2012) in a series called Digital

Diaries, 58% of children ages two through five can play a basic computer game but only 42% of the children in the same age range can ride a bike; 19% can successfully access a smartphone application but only 9% can tie their own shoes; one-in-five children ages six through nine use email; almost half of the children in the six to nine year old range spend at least two hours a week online. In fact, in a study by Etherington (2013) there are an estimated four and a half million students that use tablets every day.

Economic and Political Impact

Technologies such as tablets are raking in $72 billion yearly with 42% of adults owning one (ProCon, 2016). Consumers spent $966 million on eBooks and beginning in January of 2011, Amazon sold more eBooks than print books (Kessler, 2011). In a report by McKinsey and GSM Association (GSMA) mobile education may be up to $70 billion and demand for devices to support this will be in the $32 billion range by 2020 (Rock, 2012).

More schools have begun to purchase technology tools that increase the amount of screen time students encounter daily. The Apple Classrooms of Tomorrow (ACOT) (Apple Inc., 2008) report shows that 4% of school districts in the United States were transitioning to one-to-one programs in 2003 and by 2006 that number increased to 24%. In fact, Fletcher, et al. (2012) describe the increase in the use of digital content in schools at a “year-over-year” rate of more than 100%.

Other statistics that show the enormous increase of exposure to technology were found in a 2016 report from the National Center for Education Statistics (NCES). In 2013, 71% of the United States population ages three and above accessed the Internet and classroom Internet availability increased from 8% in 1995 to 98% in 2008. A study by ProCon (2016) showed similar growth of access to the Internet with an increase in all K-12 classrooms from 51% in

1998, to 98% in 2008. The amount of money, time, and investment guarantees one thing: this technology is not a fad that will be going away. If nothing else, new technologies will be introduced to our students at alarming rates.

This influx of technology has not gone unnoticed at the federal level. The United States Department of Education released its National Education Technology Plan (NETP) in 2010 and provided updates in 2014 and every year since. The purpose of the NETP is to encourage districts to advance learning with the use of technology. It contains recommendations for using devices in the classroom, plans for districts to increase the amount of technology in their curriculums, and guidelines for schools so they can provide equitable access for all students. In 2011, the US Department of Education, along with the Federal Communications Commission (FCC) produced a document called the Digital Textbook Playbook (Digital Textbook Collaborative, 2012), which builds upon the NETP and the FCC's National Broadband Plan. The information provided assists K-12 educators and administrators with a smooth transition to digital content in the schools. It provides guidelines for broadband access within the schools including considerations for home and community broadband access, advice on the best devices to include, and ideas to improve digital learning along with development of digital textbooks.

Across the United States, school districts spend an average of $3 billion yearly on digital content, infrastructure, and hardware (ProCon, 2016). State lawmakers are recognizing the need to adjust the strict policies associated with textbook adoptions and many have begun to remove restrictions and include language that allows for digital content (Fletcher et al., 2012). According to a report produced by the State Educational Technology Directors Association (SETDA) (Fletcher et al., 2012), more than 22 states have adjusted policy on textbook adoptions that opened pathways for flexible funding or made definitional changes within policy

allowing for initiatives that include either digital textbooks or Open Educational Resource (OER) initiatives. The changes even go so far as to allow for hardware, software and in some cases materials for flexible learning spaces.

Entire school districts are requiring all content be available as digital content (Fletcher, et al., 2012). Although it is nearly impossible to find out exact numbers of schools incorporating digital content in the classroom, the following examples from around the nation offer an idea of how quickly one-to-one initiatives, such as iPads, are becoming an essential part of classroom instruction. In the state of North Carolina, Mooresville School District provided laptops for every student in grades 4-12 beginning in 2009; the San Diego Unified School District in California began the i21 Interactive Classroom Initiative and has distributed upwards of 78,000 devices to their teachers and students (Digital Textbook Collaborative, 2012). Other states such as Maine, Texas, Virginia, West Virginia and Massachusetts have been leaders in changing legislative policy in order to allocate textbook funds to be used on digital content (Fletcher et al., 2012). Beginning in 2010 in response to decreases in the achievement gap, the Massachusetts legislature set aside funding to help schools become innovation schools. As of 2015 there are 54 approved innovation schools throughout Massachusetts that have flexibility with curriculum, scheduling, instructional practices, and professional development (NETP, 2010).

In an effort to close the achievement gap for low-income and minority youth, schools, youths and communities are connected through a program called LRNG (2017), an acronym for learning. LRNG cities have received $50,000 grants with a purpose of redesigning learning opportunities for the age of the Internet. LRNG cities provide opportunities for youth to build real-world experience outside the classroom. In LRNG, cities become learning labs for students

to explore. Businesses, institutions, and organizations are connected through online programming. Cities such as Washington, Chicago, and Philadelphia have come together as LRNG cities to make learning possible outside the school walls. These are just a few examples of how innovative states are adapting to meet the needs of students when it comes to integrating technology.

Mobile Device Integration

The introduction of mobile devices such as the Apple iPad has impacted the use of technology by creating a way for users to access the Internet without being bound to a stationary location (Pew Research Center, 2017). According to the Pew Research Center (2017), the percentage of adults owning a tablet grew from 3% in May of 2010 to 51% in November of 2016; rates of laptop and desktop computer ownership remained at 78% within the same time period.

Specific to the Apple iPad, many districts have increased the availability of iPads to their teachers and students; in fact Apple iPads account for 94% of tablets in education (Kamenetz, 2013). Kamenetz also noted some examples of districts around the country funding iPad initiatives. Some include Horry County in South Carolina, which distributed 10,000 iPads to middle school students and California's Coachella Valley School District, which provided 19,000 iPads. Other examples include San Diego Unified Schools that purchased 26,000 iPads, Knox Public Schools provided 56,000 iPads, and El Paso public schools dispersed 7,200 iPads (Wainwright, 2013).

Research Findings Specific to iPads

As stated earlier, the Apple iPad has been available only since 2010, so the research specific to iPad use for instruction is limited, but some studies are beginning to surface showing

the impact iPads have on teachers and learners, teacher perception of iPad use for instruction, how iPads are being used in classrooms, and considerations districts must include when making decisions about iPads.

Teachers and Learners

Decisions to use iPads for instructional purposes are not without controversy. Those opposed to purchasing iPads to use as everyday instructional tools feel the amount of screen time is not healthy (ProCon, 2016). O'Malley, et al. (2014) showed great costs with training, maintenance, and support for technologists. Others feel giving iPads to students may lead to misuse and may become an issue of safety. Parents have voiced concerns about giving children the responsibility of having an iPad because of theft, loss, misuse, and costs involved in replacing devices that have been broken (Clark & Luckin, 2013), but studies have shown iPads can have a positive effect on teaching and learning (Fletcher et al., 2012; Greaves, et al., 2012; O'Malley et al., 2014). According to Schrum and Levin (2016) the current one-to-one movement in the United States has encouraged 21st century skills that include: deeper learning, engagement, improved writing skills, and an easier inclusion of technology integration in the classroom.

In a study by Deimer, et al. (2012), students and teachers surveyed responded positively when asked about their experiences using iPads. In other studies, iPads assisted in developing 21stcentury skills, engaging students, motivating them during instruction, and are one reason students remained on task for longer periods of time (Bloemsma, 2013; Clark & Luckin, 2013; Greaves et al., 2012; Mango, 2015). Other studies have shown that using iPads for collaborative lessons gave students more opportunities for social interactions, increasing collaboration, because of the mobility of the device as opposed to desktop computers that tend to encourage

individual use or other “mouse-driven” (Clark & Luckin, 2013, p. 2) screen devices that remain in a fixed location and are not conducive for group work (Chou, Block, & Jesness, 2014; Clark & Luckin, 2013).

In 2012, Heinrich completed a study in a secondary school in the United Kingdom. Students, ages ranging from 11-18, responded positively to the use of iPads. Of the students surveyed, 69% of them stated they were more motivated to learn using iPads; 73% said they produced better quality work with iPads; 61% felt their achievement improved with the use of iPads; 73% reported working more efficiently with iPads; 65% said they were able to collaborate with their peers more easily; and 90% stated the use of iPads in school made them happy (as cited by Hallissy, Gallagher, Ryan, & Hurley, 2013).

iPads for Instruction

When iPads are used in instruction, it expands opportunities for more varied learning activities because of the large number of apps available to teachers (Chou et al., 2014; Clark & Luckin, 2013; Hallissy, et al, 2013; Ludwig & Mayrberger, 2012). Studies have shown iPads to be an effective tool in increasing collaborative, personalized, and independent learning activities during instruction (Gielniak, Wilson, & Greaves, 2017; Global Digital Promise, 2016). iPads have been credited with enhancing learning by creating higher depth of knowledge lessons (Chou et al., 2014; Clark & Luckin, 2013). Immediate and continuous digital assessment results and monitoring are another positive seen by teachers and learners (Clark & Luckin, 2013; Hallissy et al., 2013). Other studies showed the iPad contributed to the ease of sharing resources between teacher and students (Hallissy et al., 2013; U.S. Department of Education, 2017).

The body of research is growing to support inquiry-based learning strategies such as Problem-Based or Project-Based Learning (PBL) because they contribute to a deeper

understanding of concepts and make connections for learners (Dole, Bloom, & Kowalske, 2016). Dole, et al. (2016) also stated these connections help to transfer general knowledge to new problems or situations. According to Remijan (2016) technology has been an integral part in increasing the interest in PBL activities in K-12 schools because students can use iPads or laptops to easily conduct research, share data, or work simultaneously on projects or presentations in real-time. According to Markham (2011) students are able to solve real world problems in PBL while learning knowledge of the core curriculum. Markham states, "As in the real world, it's often difficult to distinguish between acquiring information and using it" (p. 38).

Studies show there are benefits for teachers who choose to incorporate iPads within their instruction. In a study by Hallissy et al. (2013), 21 teachers of various subjects and backgrounds took part in a focus group and findings recognized teachers felt iPads were instrumental in transforming and enriching their teaching practices. It was shown that the addition of iPads in the classroom caused some teachers to feel revitalized with their practice due to the results and enthusiasm they were getting from their students, but they did voice cautions about issues and challenges they may face. In the discussion from the focus group, teachers saw their students becoming more independent, but felt that some students still needed more support from the teacher than others. Other benefits that were stated included less copying, better communication between teachers and students, and the ability to give immediate feedback to their students.

The challenges teachers face that were discussed during the focus group (Hallissy et al., 2013) included: the preference of some students in having a real textbook versus an e-book, the difficulty and lack of experience that students have taking notes on an iPad versus paper and pencil, the performance of written work on tests from those students who they call the "cut and paste culture" (p. 31), and the lack of broadband access for some of their students.

Access to assistive tools offered by the iPad has given students with disabilities a chance to lessen the burden of learning new material and made instruction more equitable (O'Malley et al., 2014) with tools that assist hearing and visually impaired students and students with learning disabilities. The iPad was shown to impact students diagnosed with autism because it allowed those students to contribute to instruction with the use of video and voice recordings when the students had not previously done so because of their disability (O'Malley et al., 2014).

Classroom Use

When used routinely in a classroom, iPads have improved communication between teachers and students and teachers and parents (Clark & Luckin, 2013; Fletcher et al., 2012). Students surveyed liked being able to submit assignments and receive immediate feedback from their teachers with the tools iPads offer (Heinrich as cited by Clark & Luckin, 2013). Several districts are using learning management systems that organize courses and resources in one place for their teachers and students (Watson, Pape, Murin, Gemin, Vashaw, & Evergreen Education, 2014). Learning management systems have been met with encouragement and positive feedback from stakeholders. Having several communication options (email, texting, instant messaging, *Remind*, or *Class Dojo* [Schiola & Sin, 2016]) to choose from gives a wider range of parents an easier time to discuss the progress of their children (Watson et al., 2014). *Remind* is an instant messaging app offered for iOS devices where teachers can connect with parents to share classroom information to a whole group or to an individual (Schiola & Sin, 2016). *Class Dojo* is another communication app offered for iOS devices that can be used by teachers, students, and parents (Schiola & Sin, 2016). *Class Dojo* gives teachers the ability to share classroom experiences and communicate with students and parents by allowing them to send private messages, upload videos, pictures, or assignments. It can also be used as a behavior

management tool that encourages students to do their best and assigns points that can be used to earn positive rewards. iPads have been shown to provide tools that contribute to student creativity, productivity, and self-regulation (Greaves et al., 2012; O'Malley et al., 2014), all which encourage the engagement and motivation previously discussed.

Communication between school and home can only be accomplished when students have the right tools. Findings show there is more success with iPad initiatives when students use school-issued devices (Clark & Luckin, 2013). When districts are not able to fund shared iPads or one-to-one devices, some schools choose to allow students to bring their own devices from home, or what is called Bring Your Own Device (BYOD) (Hallissy et al., 2013; Watson et al., 2014). Clark and Luckin (2013) found that the use of student personal devices has not been as successful because different types of devices use different operating systems and schools do not have as much control over the support, security, and maintenance. These are areas that must be considered by the leadership within the district when deciding whether or not to fund iPad use in their schools.

District Considerations

Research found successful iPad initiatives used similar plans when making decisions about implementing a one-to-one or shared device program before purchasing iPads for their districts. Most initiatives were started by certain groups of people such as bodies of government or school leadership, and are approached in different modes of implementation (Clark & Luckin, 2013).

Some of the approaches included small-scale initiatives or pilot programs, where only a small group of schools were equipped with devices, trainings and support, and were monitored to see what kind of impact the implementation had on student learning. There have been

districts that decided to start off small with a shared device program by purchasing small sets for each classroom, one iPad for every three or four students in a room (Hallissy et al., 2013; Watson et al., 2014). Studies show this can be somewhat effective at the elementary level, but not as effective at the middle or high school level (Greaves et al., 2012). Ultimately, shared device programs are not as effective as one-to-one (Clark & Luckin, 2013; Greaves et al., 2012), but this can be an option at the beginning of implementation when funding is an issue. When iPad initiatives began, many districts were able to commit adequate funding for their implementation, but more recently there has been a shift to shared monetary responsibility with parents or leasing options offered by Apple and other technology companies that sell tablet devices (Clark & Luckin, 2013). Using other funding options eases the financial burden on the district and may encourage the school leadership that may be hesitant about the process to pursue one-to-one programs.

One area that is prevalent in several studies (Fletcher et al., 2012; Hughes, 2012; Kopcha, 2010) is the idea of what is necessary for successful adoptions at the state and district levels when it comes to decision-making. In studies by Burden et al. and Heinrich (as cited by Clark & Luckin, 2013) several areas of consideration for districts were listed before deciding what is best for them: having a clear plan in place, appropriate professional development, considerations about personnel, adequate infrastructure, buy-in from all stakeholders, and an evaluation plan for the progress of the program so justification can be made for the commitment.

Many of the considerations listed above were expressed in the district where this study will be conducted. In an interview with the Executive Director of Technology[1], specifics of their

[1] Personal communications with the Executive Director of technology is not cited due to confidentiality with the person and county being studied.

implementation were discussed. Beginning in 2014, this district dedicated $14 million to the initial implementation, but it was based on a five-year lease with Apple, which calculates to $2.8 million for each year. The funding covered 15,000 iPads, a project manager, distribution support, asset tagging and provisioning support, a mobile device management system, professional development (approximately 20-30 percent of the funding), and two full-time Apple Professional Development Specialists that stayed on-site for two years.

For the initial distribution, they began deployment of 2,200 iPads in the summer of 2014 to all teachers and principals encouraging them to become familiar with the devices over the summer. All sixth through twelfth graders received an iPad beginning in January 2015. Every student in the eight district high schools and 13 middle schools had their devices by the end of the 2014-2015 school year. Elementary students were included in the following year, 2015-2016, with a shared device model. Students in grades kindergarten through fifth grade received iPads at a four-to-one ratio, meaning one iPad for every four students.

According to the Executive Director of Technology, the district decided it would be fiscally responsible to trade in the iPads from the original distribution after three years and receive new iPads at the beginning of the 2017-2018 school year. The lease between the district and Apple extended the one-to-one ratio to all students in grades five through twelve, which resulted in deployment of 18,000 iPads. The addition of fifth grade was a deciding factor in the second deployment because the yearly lease agreement amount remained the same, so moving money or finding funding sources was not a factor.

When asked about the instructional approach to professional development the county adopted for iPads, the following is the response received from the Executive Director of Technology:

> The instructional approach is job embedded PD. My [county technology team] coaches go into [teachers'] classrooms on a day1 week and plans a standards based lesson infusing technology in the lesson. Then they go back the next week and model and/or co-teach the lesson in the classroom. It gives the job embedded support providing teachers with what they need when they need it. The idea is to provide this basically as differentiated instruction for teachers. We meet teachers where they are and help them to make baby steps of forward movement with support that they need to keep taking steps.

The Executive Director of Technology advised that in the beginning, the district's professional development allowed the teachers to become familiar with the devices, but more recently the district has changed to a focus on student learning and providing quality standards-based instruction using the iPad as a tool that engages students in learning activities that have higher order thinking as the main goal.

When asked if there was anything else to share, the Executive Director stated:

> Not really. It's really all about the learning. Always. Not about the tech but about how we engage students in critical thinking, problem solving, collaboration, and communication. We want them to be real world ready and all of those skills are required by the real world to be successful.

It is important to understand the impact of having rapid changes with technology in our classrooms. Our students have changed and our world has changed. Educators have to acknowledge and respond by incorporating these technologies into the curriculum. What technology brings to learners is a chance to become motivated learners, critical thinkers, and problem solvers (An & Reigeluth, 2011). In the ACOT report (Apple Inc., 2008), the authors stated "Current data show high school graduates in jobs requiring the highest degree of

innovative thinking earn more than 50% more than those in jobs requiring the least innovative" (p.7).

PEDAGOGICAL SHIFTS THROUGHOUT THE LAST CENTURY

The successful integration of technology is not solely dependent on having the right equipment, infrastructure, and funding in place. It is greatly influenced by the teachers that have the responsibility of implementing lessons that include technology tools. In his meta-analysis on student achievement, John Hattie (2015), examining over 800 studies, ranked 195 important influences within a classroom having the biggest effect on student achievement and found teacher expectations and teacher efficacy had the largest effect on how students perform in the classroom. As Eileen Coppola (2004) stated in her book *Powering Up*, technology use in a classroom is linked to teacher pedagogy. When researchers are interested in exploring improvement in classroom practice with technology, they "must therefore design studies that begin with an investigation of pedagogical practice before investigating its antecedents" (p. 27).

It is also important to consider what classrooms looked like 100 years ago compared to now and how pedagogical beliefs have changed in the last century. What type of teaching practices have changed, which have stayed the same, and what events in society have caused these changes to take place to get us where we are today? Pajares (1992) supported this when he stated, "Little will have been accomplished if research into educational beliefs fails to provide insights into the relationship between beliefs… and teacher practices, teacher knowledge, and student outcomes" (p. 327). He also noted that, "Few would argue that the beliefs teachers hold influence their perceptions and judgments, which in turn, affects their behavior in the classroom…" (p. 307).

Teacher-Centered Versus Student-Centered Instruction

For the purpose of this study, literature was examined to gain a better understanding of the type of instruction present in various classrooms. In order to understand the best way to achieve effective integration, it is important to understand teachers and pinpoint the reasons for them using technology (Ertmer, 2005). Consider the perspective of teacher-centered instruction versus student-centered instruction. Pedagogical beliefs are the driving force behind the decisions teachers make, Coppola (2004) argues: "Good professionals will adopt technology only when they see a pedagogical reason for doing so" (p. 151). Educational reform can be expected, but what happens in a classroom when the teacher closes the door becomes the decision of the teacher and it most certainly will fit his/her belief system (Cuban, 1984; Ertmer, 2005). Seeing where teachers are in their values, practices, and beliefs about teaching will give us insight into those teachers who are more likely to incorporate technology into their curriculum.

As described by Minter (2011), the focus of instruction is on the teacher within teacher-centered models. In teacher-centered classrooms, the teacher is usually in the front of the room, lecturing to students who sit at desks set up in forward-facing rows (Cuban, 1995). Textbooks, seatwork, and recitation followed by summative assessments are the primary source of instruction (Minter, 2011). Very little discussion or movement from the students is occurring and only when initiated by the teacher. Dewey (1900) called this "old education… derived from a factory model of organization in which students are raw materials subjected to uniform schooling processes" (p. 34). This traditional type of teaching still occurs in schools around the nation. This type of instruction dominated classrooms throughout the 20th Century as illustrated by Cuban (1984) in his study of classrooms of the 1900s. Cuban used a variety of secondary

resources: photographs, textbooks, correspondences, reports, and research studies, to provide examples of classroom practices. He described the teacher-centered classrooms during this time as organization and practices that would look similar to observers even 100 years later.

Teacher-centered practice endures because "it produces student behaviors expected by the larger society" (Cuban, 1984, p. 9). Teacher-centered beliefs are associated with behaviorism (Deng, Chai, Tsai, & Lee, 2014) and tend to include students responding to questions only when asked by the teacher and moving around the room only when given permission, which shows that the teacher is in full control and makes all curriculum decisions. Only the teacher evaluates, and evaluation is completed solely on student learning outcomes, not the process used to reach these outcomes (Minter, 2011). Researchers agree teacher-centered instruction was structured and has sustained because it is easier to deliver material to large groups of students and is organized in a way that allowed for teachers with little experience to be successful (Cuban, 1984; Johnson, Johnson, & Stanne, 2000; Matijevic & Opic, 2016). The teachers in this model believe their role is "to communicate knowledge in a clear and structured way, to explain correct solutions, to give students clear and resolvable problems, and to ensure calm and concentration in the classroom" (Organisation for Economic Co-operation and Development [OECD], 2009, p. 6).

Glowa & Goodell (2016) point out that "Student-centered learning models personalize learning with the use of competency-based approaches, supported by blended and online learning modalities and environments, as well as extended learning options and resources" (p. 1). Students are responsible for their learning and share ownership, with their teachers acting as support. "Here, the development of thinking and reasoning processes is stressed more than the acquisition of specific knowledge" (Staub & Stern, 2002, as quoted by OECD, 2009, p. 92).

The student-centered classroom looks very different from a traditional setting. The students work in small groups or individually. The seating varies from tables, desks arranged in small groups, and areas set up as collaborative centers (Minter, 2011). An observer entering into a classroom might see the teacher walking around the room checking in on groups or meeting individually with a student. The students are involved in discussions, which makes it "a noisier, messier classroom" (Cuban, 1984, p. 12). Far more is expected from the teacher prior to instructional time to deal with classroom management and preparation: "Teachers holding this view emphasize facilitating student inquiry, prefer to give students the chance to develop solutions to problems on their own, and allow students to play active role [*sic*] in instructional activities" (OECD, 2009, p. 92).

EDUCATIONAL REFORMS

Educational reforms can be connected to either teacher-centered or student-centered ideologies that came about because of significant events occurring in our nation. The following is a quick overview of educational reforms that occurred in the 20th century up to the present, the events that caused the reform, and the teaching ideology that most closely represents the reform.

The Common School Movement

The Common School Movement, led by Horace Mann, and supported by other influential education officials, was the basis of how schools were run in the early 1900s (Ramsey, 2014). Modeled after the Prussian (modern day Germany) education system, it promoted the idea of equal schooling for all children regardless of wealth and was supported by state taxes (Dotts, 2010), "where the rich and the poor meet together on equal terms, where high

and low are taught in the same house, the same class, and out of the same book, and by the same teacher" (Taylor 1837, as quoted by Baines & Foster, 2006, p. 221).

Industrialization was the backbone of the economy in the United States during this time, so the mindset of those supporting this movement expected schools to prepare students for the industrial workplace (Lawn, 2015). Emphasis was placed on reading, writing, and arithmetic through the process of memorization and recitation, and included a strong influence on morality (Ramsey, 2014). There was also an emphasis on the preparation of teachers so they could get to a professional status (Iorio & Yeager, 2011). Horace Mann's commitment to the common school was driven by his beliefs that schools should be open to all children, should be nonsectarian, and should be paid for and controlled by the government to ensure improvement in society and a retention of political stability (Groen, 2008; Wagoner & Haarlow, 2000).

The Common School Movement was the dominant school format during the latter half of the 1800s and early 1900s, but additional attention to standards and curriculum was needed because of the tremendous growth of industry and an influx of immigrants into the United States as the 20th century approached (Parker, 1986). The development of the Common School model into what is now referred to as the beginning of the modern-day high school format was bolstered by a report from the Committee of Ten in 1893 that was led by a group of 10 of the most influential scholars of the time (Feldmann, 2005). According to Feldmann, what this meeting accomplished was a standardization of the school system and a layout of what students should be learning and when that should occur. As the above description makes clear, schools at the turn of the 20th century supported a teacher-centered curriculum.

Progressive Education Reform

The next major shift in education, Progressive Education Reform, began to take hold between 1900-1930 and would be a major influence on American education for three decades (Little, 2013). The end of World War I and entrance into "The Roaring Twenties," brought with it a baby boom and an influx of immigrants, increasing the number of children that needed to be educated, which also increased the number of teachers and school buildings needed (Bowles & Gintis, 1976; Ravitch, 1983). Economic growth in the country impacted schools and new programs were added due to the increased number of students and a shift from an agrarian to an industrial society (Lauderdale, 1987). These programs included kindergarten, physical education, arts, and humanities (Perrillo, 2004). Perrillo (2004) stated that supporters of progressive education believed in educating the whole child through life skills, work, study, and play. Those beliefs stemmed from the works of John Dewey, considered the "father of progressivism," and challenged the traditional methods of teaching that were prevalent in schools (Aldridge, 2009). The main instructional focus was on experiential learning defined by Kolb (2015) as, "The process whereby knowledge is created through the transformation of experience" (p. 49). There were also social and political aspects because progressive educators believed it was necessary to teach all learners, which was a democratic ideology (Ravitch, 1983). The pedagogical beliefs supported a student-centered philosophy because the focus was on the whole child. This attempt at reform was not successful because as Cuban (1984) determined, progressive education required a wealth of well trained, experienced teachers and the numbers of such teachers began to decline in the years that followed. Other reasons cited by Cremin in his 1961 book *The Transformation of the School: Progressivism in American Education, 1876-1957,* were adverse feelings towards social reforms, conflict with the

leadership of the Progressive Education Association, and shifts towards conservative ideas after World War II (as cited by Little, 2013).

The Great Depression and World War II

The great depression and World War II brought about changes for schools in the United States. Although the progressive education philosophy was continuing to be what the majority of American educators felt was best for schooling, after World War II, the movement began to split from its original political and social beginnings and focus more on pedagogical ideals (Ravitch, 1983). The growth in funding for schools that was seen during the 1920s was cut, decreasing teacher pay, cutting programs, and closing school buildings, which increased class sizes (Baughman, Bondi, Layman, McConnell, & Tompkins, 2001). For example, Georgia found it necessary to close 1,318 schools, leaving 170,790 students without a place to learn (Baughman et al. 2001). The need for the state to begin funding local school districts brought about a standardization of curricula, inclusion of achievement testing, and the equal distribution of funding (Cuban, 1984). Due to the hardships many faced during this time, there was a general feeling of going back to the basics in society that trickled into schools, and parents wanted to ensure their children were being prepared to compete in a changing economic landscape (Iorio & Yeager, 2011). Educators were having conflicted feelings because of the pressure of accountability through achievement testing and the increase in class sizes, so the focus began to shift back to recitation and memorization in order for students to succeed on annual exams (Cuban, 1984). The Great Depression and World War II caused the pedagogical shift to lean in the direction of teacher-centered instruction.

The Cold War

The 1950s brought a new focus on educational reform with the Cold War between the United States and Russia. The two countries became involved in the Space Race. After Russia launched the first satellite, Sputnik, on October 4, 1957, Americans believed the United States was losing to its enemy and this to many symbolized a threat to our nation's security (Bybee, 1997; Iorio & Yeager, 2011). It was believed that our schools were not preparing students to compete with the Russians, so curriculum changes were made in the areas of science and math; increasing expectations and providing funding with the National Education Defense Act of 1958 (Fraknoi, 2007). Hoff (1999) explained that the National Science Foundation (NSF) had a great influence on curriculum changes, spending $500 million over the next few decades increasing the expectation levels and making substantial changes in math and science courses. The goal of the NSF during this period "…was to teach the basic principles by offering students experiences in learning by doing. With that background, the hope was that students could apply their knowledge in a variety of circumstances" (p. 2). This curriculum change focused on the idea of students learning the theory behind these disciplines rather than just simple calculations and rote information (Hoff, 1999). This reform changed the focus of education to student-centered learning in the latter part of the 1960s.

The Open Classrooms of the 1960s and 1970s

The latter part of the 20th century brought about other reforms, such as, the Open Classroom Movement of the 1960s and 1970s, which took on early progressive ideas of child-centered teaching and social reform (Cuban, 1984; Iorio & Yeager, 2011). Cremin (1974) stated that blacks and other groups were trying to establish an identity for themselves that resulted in a sense of community. Supporting legislation during this time period included: the Elementary

and Secondary Education Act (ESEA) of 1965 (McAndrews, 2006), Head Start (White & Phillips, 2001), and Education for All Handicapped Children's Act of 1975 (Hock & And, 1990). The purpose of each was to exhibit a commitment by the national government to establish equal opportunity for all, and to lessen the achievement gaps between white middle class children and other underserved populations; and all resulting from the Civil Rights Movement of the 1960s and Lyndon B. Johnson's war on poverty (US Department of Education, 1999). According to Iorio and Yeager (2011), Johnson, being a former educator, wanted to put a focus on improving the welfare of certain underserved populations. Although critics believed these laws would give too much control of education to the federal government, Johnson was successful because the focus of the aid was specific to student need and not directly connected to the institution (Iorio & Yeager, 2011).

A Nation at Risk

The economic landscape of the United States was changing and many in the US were concerned about the country's ability to prepare students to compete internationally (Mehta, 2015). Backed by the US Department of Education and President Ronald Reagan, a group of well-known scholars released a document in 1981 titled *A Nation at Risk*, which described the "rising tide of mediocrity" (p. 1) in the school system (Adams & Ginsberg, n.d.; Mehta, 2015). Citing increased illiteracy among young adults and adults, poor academic gains compared to other countries, and an increased enrollment in remedial classes for first year college students; this document had a significant influence on higher academic rigor and measurable standards, holding administrators and teachers accountable, and increased the federal government's role in funding and decision making (Adams & Ginsberg, n.d.; Iorio & Yeager, 2011; Mehta, 2015).

A Nation at Risk, more so than others in the past, caused many changes because of the timing of its release: America was in a recession, the people selected to the commission to produce the document were highly regarded academicians, and the people of the US were more aware of international competitors (Mehta, 2015). The attention it received caused more input from the federal government over the next few decades, which resulted in major reform movements from presidents George Bush, Bill Clinton, and George W. Bush, and education organizations at the national level raised expectations of teacher qualifications and professional standards (Adams & Ginsberg, n.d.). Legislative acts like Clinton's Goals 2000 mandate and George W. Bush's No Child Left Behind (NCLB) increased the amount of federal education funding and academic requirements (Jorgensen & Hoffmann, 2003). More recently, President Barack Obama signed into law *Every Student Succeeds Act* (ESSA) in 2015, which continues to revamp the Elementary and Secondary Education Act (ESEA) of 1965, by ensuring equity for all students and high academic standards (US Department of Education, 2015). The increased academic expectations, increased accountability for students and teachers in the form of standardized testing, and increased federal government involvement in schooling caused a shift towards teacher-centered instruction.

Technology and the Internet

The next major cultural event to affect schooling was the introduction of technology and the Internet in the 1980s and 1990s, continuing at a rapid pace to the present. Technology was introduced to educators in the mid-1980s with the use of microcomputers, used mostly for drill and practice in elementary schools and as a tool for teaching technology related skills in secondary schools (Reiser, 2001). By the mid-1990s, with the invention of the Internet and the World Wide Web (WWW), technology began to impact institutional practices and became

recognized as an important tool for gaining information at a quicker pace (Sharpe, Beetham, & DeFreitas, 2010). This growth continued into the 21st century verified by the National Center for Education Statistics (NCES) and their Fast Response Survey System (FRSS) (Wells & Lewis, 2006). Beginning in 1994 the NCES completed a yearly survey to analyze the changes taking place in schools regarding computer use and Internet accessibility. The findings from the 2005 survey showed that 100% of public schools surveyed had access to the Internet compared to 35% in 1994, and Internet access within instructional rooms rose from 3% in 1994 to 94% in 2005 (Wells & Lewis, 2006).

Researchers contended that using technology in the classroom required a shift in pedagogical practices that favored student-centered instruction (Apple Inc., 2008; Barr & Tagg, 1995; Jonassen, 2000), but the reality was schools felt pressure from the federal government to increase academic achievement and accountability in the form of performance and content standards verified by mandated high-stakes testing (Jorgensen & Hoffmann, 2003). Jorgensen and Hoffmann described a system where, "Funding is now tied directly to accountability expectations. Schools must ensure that all students learn the essential skills and knowledge defined by the state using grade-level standards and benchmarks" (p. 5). Instruction that supports this increased pressure for accountability often clashes with a student-centered approach because the delivery methods for instruction are quite different, and often the student-centered practices take a backseat to traditional practices teachers feel prepare students to score higher on standardized tests (Brooks, Brooks, & Goldstein, 2012). Caslin and Good (1992, 1998) warned those instructors that favored constructivist, or student-centered, teaching that the system had "created an oxymoron: a curriculum that urges problem solving and critical thinking and a management system that requires compliance and narrow obedience" (as quoted by

Garrett, 2008, p. 12). Former International Society for Technology in Education (ISTE) President Jan Van Dam agreed, "Many districts are so overwhelmed and concerned about the NCLB requirements and potential financial repercussions of not complying, that for lots of them the safest route is the 'back-to-basics' approach-focusing entirely on 20th century skills at the expense of 21st century ones" (as quoted by Salpeter, 2003).

Educators of today face challenges in a rapidly changing world. Historically, school reforms have occurred due to major cultural events and societal and political pressures that shifted pedagogical beliefs, allowing for a back-and-forth swing from teacher-centered to student-centered ideologies. Reforms of today are different because with technology there is no turning back, and the reality teachers face is that students use it as part of their everyday lives. Research shows that when students see a connection between their digital life and school, they are more engaged in their learning (Apple Inc., 2008; ProCon, 2016). Meeting these challenges requires a fundamental change in teaching practices (Barr & Tagg, 1995). "Educators must produce college- and career-ready graduates that reflect the future these students will face. And, they must facilitate learning through means that align with the defining attributes of this generation of learners" (Glowa & Goodell, 2016, p. 1).

STUDENTS OF THE 21ST CENTURY

"We really have to focus on creating schools that work for kids, as opposed to those that just work traditionally well for us." –Eric Sheninger, Principal (ISTE, 2015)

With a focus on the "defining attributes of this generation of learners" (Glowa & Goodell, 2016, p. 1), educators must consider the students in front of them so they can adequately prepare them for the future. Since the beginning of the 21st century, there has been much discussion on what it takes to prepare our students. Project Tomorrow (as cited by

Fletcher et al., 2012) says the three characteristics, or "new three E's" of education are: enable, engage, and empower. When educators provide students with the three E's, they are preparing them for skills needed for careers of today and tomorrow. A survey completed by the World Economic Forum provided some insight into the future of the economy, "A projected 65% of children entering grade school will work in jobs that do not exist today" (ISTE, 2016c, p. 2).

As previously discussed, the economy has changed drastically since the 20th century and the skills needed in the workforce are different from the past. Seymour Papert put it into perspective when he said, "It is no longer good enough for schools to send out students who know how to do what they were taught. The modern world needs citizens who can do what they were not taught. We call this "*learning learning*" (as quoted by Greaves et al., 2012, p. xvi). Angus King, the former governor of Maine, agreed when he said the future depends on "brains, not brawn, and the best brains, or maybe more accurately, the best trained brains, will win" (Greaves et. al, 2012, p. xvi).

ISTE Standards

The term "21st century skills" took hold early in the 2000s and has developed from a focus strictly on technology tools, to a broader definition that includes global awareness, deep thinking, and collaborative and creative attributes for all students, not just a small population that has access to effective teachers (Rotherham & Willingham, 2010). Many groups throughout the world have put together standards or frameworks, listing necessary skills needed for our students to succeed (Dede, 2010). The International Society for Technology Education (ISTE) (2016a) is a nonprofit organization that provides a set of standards educational leaders can use as a guideline for developing their state-level technology standards, or 21st century skills. The first set of standards was released in 1998 under the name National Educational Technology

Standards or NETS, with a focus on student technology skills describing what students needed to know about how to use technology (ISTE, 2016c; Sharp, 2014). In 2000 and 2001teacher and administrator standards were added, revamped in 2007 and renamed from NETS to the ISTE standards (ISTE, 2016c; Metcalf & LaFrance, 2013). This section will describe the ISTE standards for students and the research supporting each; and compare them to the West Virginia College and Career Readiness Standards (2017) since the study will be conducted in West Virginia.

The ISTE (2016a) standards for students are not intended to be a checklist for educators but recommendations for the purpose of lesson design and curriculum reflection. The most recent ISTE standards revised and released in 2016 include seven (not in any particular order): Empowered Learner, Digital Citizen, Knowledge Constructor, Innovative Designer, Computational Thinker, Creative Communicator, and Global Collaborator. Each comes with four indicators that educators can use to determine whether the student has mastered, or is striving to master that standard.

The first, Empowered Learner, is defined as, "students leverage technology to take an active role in choosing, achieving and demonstrating competency in their learning goals, informed by the learning sciences" (ISTE, 2016b, p.1). The indicators for this standard describe a student that can:

a. articulate and set personal learning goals, develop strategies leveraging technology to achieve them and reflect on the learning process itself to improve learning outcomes.

b. build networks and customize their learning environments in ways that support the learning process.

c. use technology to seek feedback that informs and improves their practice and to

demonstrate their learning in a variety of ways.

d. understand the fundamental concepts of technology operations, demonstrate the ability to choose, use and troubleshoot current technologies and are able to transfer their knowledge to explore emerging technologies. (p.1)

When a student is an empowered learner, or as Fletcher et al. (2012) call a self-directed learner, there are many benefits. The authors stated that when students become more comfortable with using digital content, they are able to choose their own types of resources for learning, build their digital literacy, and avoid being restricted to a fixed textbook. Ng (as cited by Vu, 2013) considered empowered learners "dynamic and informed 'webizens' who are able to critically make judgments on information provided by media, books and journals" (p. 2). This is a much sought-after skill for our current students.

The second standard, Digital Citizen, is defined as, "students recognize the rights, responsibilities and opportunities of living, learning and working in an interconnected digital world, and they act and model in ways that are safe, legal and ethical" (ISTE, 2016b, p.1). The supporting indicators are as follows:

a. cultivate and manage their digital identity and reputation and are aware of the permanence of their actions in the digital world.

b. engage in positive, safe, legal and ethical behavior when using technology, including social interactions online or when using networked devices.

c. demonstrate an understanding of and respect for the rights and obligations of using and sharing intellectual property.

d. manage their personal data to maintain digital privacy and security and are aware of data-collection technology used to track their navigation online. (p. 1)

As technology tools increase in schools, the importance of addressing and teaching digital citizenship with students is becoming more of a priority for educators. One major barrier for educators when using technology in classrooms is the opportunity for students to misuse their devices in ways such as illegally downloading music, not being able to discern fact from fiction when gathering information, cyber bullying, and plagiarizing from the Internet (Ribble, Bailey, & Ross, 2004). Even though students have an excessive amount of experience using technology, Vaidhyanathan (2008) established in his article that students may not be as tech savvy as teachers believe. They know how to use search engines, but may not know the potential benefit to their learning. Students need to be able to appraise and understand contradictory ideas (Apple Inc., 2008). The importance of including digital citizenship for this reason grows every day with the changes in available technology (Ribble et al., 2004).

The third ISTE (2016b) standard recommends students become Knowledge Constructors and is defined as: "students critically curate a variety of resources using digital tools to construct knowledge, produce creative artifacts and make meaningful learning experiences for themselves and others" (ISTE, 2016b, p.1). The indicators that identify a student as a knowledge constructor are:

a. plan and employ effective research strategies to locate information and other resources for their intellectual or creative pursuits.

b. evaluate the accuracy, perspective, credibility and relevance of information, media, data or other resources.

c. curate information from digital resources using a variety of tools and methods to create collections of artifacts that demonstrate meaningful connections or conclusions.

d. build knowledge by actively exploring real-world issues and problems, developing

ideas and theories and pursuing answers and solutions. (p. 1)

The goal of students who are knowledge constructors reinforces the student-centered or constructivist learning model. According to Vrasidas and McIssac (2001), "knowledge does not exist external to the learner" (p. 3). Learning cannot occur without the learner making sense and constructing his/her own meaning and technology can enhance this ability to construct meaning with rich content, opportunities for collaboration, and tools students can use to create different forms for communicating what they have learned (Apple Inc., 2008; Barr & Tagg, 1995; Vrasidas & McIssac, 2001).

The fourth ISTE (2016b) standard is Innovative Designer, defined as, "students use a variety of technologies within a design process to identify and solve problems by creating new, useful or imaginative solutions" (ISTE, 2016b, p.2). Students considered Innovative Designers should:

a. know and use a deliberate design process for generating ideas, testing theories, creating innovative artifacts or solving authentic problems.

b. select and use digital tools to plan and manage a design process that considers design constraints and calculated risks.

c. develop, test and refine prototypes as part of a cyclical design process.

d. exhibit a tolerance for ambiguity, perseverance and the capacity to work with open-ended problems. (p. 2)

When students are given an instructional design process and asked to use a variety of technology tools to develop new solutions, they are simulating experiences they will encounter in the workforce. The research behind this standard supports instruction that gives students an opportunity to become critical thinkers, collaborators, and problem solvers; and develops their

social and emotional skills (ISTE, 2016c). Using real-world activities that promote critical thinking gives students a competitive advantage in the global society (Greaves et al., 2012).

The fifth ISTE (2016b) standard describes students that are Computational Thinkers. "Students develop and employ strategies for understanding and solving problems in ways that leverage the power of technological methods to develop and test solutions" (ISTE, 2016b, p.2). Computational Thinkers:

> a. formulate problem definitions suited for technology-assisted methods such as data analysis, abstract models and algorithmic thinking in exploring and finding solutions.
>
> b. collect data or identify relevant data sets, use digital tools to analyze them, and represent data in various ways to facilitate problem-solving and decision-making.
>
> c. break problems into component parts, extract key information, and develop descriptive models to understand complex systems or facilitate problem-solving.
>
> d. understand how automation works and use algorithmic thinking to develop a sequence of steps to create and test automated solutions. (p. 2)

ISTE (2016b) also states that, "Computational thinking is the thought processes involved in formulating a problem and expressing its solution in a way that a computer—human or machine—can effectively carry out" (p. 8). In other words, it is having the ability to break down complex problems into steps, or sub-problems, and connecting that solution to solve other similar problems (Yadav, Hong, & Stephenson, 2016). Yadav et al. (2016) believe students who are computational thinkers not only foster creativity, but go beyond just using technology to becoming builders of information with the use of technology.

Standard six describes a Creative Communicator. Defined as, "students communicate clearly and express themselves creatively for a variety of purposes using the platforms, tools,

styles, formats and digital media appropriate to their goals" (ISTE, 2016b, p.2). If a student has mastered this standard, he or she can:

> a. choose the appropriate platforms and tools for meeting the desired objectives of their creation or communication.
>
> b. create original works or responsibly repurpose or remix digital resources into new creations.
>
> c. communicate complex ideas clearly and effectively by creating or using a variety of digital objects such as visualizations, models or simulations.
>
> d. publish or present content that customizes the message and medium for their intended audiences. (p. 2)

Not all students learn in the same manner. In the traditional model of teaching, students are presented information in a linear sequence when in actuality, learning is multi-dimensional (Glowa & Goodell, 2016). Harvard graduate and education researcher Todd Rose supports this idea in what he calls a "jagged profile" of learning (Global Digital Promise, 2016). Rose suggests that there are many factors that contribute to learning that cannot be measured in one dimension such as an IQ test. Technology gives students a chance to communicate in a style different from the traditional teacher-centered lecture format, allowing for collaboration, creative thinking, and cooperative learning activities, which is beneficial to all students creating a more equitable classroom environment (Global Digital Promise, 2016). Research shows these types of activities create higher student engagement, which increases productivity and learning outcomes (Deimer, et al., 2012; Hughes, 2012; Mango, 2015) and gives students a "sense of freedom and encouragement" (Wang, 2004, as quoted by Hughes, 2012, p. 9).

Including technology has been especially beneficial to those students who have struggled with traditional teacher-centered instruction like those with developmental disabilities (O'Malley et al., 2014). According to Global Digital Promise (2016), around 50%, or 26 million American students, have differences in their learning that affect how they process information. Students process information differently depending on the content and their abilities, not necessarily in a linear path (Glowa & Goodell, 2016). Since learning is not a linear path, it is important to note that providing students with "an array of tools for acquiring information and for thinking and expression allows more children more ways to enter the learning enterprise successfully" (Dwyer, 1994, p.8). Providing various tools for communication that meet an individual's goal promotes learning and contributes to higher order thinking (Benton, 2012). Opportunities with different tools give a broader range of students a chance to develop skills they will face in the future (Dwyer, 1994).

The seventh and final ISTE (2016b) standard defines a Global Collaborator as, "Students [who] use digital tools to broaden their perspectives and enrich their learning by collaborating with others and working effectively in teams locally and globally" (ISTE, 2016b, p.2). A global collaborator can:

a. use digital tools to connect with learners from a variety of backgrounds and cultures, engaging with them in ways that broaden mutual understanding and learning.

b. use collaborative technologies to work with others, including peers, experts or community members, to examine issues and problems from multiple viewpoints.

c. contribute constructively to project teams, assuming various roles and responsibilities to work effectively toward a common goal.

d. explore local and global issues and use collaborative technologies to work with others

to investigate solutions. (p. 2)

Connecting with others through social media and other tools is second nature to students of today. Promoting the standard of global collaborator makes our world seem much smaller to students and assists in teaching students to be self-directed learners (Apple Inc., 2008). When educators promote global collaboration, students become able to engage in conversations with others from different backgrounds, perspectives, and cultures (ISTE, 2016c; Smith & Mader, 2017). This standard relates to communicating with others around the globe, but also stresses the importance of working in groups within classrooms, in the local community, and connecting with experts to develop skills that enable students to become citizens who can solve problems around the world (ISTE, 2016c).

According to ISTE (2016c) these seven standards should be used as guidance for teacher pedagogy and are different than past standards used as a checklist for teachers to demonstrate what they had covered. They provide districts with a guide that "…can be used to amplify and even transform learning and teaching" (p. 2). The intention is for these standards to move the focus from the tools themselves to the instructional practices that make learning engaging, equitable, and improve students' academic success (ISTE, 2016c).

West Virginia Technology Standards

On July 1, 2017, the West Virginia College and Career Readiness Standards for Technology and Computer Science (WVCCRSTCS) were adopted (West Virginia Board of Education Content Standard Policies (WVBECSP), 2017). The standards are similar to the ISTE standards discussed above. They are organized into six clusters, with relevant standards listed within each cluster. The clusters are listed here in no particular order: Computational Thinking, Collaboration, Digital Citizenship, Information and Communication, Empowered Learning, and

Innovation and Design (WVBECSP, 2017). They are also separated into grade bands. Table 1 shows the grade band; each cluster associated with the grade band, and the comparative ISTE standard(s).

Table 1 *Comparison of the WVCCRSTCS to the ISTE Standards*

ISTE Standards	**WVCCRTCS Clusters**	**WVCCRTCS Grade Band Inclusion**
Knowledge Constructor Creative Communicator	Information and Communication	Grades K-2 Grades 3-5 Grades 6-8 Grades 9-12
Computational Thinker	Computational Thinker	Grades K-2 Grades 3-5 Grades 6-8 Grades 9-12
Digital Citizen	Digital Citizenship	Grades K-2 Grades 3-5 Grades 6-8 Grades 9-12
Global Collaborator	Collaboration	Grades 6-8 Grades 9-12
Empowered Learner	Empowered Learner	Grades 6-8 Grades 9-12
Innovative Designer	Innovation and Design	Grades 6-8 Grades 9-12

The clusters defined by the WVBECSP (2017) have the following characteristics:

Cluster 1: Information and Communication- Students critically curate a variety of resources using digital tools to construct knowledge, produce creative artifacts and make meaningful learning experiences for themselves and others. Students communicate clearly and express themselves creatively for a variety of purposes using the platforms, tools, styles, formats and digital media appropriate to their goals. (p. 4)

Cluster 2: Computational thinking - Students develop and employ strategies for understanding and solving problems in ways that leverage the power of technological methods to develop and test solutions. (p. 4)

Cluster 3: Digital Citizenship – Students recognize the rights, responsibilities and opportunities of living, learning and working in an interconnected digital world, and they act and model in ways that are safe, legal, and ethical. They will recognize the community, global, and ethical impacts technology and computer science have on society in the world. (p. 4)

Cluster 4: Collaboration – Students use digital tools to broaden their perspectives and enrich their learning by collaborating with others and working effectively in teams locally and globally. (p. 5)

Cluster 5: Empowered learning – Students leverage technology to take an active role in choosing, achieving, and demonstrating competency in their learning goals, informed by the learning sciences. (p. 5)

Cluster 6: Innovation and Design – Students use a variety of technologies within a design process to identify and solve problems by creating new, useful or imaginative solutions. (p. 5)

Each cluster is accompanied by a set of technology standards that are intended to provide educators with an understanding of what students should have mastered by the end of the grade band (WVBECSP, 2017). In kindergarten through grade two, there are a total of 17 standards; grades three through five have a total of 24 standards; grades six through eight have 28 standards; and grades nine through twelve have 28 standards under the aforementioned clusters (WVBECSP, 2017).

According to the WVBECSP (2017) there are separate computer science courses for middle and high school students. Since this study is being conducted at the elementary level, only a brief description of the course is provided. In middle school, students in grade six through eight will be exposed to *Discovering Computer Science*. This course is designed to introduce students to the many aspects of computer science and allows them to explore how computer science affects them and the world around them (WVBECSP, 2017). High school students will take three courses: *Computer Science in the Modern World*, *Computer Science & Mathematics*, and *Computer Science —Introduction to Geographic Information Systems*. *Computer Science in the Modern World* exposes all ninth through twelfth grade students to the skills they will need after graduating (WVBECSP, 2017). The *Computer Science & Mathematics* course must be taught by a certified math instructor, can be used as a fourth math elective, and will cultivate and develop the skills of computer science using mathematical concepts (WVBECSP, 2017). The final high school course *Computer Science —Introduction to Geographic Information Systems* teaches students how to analyze, collect, and problem solve using geospatial technologies and must be taught by a certified science teacher. This course can be used as a third science elective (WVBECSP, 2017).

The current ISTE standards and the WVCCRSTCS standards are very similar and give West Virginia educators a clear picture of what it takes to prepare their students for what they may encounter with technology after graduation. Several years have been dedicated by ISTE to develop standards for effective technology integration with the use of international research (Simsek & Yazar, 2016). In recent years there has been a shift from a focus on tools to transformation of the curriculum, and from incorporating effective teaching using technology to enhancing instruction and making it possible for learning to be personalized (Global Digital

Promise, 2016; Simsek & Yazar, 2016). With the use of standards, teachers can, "build a rigorous, relevant, challenging, and developmentally appropriate technology and computer science curriculum to prepare students for college- and career-readiness" (WVBECSP, 2017, p. 3).

NEXT STEPS FOR EDUCATORS

Educational systems include several groups of people: community members, superintendents, parents, and many other participants, but ultimately the burden of providing everything necessary to improve student achievement falls on the shoulders of the teachers (Bayar, 2014). There has been increased pressure from outside sources to transform the curriculum to include technology standards, and these pressures are most felt at the school level by principals and teachers (Lim, Zhao, Tondeur, Chai, & Tsai, 2013). The addition of technology in the curriculum changes what teachers do in the classroom (Apple Inc., 2008). For that reason, it is important for educators to look ahead at what is vital for successful and effective instruction that includes technology. After a thorough investigation of past and current research, there were three main areas of importance that pertain to what is needed for educators to be ready for their next step. First, we will define and discuss 14 essential conditions developed by ISTE that are necessary to effectively influence learning with the use of technology (ISTE, 2009). Second, we will look at three main themes that developed throughout the literature that impact the next steps for educators: instructional practices, school culture, and the community, which all impact student learning. Finally, we will consider a framework developed by the Florida Center for Instructional Technology, part of the University of South Florida, called the Technology Integration Matrix (TIM), which teachers can use to evaluate their instruction when using technology. This tool will be used as part of the current study.

Essential Conditions

ISTE (2009) developed a framework of research-backed conditions necessary for districts and schools to successfully impact learning with the use of technology. "These conditions describe how people, policies, and resources must come together to create an environment that supports the robust implementation of the ISTE standards" (ISTE, 2015, 0:07-0:17). A list of each condition is provided and will be connected to one of the three themes that emerged from the research (ISTE, 2009).

The 14 conditions include: shared vision, empowered leaders, implementation planning, consistent and adequate funding, equitable access, skilled personnel, ongoing professional learning, technical support, curriculum framework, student-centered learning, assessment and evaluation, engaged communities, support policies, and supportive external context.

As the 14 essential conditions listed above point out, it is not just about the technology tools. Everyone having an interest in the school system is a part of the plan (ISTE, 2015). ISTE (2015) wants educators to have an understanding that technology is a tool that should be used to support student learning the same as classroom supplies, whiteboards, and textbooks. Having essential conditions allows for all parties to understand what it takes to be successful with the use of a common language and vision.

Instructional Practices

There has been a transformation of teaching practices with the addition of technology standards that has caused a shift from the teacher as a sole provider of information to one that supports learning and encourages reflection in classroom practices (Lim, et al., 2013).Teachers should reexamine their teaching practices and adapt their old ways of thinking and teaching to take advantage of the new technology (Vrasidas & McIssac, 2001). Vrasidas and McIssac

(2001) point out that continuing old practices with the use of current technology will not improve student learning; rather it is necessary for traditional practices to be restructured to include the new technology. As Coppola (2004) states, when technology is added to poor teaching practices without adjustment of implementation, then instruction will continue to be poor. To have successful implementation it is important educators learn to reflect on current practices, paying attention to outside factors and how they influence their instruction. These factors are connected to teachers' belief systems, the importance of professional development and ongoing learning, and supports and barriers to technology integration.

While examining the literature a common theme repeatedly appeared when addressing the teacher's willingness to include technology in his/her instruction: it is not necessarily a problem with the resources themselves but the compromise and struggle over a teacher's core values and what he/she believes to be true about teaching (Ertmer, 2005; Greaves et al., 2012; Niederhauser & Stoddart, 2001). A study by Kagan in 1992 found that teachers' belief systems are associated with comparable teaching styles across classes and grade levels (as cited by Ertmer, 2005). Kagan added that beliefs and professional knowledge go hand-in-hand, proving the importance of reflecting on beliefs and their effect on instructional decisions. A teacher's core beliefs are formed over several years so when new practices are introduced, if they are too far from a teacher's current belief system, they are less likely to be implemented (Ertmer, 2005).

Researchers found technology is adopted by teachers at different rates depending on their beliefs and their skill level (Blau & Shamir-Inbal, 2017; Kopcha, 2010; Levin & Wadamy, 2007; Woodbridge, 2003; Zhao, Lei, & Frank, 2006). It is recommended by the researchers that changes should come about with small successful experiences to help build confidence before bigger changes occur (Ertmer, 2005; Kopcha, 2010). In 2010, Kopcha made the following

observation about Zhao and Frank's 2003 work, "The authors suggested that the process of technology integration is an evolutionary one, and that the teacher's beliefs, pedagogy, and technology skills slowly build upon each other and co-evolve as technology is introduced and assimilated into the school culture" (Kopcha, 2010, p. 176). Ertmer (2005) points out, through his research, Nespor in 1987 showed that instructional change does not necessarily mean abandoning all of one's beliefs, but can include a slow replacement with more relevant beliefs. When teachers make a connection between their core beliefs and see that the technology is supporting these beliefs along with increasing student achievement, they can become an empowered leader, one of the essential conditions established by ISTE (2009).

Some studies made a connection to Albert Bandura's Social Cognitive Theory and the connection between self-efficacy and productivity (Hughes, 2012; Stepp-Greany, 2002). With small successful experiences teachers can become more effective and build confidence showing that strong self-efficacy impacts professional activities (Browne, 2009). Bandura's theory supports the idea that self-efficacy plays a role in how one faces the challenges of change; when people feel confident in what they do, they are more likely to take the risk and attempt the task (Stepp-Greany, 2002). The opposite can also occur when a teacher feels overwhelming pressure to change pedagogy in order to accommodate the technology, then, resistance to adapt can occur (Ertmer, 2005). The work of Hattie (2015) further supports the idea of efficacy, as it is listed as the second highest influence on student achievement out of a list of 195 factors. Other studies took this a step further and connected the self-efficacy of a teacher's technology use to more than one factor: successful experiences within the classroom and a strong influence of their school environment (Becker, 1994; Windschitl & Sahl, 2002, as cited by Ertmer, 2005). Continuous reflection of beliefs associated with teaching practices addresses another essential

condition for successful technology inclusion: assessment and evaluation (ISTE, 2009).

To create a strong positive influence of a school environment on teaching practices, it is necessary to reflect on the professional development component of technology integration. "Professional development and teacher training play a vital role in schools providing more student-centered learning and creative opportunities" (Adams-Becker, et al., 2016, p. 24). Effective ongoing professional learning is an essential condition (ISTE, 2009) that supports teachers, and is important in providing them with opportunities to collaborate with peers and share ideas (Sawyer, 2017). Leaders must consider the importance of providing educators with enough support so teachers do not consider technology a barrier to the learning process. In a 2015 Horizon Report survey of teachers, 81% felt students are provided with hands-on learning experiences using technology, but one-third of those surveyed felt they do not receive enough support from the school to allow this to take place (Adams-Becker, et al., 2016). It was recommended by the Web-Based Education Commission in 2000 that 30% of technology budgets should be dedicated to professional learning (Vrasidas & McIssac, 2001).

Examining the literature, it is evident that teacher quality has an enormous impact on student achievement (Bayar, 2014; Hattie, 2015). The authors stated that to improve teacher quality, professional development is essential. Although educators have a difficult time coming to a consensus on a clear definition of effective professional development, it is imperative that policymakers, school boards, and educators consider the most efficient and effective professional development models available to improve teacher quality (Bayar, 2014). A few types of current professional development models include face-to-face, online professional learning (Greaves, et al., 2012), how-to workshops, train the trainer models, conferences,

professional learning communities (Benton, 2012), mentoring, and job-embedded models (Bryk, Harding, & Greenberg, 2012; Pancucci, 2007).

Greaves, et al. (2012), stated face-to-face professional development models are the most expensive and least effective. In this model, teachers come together as a group to sit and listen to a speaker. There is little input and engagement from the audience. These "how-to" workshops do not give teachers a chance to apply what they learned immediately, "there is a lack of authentic applications for their particular content, classroom, or learning style" (Plair, 2008, p. 71). Both of these models dominated professional learning in the past and have proven to be very expensive and inconvenient for teachers because they are offered while teachers are working or after school, which adds costs of substitutes, stipends, and/or transportation to the district's budget (Benton, 2012; Clarke & Hollingsworth, 2004).

Recently, online courses, mentoring and job-embedded models have become more popular (Bayar, 2014; Greaves, et al., 2012). Online professional learning gives teachers some flexibility because they can choose the time, place, and content according to what meets their individual needs (Greaves, et al., 2012). Train the trainer models, mentoring, and job-embedded models (considered more nontraditional), reduce costs, prove to be a better use of time and give teachers an opportunity to apply what they are learning to an authentic task (Bayar, 2014; Plair, 2008). These methods have proven to be effective tools because teachers are in a comfortable learning environment applying the skills immediately. They are learning from each other having the support of coaches, mentors, and seasoned teachers that meet, share ideas, and reflect to improve their practices (Bryk, et al., 2012; Pancucci, 2007). Implementing these models of professional development increased teacher skill, access and use, effectively increasing the amount of technology use in the classroom (Ertmer, 2005). Having skilled personnel available

to share their ideas is one of ISTE's essential conditions (ISTE, 2009) and proves to be a support for educators integrating technology (Kopcha, 2010). "Digital confidence of a school staff can improve teaching, promote lifelong learning pedagogy, and increase the efficiency of education" (Blau & Shamir-Inbal, 2017, p. 770).

When it comes to instructional practices, the school culture plays a role in either promoting or hindering effective technology integration. Levin and Schrum (2013) note that through their research, and the research of others such as MacNeil, Prater, and Busch, they found the leadership within the school has the highest impact on the culture and climate by facilitating what can be accomplished with encouragement and support, or hampering progress with a lack of encouragement and support. Schools having success with technology have increased student achievement (Blau & Shamir-Inbal, 2017; Greaves, et al., 2012). It is important schools consider their culture when examining their progress of technology integration.

Conditions can either be considered barriers or supports for educators depending on the school and its vision. Kopcha (2010) summarized research findings completed by Ertmer, Franklin, Hew and Brush, Hinson, et al., and others, describing what teachers typically considered barriers to technology integration: lack of time for planning and learning new technologies they can use during instruction; the conflict between their pedagogical beliefs and their beliefs about technology; knowledge; access and maintenance of necessary technology tools; support in the form of funding; professional development; support from their peers, district and school administrators; and technology support personnel. Hew and Brush (2007) added to the list with their set of barriers: resources, school culture, personnel attitudes and beliefs, skill and knowledge of technology, and assessment tools.

Those same barriers, when examined at schools proven to have a positive school culture with technology integration, can also be considered supports when the right people, funding, and motivation are in place. Schools considered successful when implementing technology for school improvement were examined in a cross-case analysis by Levin and Schrum (2013) and their findings supported eight factors contributing to their success: "(a) vision, (b) leadership, (c) school culture, (d) technology planning and support, (e) professional development, (f) curriculum and instructional practices, (g) funding, and (h) partnerships" (p. 36). The authors described these as a jigsaw puzzle that can only be complete when all the pieces are in place. An organization will not have successful change unless all impacted individuals participate in innovations in this complex process that involves school leadership, teacher readiness, self-confidence, and competence (Blau & Shamir-Inbal, 2017).

School and Community

According to the U.S. Department of Education (2003) most parents and educators consider technology to be a vital part of a high-quality education. Teachers are not the only stakeholders influencing what occurs with technology during instruction. The stakeholders go beyond educators to community members, business leaders, lawmakers, and parents. When a community understands the impact of technology on education, then all stakeholders can work together to make it happen in their schools. In fact, in a Rand Report in 1996, it was determined that when computer use in classrooms was encouraged to support high level teaching and learning, stakeholders became clear of the importance of technology use and its effect on school reform (Coppola, 2004). For successful reform, there need to be changes in curriculum, pedagogical practices, and policy (Vrasidas & McIssac, 2001), which requires many parties outside the school walls to have a say in school level decisions.

The ISTE (2009) essential conditions promote the use of technology and learning and involve many influences outside the classroom. The conditions supported by both outside influences and within the school community include: shared vision, implementation planning, consistent and adequate funding, equitable access, technical support, engaged communities, support policies, and supportive external context. To promote student learning with technology it will require a collaborative relationship between teachers, administrators, parents, and community members (O'Malley et al., 2014).

In order to create a shared vision for technology implementation those involved need to understand the impact it will have on community. Greaves et al. (2012) provided three important insights from their studies for leadership teams: when technology is properly implemented there are improvements in student achievement; there is positive revenue at the local, state, and national levels; and giving continuous access will increase achievement, which will in turn provide financial benefits. Greaves et al. (2012) and others went further to show in their findings that proper implementation of technology had an impact on student success, attendance increased, 92% reported a decrease in discipline referrals, 90% reported an increase in state mandated testing (high-stakes testing), and nationally there was an increased graduation rate of 25% (Apple Inc., 2008; Benton, 2012). When there is a national increase in graduation rates of 25% and some of those students go on to college, then eventually there will be an increase in tax revenue that could reach $77 billion per year, and after 40 years this could increase to $3 trillion (Greaves et al., 2012). These motivating factors of financial gain should encourage continuous funding and support, policies that support technology initiatives, and support from local business and community leaders to ensure successful implementation, appropriate and adequate resources, and a shared vision (Fletcher et al., 2012).

Technology Integration Matrix

Kopcha (2010) believes that teachers who want to integrate technology and change their pedagogy to be more student-centered need a model to guide them on learning the technology, overcoming barriers, and adjusting their beliefs to fit with constructivist practices. As briefly discussed in Chapter 1, this study will use the Technology Integration Matrix (TIM) as a tool for analyzing data from the observations and determining which level of integration each lesson represents. Although there are other models available for examining technology integration such as the SAMR Model, Technological Pedagogical and Content Knowledge (TPACK), and Grapplings Technology and Learning Spectrum, the TIM was chosen as the tool for this study because it uses ascending levels of integration and attributes of the learning environment. The TIM was appealing to the researcher because it provided a total of 25 different "cells" within the matrix. Other models focus on fewer attributes and the researcher felt it would be more beneficial for this study to have more choices available to compare the activities observed. This section describes available technology integration models and provides background on the TIM.

In 2006, Ruben R. Puentedura, with the Maine Learning Technologies Initiative, created the SAMR model as a framework for educators in Maine to use as encouragement to boost the quality of their mLearning (mobile learning) activities (Romrell, et al., 2014). Puentedura's hope was to change the way mobile devices are used to transform the activities from merely being used as a substitute for traditional activities, to tools that will personalize and enhance digital lessons.

The framework consists of four classifications: Substitution, Augmentation, Modification, and Redefinition. Romrell et al. (2014) described Substitution as, "The technology provides a substitute for other learning activities without functional change" (p. 4).

Augmentation is defined as, “The technology provides a substitute for other learning activities but with functional improvements” (p. 4). Modification is defined as, “The technology allows the learning activity to be redesigned” (p.4). Redefinition is, “The technology allows for the creation of tasks that could not have been done without the use of the technology” (p. 4). Focusing on these classifications can allow educators and instructional designers to see whether or not the technology being used is transforming learning in classrooms (Romrell et al., 2014).

The Grappling’s Technology and Learning Spectrum, created by Bernejean Porter, is another instructional framework that includes three categories that are broader: Technology Literacy Uses, Adapting Uses, and Transforming Uses (Bannister, Cornish, Bannister-Tyrrell, & Gregory, 2015; Skoretz & Childress, 2013). Technology Literacy Uses includes the learning of the tools and does not have a curricular focus; instead technology-centered pedagogy, instruction, and the acquisition of technology skills is the expectation (Porter, 2001). Porter indicates that the role of the teacher and student in this stage remains in the traditional forms where the teacher is the instructor and the student is the passive learner. The use of technology tools in place of traditional instructional materials to accomplish the same curriculum goals is the focus of the Adapting Uses category (Porter, 2001). The thought process of the educator in this stage is to, “Use it for something, anything…just use it” (p. 1). The teacher and student roles remain traditional and technology is used to adapt instruction in activities that cover educational standards (Skoretz & Childress, 2013). The Transforming Uses category of the spectrum takes on the idea of new student-centered learning with technology tools that are effortlessly implanted in the learning (Porter, 2001; Skoretz & Childress, 2013). The roles of the educator and student change to a constructivist approach and technology is used for students to become producers of information (Porter, 2001). It is expected that, when used to the highest

level (Transforming), student-centered learning can be accomplished only with the use of digital tools (Bannister et al., 2015).

The Technology, Pedagogy, and Content Knowledge (TPACK) Framework is another model teachers can use to gain a better understanding of an approach to technology integration. It includes a look at the areas of technology, pedagogy, and content knowledge and how they interact. This framework represents the importance of all three components when integrating technology in the classroom (Koehler & Mishra, 2009).

In a personal interview with the Assistant Superintendent of Curriculum[2], it was discovered that the district where this study will be conducted used the SAMR model as guidance for their professional development, but adapted it to include descriptions of each level that includes characteristics of the classroom environment: Task, Focus, Students, and Teachers. When the iPad initiative began in 2013, the technology professional development had a focus solely on the SAMR Model. Leaders in the district had discussions recently and decided the teacher's experience and exposure with iPads has moved their practice beyond just considerations of the iPad as a tool. District leaders felt there was a need to have teachers look at technology instruction at a deeper level, which includes more focus on the instructional practices instead of the tools. Although the SAMR model is a great way to look at how digital tools are used in instruction, there was a need to broaden the focus of professional development being offered to teachers. The leaders collaborated and designed a framework of instruction, which they called Learning and Teaching with SAMR.

Creators of Learning and Teaching with SAMR used the definitions of Puentedura's (2014): Substitution, Augmentation, Modification, and Redefinition; then included examples or

[2] Personal communication with the Assistant Superintendent of Curriculum is not cited due to confidentiality of the person and district being studied

definitions of what each would look like specific to the Task (or activity) in which the technology is being used, the Focus (or purpose) of the lesson where technology is included, the role of the Student at each level, and the role of the Teacher at each level. The purpose of this new framework was to allow teachers to design lessons with a focus on both the levels of SAMR and activities with higher depth of knowledge considerations. The Assistant Superintendent of Curriculum noted that including the characteristics of Task, Focus, Student Role, and Teacher Role assisted educators in "designing a good lesson for learning and teaching."

The TIM was developed through a collaboration effort of the Florida Department of Education and the University of South Florida's College of Education's Florida Center for Instructional Technology (FCIT) (Welsh, et al., 2011). This assessment tool: "i) provides a framework for defining and evaluating technology integration; ii) sets a clear vision for effective teaching with technology; iii) gives teachers and administrators a common language for setting goals; iv) helps target professional development resources effectively" (Bartoschek & Carlos, 2013, p. 3). The TIM is based on both Jonassen's, Howland's, Moore's, and Marra's Constructivist Learning Environments framework and ACOT's Level of Technology Integration Curriculum with the key factor being the learner's interactions in constructing their own learning (Bartoschek & Carlos, 2013). The TIM was developed to help K-12 schools by providing a common language of pedagogically-centered ideas and describing what effective technology integration should look like, so they can provide skills necessary for their future success (Harmes, Welsh, & Winkelman, 2016).

The TIM demonstrates how educators can enhance their instruction with use of technology. It includes both levels of technology integration along with characteristics of the

learning environment. The levels of integration include: Entry, Adoption, Adaptation, Infusion, and Transformation; the characteristics of the learning environment include: Active, Collaborative, Constructive, Authentic, and Goal-Directed (Welsh, et al., 2011). Below are the definitions of each level of integration and characteristic of the learning environment included on the TIM. A table of summary descriptors is included as Appendix B.

Levels of Technology Integration

Entry Level - The teacher begins to use technology tools to deliver curriculum content to students.

Adoption Level - The teacher directs students in the conventional and procedural uses of technology tools.

Adaptation Level - The teacher facilitates students in exploring and independently using technology tools.

Infusion Level - The teacher provides the learning context and the students choose the technology tools to achieve the outcome.

Transformation Level - The teacher encourages the innovative use of technology tools. Technology tools are used to facilitate higher order thinking activities that may not have been possible without the use of technology. (Florida Center for Instructional Technology (FCIT), n.d.a, p. 1)

Characteristics of the Learning Environment

Active Learning - Students are actively engaged in using technology as a tool rather than passively receiving information from the technology.

Collaborative Learning - Students use technology tools to collaborate with others rather than working individually at all times.

Constructive Learning - Students use technology tools to connect new information to their prior knowledge rather than to passively receive information.

Authentic Learning - Students use technology tools to link learning activities to the world beyond the instructional setting rather than working on decontextualized assignments.

Goal-Directed Learning - Students use technology tools to set goals, plan activities, monitor progress, and evaluate results rather than simply completing assignments without reflection. (FCIT, n.d.a, p. 1)

Both the levels of technology integration and the characteristics of the learning environment come together on the framework to create 25 cells. This interactive online assessment tool allows educators to explore extended definitions, other resources, and videos by clicking the desired cell (FCIT, n.d.a, p. 1). The anticipated outcome of using this tool is for teachers to discover where their instruction falls on the framework, reflect on their practice, and improve and monitor their progress with the hopes of achieving a higher level by adjusting lessons (Bartoschek & Carlos, 2013).

SUMMARY

To develop a deeper understanding of technology integration, this chapter reviewed literature associated with the implementation of technology, specifically iPads. Kopcha (2010) acknowledged that technology, "… is at the point of saturation in schools that allows researchers to focus on how, rather than if, teachers are using technology" (p. 187). More research is needed looking closer at the levels of technology integration happening in our schools.

The preceding literature review addressed research associated with issues relevant to the use of technology in the classroom. The specific themes that developed included a look at the influx of technology and how technology is becoming a normal part of everyday life, the importance of looking at teacher pedagogy and how social and political events throughout history changed educators' belief systems and teaching practices, how students of today learn and what that means for educators, and finally, what is needed for educators to take the next step to be ready to implement the technology so that student learning is affected in a positive way. The following chapter will outline the methods that were used in this study.

CHAPTER 3

METHODS

This chapter describes the research methods used to complete this qualitative study. Marshall and Rossman (2016) define qualitative research as "… a broad approach to the study of social phenomena" (p. 5). Qualitative research allows the researcher to give a human side to research by seeking answers to questions, collecting evidence, and providing findings that were not predetermined (Mack, Woodsong, MacQueen, Guest, & Namey, 2005). Qualitative research methods can include observations, interviews, and focus groups. For the purpose of this study, observations and follow-up interviews were the main sources of data collection. Included in this chapter is a description of the research design, population and sample, instrumentation, data collection and procedures, and analysis and summary of the data.

RESEARCH QUESTIONS

This qualitative study addressed the following research questions:

1. How are the various levels of the Technology Integration Matrix – entry, adoption, adaptation, infusion, and transformation, and the classroom attributes of active, collaborative, constructive, authentic, and goal-directed – represented as instructional practices in classrooms of elementary teachers within schools identified as part of a one-to-one cohort?
2. What are the perceptions that elementary teachers and principals participating in a one-to-one cohort have about their experiences with iPads regarding their students?
3. What are the perceptions that elementary teachers and principals participating in a one-to-one cohort have about their experiences with iPads regarding their classroom or school?

4. What are the perceptions that elementary teachers and principals participating in a one-to-one cohort have about their experiences with iPads in regarding their instructional or leadership practices?

RESEARCH DESIGN

This was a qualitative study that used observations and in-depth interviews as data sources. The nature of qualitative research, according to Creswell (2003), is that, "Qualitative research is emergent rather than tightly prefigured" (p. 182). Creswell notes that research questions may change or be refined, data collection procedures may change as information and circumstances become familiar to the researcher, and themes and theory will emerge as specifics of data come to light.

This study allowed the researcher to complete observations and interviews, providing a snapshot of best practices with technology integration. The researcher used the Technology Integration Matrix (TIM) (Appendix B) to determine the level of integration and classroom attributes included in observed instructional practices. Follow-up interviews were conducted with teachers and principals at each school to clear up any confusion from the observations, allow the teachers and principals to provide additional information about the lessons observed, share stories and experiences about their students when using iPads, and gain an understanding of the perceptions the educators have regarding the impact of iPads on their students, classrooms or schools, instruction, and leadership within their school.

In qualitative research, according to Flick, von Kardorff, and Steinke (2004), "the term 'triangulation' is used to refer to the observation of the research issue from (at least) two different points" (p. 178). To improve the quality of the findings of this study, triangulation was used to gather data from multiple methods and multiple perspectives. Specific to this study, the

methods used to gather data included a demographic form completed by the teachers prior to starting the observations, the classroom observations, and follow-up interviews. Using these three methods assisted in triangulating the data collected to answer research question one. The three forms of data collection allowed a comparison of my interpretations with the participants' perceptions. Triangulation further developed and confirmed the findings of the study relating to research question one.

Another method of data collection used was the interview with the principals. As stated above, the teachers were asked follow-up questions to the demographic form and observations. The principal at each school was also interviewed to gain another perspective. Interviewing more than one group is a form of triangulation because both the teacher and principal were asked similar questions. Interviewing two different types of educators allowed for the researcher to find similarities in the perspectives of the teachers versus the principals, then cross-check those perspectives against my interpretations of research questions two through four. Even though there were differences in their responses, many of the responses from the principals supported responses from the teachers, and vice versa. Using this other avenue of validation further supported the findings for research questions two through four.

POPULATION AND SAMPLE

In this study, I used purposeful sampling and included teachers and principals from three elementary schools in a large school district in central West Virginia. The schools were chosen for a few reasons. Apple Professional Development Specialists, the county level technology integration team, and other county level administrators were consulted for suggestions of schools that could provide examples of instruction with iPads. A short list of four schools, all of which were a part of the voluntary county one-to-one cohort, was provided.

Each school was involved in a one-to-one cohort in the county. Four elementary schools in the district formed a group, meeting and working together with the goal of collaborating to improve instructional practices with iPads, sharing ideas of iPad integration, and working with the district technology instructional coaches and the Apple Professional Development Specialists to prepare themselves and their school for the process of applying to become a National Apple Distinguished School. As the process continued, one of the schools began to lessen their involvement in the cohort. After consideration of the sampling needed for this study, it was decided that the remaining three of the four schools would be a part of this study.

All three of the schools have begun the application process for becoming an Apple Distinguished School. As of the 2017-2018 school year, one of the schools has 100% Apple Certified Teachers on staff and has been recognized as a National Apple Distinguished School for the 2017-2019 school years. Apple Distinguished Schools are considered "centers of innovation, leadership, and educational excellence that use Apple products to inspire creativity, collaboration, and critical thinking."[3] The faculty and staff have documented instances to prove they use technology in innovative ways in student learning, teaching, and the school environment and have proof of accomplishments in academic achievement resulting from use of Apple products.

The chosen population was a limited sample that is not intended to be representative of other elementary schools in the county or across the state. For the purpose of this study, it was important the participants had enough experience using iPads to make it possible to observe behaviors that allowed me to build a thorough, detailed, and rich description of classroom

[3] The article from which this quote was taken is not cited due to confidentiality of the person and district being studied

practices. As Creswell (2003) describes, the thought behind qualitative research is to choose participants or sites that will help the researcher gain a clear understanding of the research questions. ALKathiri (2010) supports this idea of purposeful sampling to develop a better understanding of the phenomena, give us useful information, and give voice to unheard individuals. Each school is at a different point of becoming one-to-one with iPads, which was a factor when choosing the schools to give ample opportunity to gather data from different instructional situations. Two of the elementary schools have had one-to-one iPads for at least three years; this was the first year for one-to-one iPads for the third school. The researcher felt having different levels of integration brought a real-life picture to the study and allowed many different educators a chance to make a connection to the data, which added depth to the findings.

The following section will provide population and sample details for each specific school. To protect privacy, pseudonyms were used for each school and each participant. The first school, referred to as Forrest Elementary from this point forward, was located in a low-income urban location. There were just under 390 students enrolled, 19 classroom teachers cover three of each grade level kindergarten through fifth grade, one pre-kindergarten teacher, 11 resource and support teachers, and three related arts teachers with an average class size of 23. The second school, referred to as Lincoln Elementary from this point forward, was located in a low-income rural location. There were approximately 160 students enrolled, nine classroom teachers covered two of each grade level kindergarten and first grade, and one of each in second through fifth grade, one pre-kindergarten teacher, eight resource and support teachers, and three related arts teachers with an average class size of 17. The third school, referred to as Softwood Elementary from this point forward, was located in a middle-income rural location. There were

just under 340 students enrolled, 16 classroom teachers covered three of each grade level kindergarten through fifth grade, with the exception of only two second and two fourth grades, eight resource and support teachers, and three related arts teachers with an average class size of 20.

At each school there were three observations conducted in two classrooms for a total of six teachers and 18 observations. The interviews were conducted at each school with the two teachers that were observed and the principal for a total of six teachers, three principals and nine interviews.

INSTRUMENTATION

This qualitative study included classroom observations and face-to-face interviews. There were three instruments used that assisted with data collection. A Pre-Observation Teacher Demographic Questionnaire (Appendix D), the *Phillips Observation Guide* (Appendix C), and Interview Protocols for Teachers and Principals (Appendix E). An additional instrument used as a data analysis tool post-observation was the TIM (Appendix B).

For the purpose of gathering demographic information about the teachers that were observed a Pre-Observation Demographic Questionnaire was distributed to the six teachers involved in this study. The purpose of this instrument was to gather data before the observations were completed. The information was used to create a description of each teacher, including years of experience as an educator, types of related professional development the teacher had prior to the observation, and what the teachers perceived as their support for iPad integration in their curriculum. This description gave a well-rounded view of the teachers in their instructional setting and allowed the readers to make connections with their own personal experiences.

In his discussion on qualitative observations, Shank (2002) describes the difficulty in completing observations in qualitative research. Although humans naturally observe every day, there is a difference between what he calls "maintenance" observations as opposed to the type of observation a researcher must complete for qualitative studies. Shank describes maintenance observations as what we do on a daily basis, we observe in familiar settings. "That way, you do not have to invest a lot of time or attention to the observational process" (p. 20); not until something is different in that setting is there a need to put forth more focus on what we are observing. In contrast, observing in the role of a researcher takes more effort to work against our natural tendencies "in order not to see the ordinary and the everyday" (p. 20). The role of a researcher takes a great deal of focus and intense skill to be able to pay attention to important aspects of what we are watching, all while documenting details. As Shank puts it, "You have to be able to observe the extraordinary and the ordinary at the same time" (p. 20). The *Phillips Observation Guide* was created to assist in focusing on aspects of the observations that related to the research questions.

The *Phillips Observation Guide* was set up to provide a focus for the researcher during the observations. The document was set up as a table, which provided room to document descriptive notes and reflective notes. The guide was divided into four sections. Section one included a general description of the participants, the physical classroom setting, and the activity being observed. Section two provided an area to document the teacher actions and interactions, and teacher comments. Section three of the observation guide provided space to document student actions and interactions, and student comments. Section four gave the researcher a space to document any pertinent information about the iPad such as the apps being used or other information about the tool itself.

Once the observations were completed and the researcher coded the data, the TIM was used to compare classroom observations and determine the level and characteristics of the observed activity based on the technology matrix. The matrix is made up of five levels of technology integration and five characteristics of the classroom environment. The language used to define the levels of technology integration has a focus on the actions and role of the teacher, and the language used to describe the characteristics of the classroom environment focuses on students' interactions. This language was considered when creating the *Phillips Observation Guide*. The findings from the comparison of classroom observations and the TIM was included in a table and descriptive format and used to answer research question one.

As a follow-up to the classroom observations, interviews were conducted with each teacher and each school principal. Interview protocols were used not only as a set of questions, but as a procedural guide throughout the interview process (Jacob & Ferguson, 2012). When the researcher completed the interviews, the Interview Protocols were used to guide the questions and keep the conversation focused on the research questions. According to Guest, Namey, and Mitchell (2013), when using qualitative data, such as face-to-face interviews, as a comparative tool, it is important for the researcher to take a semi-structured approach. Semi-structured questions should be prepared ahead of the interview and should be used with all participants, even though they are open-ended (Guest, et al., 2013). Using this type of data collection ensured the evidence being collected would answer research questions two through four, while still allowing for individual interviewees to expand and share their personal experiences and perceptions.

There was an Interview Protocol for Teachers and a separate Interview Protocol for Principals. The questions included asked for information about specific lessons that were

observed, the perceptions of the teachers and principals on the effects iPads have had, if any, on their schools, students, classroom environments, or the staff. The answers provided supported research questions two through four and also assisted in developing a clear narrative. Some questions asked for personal pedagogical beliefs and the impact iPads have had, if any, on changing these beliefs. Responses to these questions supported research question four. There was also an aspect of finding out about their journey and development of experiences using iPads and how their personal experiences have had an impact, if any, on their leadership skills. This series of questions and additional conversation helped answer research question four. The nature of the interview was semi-structured, which allowed for the interviewees to feel comfortable enough to expand on their own experiences and feelings about iPad instruction.

Prior to beginning the study and submitting the IRB application, the researcher attempted to validate the Pre-Observation Demographic Questionnaire and the Interview Protocols for Teachers and Principals by enlisting the aid of an expert panel. The Interview Protocols for both the principals and teachers were distributed to a panel of four educators that are heavily involved with iPad instruction both within the school and at the county level. These experts included a school technology specialist that was also a classroom teacher, a county level curriculum specialist, and two technology integration specialists. They were asked to give feedback about the questions and to make suggestions to improve and streamline the interview process.

Another form of validation was used to test the *Phillips Observation Guide.* Chenail (2011) defines a pilot study as a "trial run… done in preparation for the major study" (p. 257), providing an advantage of testing out instruments to determine if they are not feasible as a data collection method or overly complicated. The researcher conducted a pilot observation that

lasted approximately one hour at an elementary school not involved with the study. *The Phillips Observation Guide* was used to ensure the ease of use and guarantee the importance of each section of the guide. The researcher used this pilot observation to make necessary changes to the instrument. Upon completion of the pilot study, it was determined that no changes were needed. Once these validation efforts were completed, these instruments were included in the Marshall University IRB application. The purpose of each of these strategies was to improve the validity and reliability of the instruments prior to use.

DATA COLLECTION AND PROCEDURES

Approval to collect data was obtained from both Marshall University's Institutional Review Board (IRB) and the participating county board of education's Request to Conduct Research. A copy of the approval letter from Marshall University can be found in Appendix A. A copy of the approval to conduct research in the district studied was sent to Marshall University's IRB as part of the approval process.[4] After obtaining approval, the researcher collected data in the form of a pre-observation questionnaire, classroom observations documented on the *Phillips Observation Guide*, and Interview Protocols from follow-up interviews with the classroom teachers that were observed and each principal from the three schools selected. This section will provide details on the process, timeline, and procedures of data collection.

To begin the process of data collection, I met with the teachers and principals at each participating school and provided information about the study. With the assistance of the principal, I chose two teachers to observe at least three times at each school for a total of six teachers. Prior to the observations I distributed the Pre-Observation Demographic Questionnaire

[4] The IRB approval letter and Informed Consent forms from the district where the study was conducted are not included as an appendix in order to maintain anonymity

to those teachers observed. I gave the teachers the option of completing the form in a digital or a print version. All six teachers completed the form in a print version. I collected the completed demographic forms prior to the first classroom observation.

There were six classroom observations at each school, in two different classrooms with the exception of one school. At Softwood Elementary, I was able to complete three observations in one room for a total of seven school observations, which gave a total of 19 observations. The intention was to complete all classroom observations within a timeframe of one month, which was accomplished. Most observations lasted for one hour and the researcher documented field notes using the *Phillips Observation Guide* as a data collection tool. The researcher also took still photos of the classrooms. This practice is supported by Loughlin's (2013) study where she suggested photography used to support field notes can allow the observer to be more engaged in other aspects of the observation. Using photos allowed the focus to be on the actions that occurred during the lesson instead of using time during the observation to record descriptions of the environment. Loughlin (2013) and her colleagues, after each observation, would find a neutral space to work on their field notes and add to them by reviewing the still images. For this study, photos were taken of the overall set-up, the walls, close-up photos of student areas, teacher areas, photos of screen shots of the iPads, and any other item in the classroom that contributed to the field notes.

After the classroom observations were completed, I conducted follow-up, face-to-face interviews with all of the participating teachers and each principal for a total of nine interviews. Prior to the interviews, an email was sent to each participant with the interview questions so they were prepared to answer the questions. In the email the message to the participants was that this interview will take a semi-structured approach and they were welcome to share other

thoughts during the interview that may not fit into the pre-determined questions. The goal of qualitative research is to provide a process that allows the researcher to uncover as much as possible about a participant and their experiences (Jacob &Ferguson, 2012), while still being able to guide the interview in the direction of the research questions.

The proposed timeline was to complete each interview within a week of the conclusion of the final classroom observation, so the activities and interactions during the observations were still fresh in the minds of both the researcher and the teacher. This timeline was followed with the exception of one participant. One teacher at Forrest Elementary took a few days off for a scheduled trip so her interview was conducted one and a half weeks after the final observation in her room. The principal interviews were completed within a one-month timeframe. It was not necessary to wait until the classroom observations were completed, so the interviews took place at a convenient time for the principals. In two schools the interviews were completed after all the observations were finished; one principal interview occurred before all of the observations were done. There was an option given for a Facetime interview if the researcher and a participant had difficulty scheduling a face-to-face interview, but it was not necessary because there were no issues scheduling. The interviews were recorded and transcribed. The purpose of recording the interviews was to allow the researcher to be able to maintain eye contact with the interviewee and to revisit the interviews in order to guarantee the accuracy of the transcription. The researcher took notes using the interview protocols, in case the recording equipment failed.

DATA ANALYSIS

The process of qualitative data analysis "…involves preparing the data for analysis, moving deeper and deeper into understanding the data, representing the data, and making an interpretation of the larger meaning of the data" (Creswell, 2003, p. 217). Qualitative research

in general is inductive and flexible and provides researchers with an opportunity to probe deeper into the data once collection procedures have taken place; even as far as going back to participants for follow-up questions and clarification (Guest et al., 2013). Different from quantitative studies, qualitative findings provide data that is not predetermined by the researcher (Guest et al., 2013). Although there are many different types of qualitative research designs that have their own specific procedures for analysis, there are general guidelines that can be followed. This section will describe the guidelines used to analyze the data for this study including: the Pre-Observation Demographic Questionnaire, classroom observations collected on the *Phillips Observation Guide*, comparison of classroom observations with the TIM, and data collected from face-to-face interviews documented with the Interview Protocols and recordings.

General guidelines for qualitative researchers, according to Creswell (2003), Guest et al. (2013), and Life (1994) include: first organize the data in the form of transcribing interviews, typing and organizing field notes, and sorting data according to the source of the information; next, read through all of the organized data to reflect and gain a general sense of ideas, attitudes, or feelings conveyed (often researchers make notes in the margins or keep a diary of their own thoughts during this step); the detailed analysis begins with the process of coding the data. Coding is the organizing of data into categories or chunks of information to begin the process of developing themes to explain larger theoretical viewpoints taken from the research; the final step is to create themes around these categories that can describe for the reader a variety of complex processes (Guest et al., 2013).

The findings section was divided into two chapters (chapters four and five). Chapter four included a narrative description of each of the teachers and settings observed to provide a story

for the readers, and chapter five included specific data collected that supported each of the research questions. Data collected from the Pre-Observation Demographic Questionnaire was included in the findings section in chapter four as part of each teacher narrative. Included in the descriptions and intertwined in the reflection of the observations were the teacher's demographics: highest degree earned, years of experience, professional development attended, and support or motivation for iPad use. Questions were asked during the interviews to clarify and expand upon the answers given on the demographics form, then used to develop the descriptive narrative included in chapter four.

Data analysis on classroom observations will begin immediately after each observation. The researcher reread the anecdotal and descriptive notes, added additional descriptive notes from memory and reflective notes on the *Phillips Observation Guide*. Still photos of the setting were taken during each classroom visit and audio recordings of the observations were used to support the quality of field notes. The photos and audio recordings assisted the researcher in recalling verbal interactions, finding details that were missed in the initial observation, and verifying statements. Once all of the observations were completed and documented, the researcher typed and sorted the data to begin the process of grouping, reading through all of the data, asking herself questions about what she read and why the information is significant; all while looking for similarities in the evidence to initiate the development of themes.

The next step for analysis was to begin the comparison of the observed instruction with the TIM. As previously discussed the TIM was used as a comparison chart for the observed lessons. The researcher reread the data specific to each individual lesson and determined, from the evidence, where that lesson fell on the matrix. This data was used for both chapters four and five. In chapter four it was included in the descriptive narratives and gave a broader picture and

provided as much depth as possible. In chapter five, it was used to provide evidence to support the research questions.

The next step for the researcher was to analyze data from face-to-face interviews. To begin this process, it was necessary to transcribe the interviews. Once the transcriptions were complete, the data, when possible, was sorted into similar categories as the observation data, looking for similarities in the evidence to initiate the development of themes. The goal for the researcher was to find commonalities in both the observational data and data from the interviews to develop the themes around more generalizable ideas to help educators. This data was used in chapters four and five. In chapter four it was added to the descriptive narratives and provided more insight into the perceptions of the participants. It contributed to the development of an overall picture of the classroom environments. In chapter five, it was used as evidence to support the research questions.

The final step in analyzing was to gather and reread all data in order to develop themes that were supported by the evidence. Another practice is to include the researcher notes or diary to help round out the process of narrowing ideas (Guest et al., 2013). "This may stimulate theoretical thinking and analytical strategies that will be noted in the diary" (Life, 1994, p. 59). This process can and should be cyclical (Shank, 2002), meaning, as the researcher began to develop themes around the evidence, she continually revisited the data, asked questions, revisited the researcher memos and notes, and added relevant data or eliminated irrelevant data. Once this process had been exhausted, the researcher walked away with larger meanings developed from the evidence (Creswell, 2003) that can describe how and why teachers use iPads and how the readers of this study can relate the findings to their own specific situations.

SUMMARY

This qualitative study was designed to examine best practices of teachers in a one-to-one iPad initiative and measure those practices to the TIM framework of technology integration. The data collection and analysis included field notes and transcriptions from observations and interviews that provided an element of discovering the story behind the teacher's and principal's journey with iPad integration. The overarching goal was to examine the process of successfully building a technology program in schools that included iPads. The information received from this study provided a snapshot of different levels of iPad instruction for those educators that are just beginning the process, and moved forward the practice of iPad instruction for those educators that have already begun their own journeys.

CHAPTER 4

OBSERVATIONS AND INTERVIEWS

This chapter provides a detailed narrative description of each school, teacher, observation, and principal. The purpose of this section is to provide the reader with the story of each participant and the perceptions about their journey with iPads in classrooms and schools. The details about the three schools were gathered by visiting the school and county websites. Descriptions of the six teachers and three principals were developed from a brief survey, 19 classroom observations, informal discussions, and interviews. As stated in chapter three, pseudonyms are used to protect the participants' privacy.

FORREST ELEMENTARY

Forrest Elementary is a pre-kindergarten through fifth grade school located in a low-income urban setting. The school opened in 2014. It offers collaborative learning spaces for students and teachers in the intermediate grades, and has an eco-friendly design meant to be used as a learning experience. It was built to accommodate the current population with adequate bandwidth and is one-to-one with iPads.

The intermediate classrooms have an open space shared by mixed grades and ability levels in grades two through five. Teachers work collaboratively to provide blended and project-based learning activities. The shared space includes areas with flexible seating that can be used for small group or individual learning activities. There is a performance area for students to present projects and practice public speaking. Each area has its own student library/media center, and smaller classrooms separate from the shared space, partitioned off by glass that can be used for grade level, teacher-led, or whole group instruction. The kindergarten and first grade

classrooms hold one grade level, but are also designed to provide flexible seating and areas for hands-on learning and small group instruction.

Each instructional area has an outside patio that can be used as a learning space and for recreation. The school's location was purposefully chosen to give students that live in the city an opportunity to experience nature. It is located high up a hill, near a wooded area with plenty of opportunity to view wildlife.

Each classroom has an Apple TV and one-to-one iPads for the students. The facility was built with wireless connectivity to allow all of the students and staff access. There is a broadcast studio available off the iMac computer lab, where students can prepare morning announcements or complete lessons using creative iPad apps.

The staff participated in professional development sessions to learn about the use of iPads with student-centered, project-based learning activities prior to the school opening and continuing to the present time. They initially met weekly for what they called Sparks Sessions. This was a chance to collaborate with other grade level teachers and share successes. The principal, Mrs. Tanner, stated that she let the teachers lead these after school professional development sessions to discuss lessons they used with other staff. She felt it was more effective for the teachers to learn from each other, share their thoughts on why they had success, reflect on what they could do differently next time, and consider how to adjust the lesson for students at different grade levels. Since the school opened and teachers have gotten more experienced, the Sparks meetings are conducted monthly instead of weekly.

Members of the county technology team and Apple Professional Development Specialists provided embedded staff development. One specialist worked collaboratively with

individual teachers from the planning stage to teaching a lesson. Each of these sessions ended with the individual teacher meeting with the specialist to reflect on the lesson.

According to the West Virginia Department of Education, the school's enrollment has declined since 2014 from approximately 450 to 420 students. The school enrollment was 55% White, 30% Black or African American, and 15% Multi-Racial. The low SES percentage for the 2017-2018 school year was 75%, down from 100% in 2014. The percentage of students receiving special education services was 16%.

Mrs. Smith

One of the teachers I observed at Forrest Elementary was a first grade teacher, Mrs. Smith. She has a bachelor's degree and is a seasoned teacher, having taught for 31 years. She has been a teacher at Forrest Elementary for the past two years. When asked about the types of professional development she received to improve her skills with the iPad, she indicated involvement in: county level iPad professional development offerings during the summer, an iPad beginners course, online PD through the *Seesaw* web site, classroom embedded training with the Apple Professional Development Specialists and county level professional development specialists, the technology one-to-one cadre, and school level Sparks meetings.

During the summer, the county professional development team offered training sessions in locations outside of schools such as state parks, museums, and similar settings. The county team shared different apps and teachers practiced with those apps at the designated locations to learn how students can use the iPad. The teachers shared ideas and had a good time while learning.

When Mrs. Smith began to integrate iPads she attended a county sponsored iPad beginner's course along with having the county professional development specialists and the

Apple Professional Development Specialists complete embedded training in her classroom. The teacher and specialists worked together and planned lessons, learned new apps, developed strategies, and implemented those lessons in the classroom. This embedded PD continued when the Apple specialist completed another round, as they worked on a mini Project-Based Learning (PBL) activity. She felt the embedded PD was extremely helpful for her because she was able to see the lesson in action and learned as it progressed. She also observed her students learning new things about the subject they were studying and about the iPad. In a few instances, students were able to teach her things about the iPad she did not know.

Mrs. Smith attended as many of the county offered PD sessions as she could. She completed PD offered through specific apps/programs. She spoke of an online digital portfolio platform called *Seesaw*. She completed the online PD they offered during the summer to become familiar with all of its features. She enjoyed being able to do this from home and used *Seesaw* daily in her classroom.

At the school level, the Forrest Elementary staff met monthly for what they called Sparks meetings. The meetings consisted of teachers taking the lead to share different apps they used in their classrooms. If there was an interest in another app that the teachers at the school did not have experience with, the principal requested that a teacher from a different school come and demonstrate that app. This type of PD was particularly helpful to Mrs. Smith because she was learning from a teacher who had used it successfully in the classroom. A type of PD she said was not helpful was the lecture format with no follow-up to see if things ran smoothly.

Specific to Mrs. Smith's pedagogical beliefs and instructional practices, she stated that children are different learners today, but claims her instructional practices have not changed very much since she started teaching. She stated that early in her career, it was easier to teach

students in the whole group format, but she always used small groups in her instruction. The difference between the past and now, with iPads in her classroom, was that she rarely taught whole group and it was much noisier. She said there was always something going on in her room. She believed that children learn much better in small collaborative groups, and that they are different today because they have had technology as a part of their entire lives. Since the students have changed in that manner, she thought iPads helped a lot.

One area Mrs. Smith felt had not been impacted by iPads was her classroom management. She always had good classroom management because she understood the importance of having the students know what was expected. She said she treated the iPad as a tool and just a part of what she needed to accomplish a task.

Mrs. Smith felt her motivation to continue using iPads stemmed from the excitement seen in her students when they tried new things. She also felt the support from the principal and fellow teachers kept her interested in learning new things herself. More specifics about each observation and details of the interview will follow.

The Classroom: Mrs. Smith

Mrs. Smith's classroom can be described as bright and cheerful. The room was large with high ceilings and large windows. I entered from the hallway door and noticed a table and bookshelf that had bins that were numbered; later I found out the numbers represented each of the students in the room. In the bins were books, workbooks, and large gallon-sized plastic bags; some were empty, but a few had headphones. The iPads were in plastic containers next to the student bins.

On the window ledge sat several plastic cups with student first names, dirt, and small plants, which looked like a science project. There was a built-in sitting area in front of the

windows that the students used as their independent work area to read or complete work on their iPads. The students sat at atypical triangular desks that could fit together with other desks to create table groupings that are conducive to small group collaboration. There were five of these groups, and each group had a blue caddie in the middle to hold supplies like pencils, crayons, and markers.

The walls were decorated with several positive and colorful bulletin boards that displayed reading and math information along with student work. There was a door that led out to an outside play area. There was a bathroom and sink in the room. The sink area had countertops and cabinets for storage. On the cabinets were posters about classroom rules. Something posted on the cabinets that caught my eye were two teacher-made posters titled: *What Makes a Great Teacher?* and *What Makes a Great Student Leader?* During one of my observations I asked Mrs. Smith about the posters, and she said she had a group discussion early in the year. The class created the lists with the assistance of the teacher. The students generated the lists to include positive characteristics about student leaders and teachers. The posters caught my attention because it spoke volumes about the way Mrs. Smith managed her classroom. Both the teacher and students took time to think about what was expected of them and each other.

Other parts of the room included two carpeted areas for group work. One area, located in the far left corner of the room near the door that led outside, was used for independent reading or working on the iPads, and the other was located in front of the SMART Board that was used for whole or small group instruction. An adult-sized rocking chair was located to the right of the SMART Board and a small media table that held the teacher computer and document camera. An easel was set in front of the SMART Board that had a large poster notepad with a graphic

organizer containing a map and word web of different places in West Virginia. There was a kidney-shaped table for small group instruction located in the far right corner of the room in front of the bathroom. The teacher desk, cabinets and bookshelves were in the opposite corner of the room from the kidney-shaped table. Each area of the room was separated by bookshelves

The room had large areas where students worked in groups, or found a quiet spot to work independently. When asked about the physical space in her classroom Mrs. Smith said the school was designed with extra space for the students to go anywhere in the room, creating areas for both collaborative group work and independent work. The technology available in the room included: a SMART Board, a mounted TV with an Apple TV, a document camera, a teacher Mac Book, an iPad charging station, 19 student iPads, and one teacher iPad.

Observation 1: Mrs. Smith

The first observation I completed in Mrs. Smith's room was early on a Monday morning. I observed during the reading block and was able to see students as they worked independently on iPads. I also observed a brainstorming activity the students completed to prepare for their PBL presentation. I found it important to pay attention to this part of the lesson because, although it was not directly related to iPads, it was part of the process of a bigger technology project. Two other teacher-led small groups were conducted during this time for a total of three rotations with transitions in between each group. There were two teachers in the room, the classroom teacher, Mrs. Smith, and the reading interventionist. Each teacher worked with all students during the small group instruction. The classroom teacher completed instruction on sight words and read a book chorally with all three groups. In addition, with the last two groups, she completed a word web activity on famous places in West Virginia in preparation for the PBL activity they completed later in the day.

Each student had a chance to work independently, the independent group, with an iPad on an app called *Smarty Ants*, an online reading program that differentiated learning and provided individual practice with reading skills. Mrs. Smith explained that it was a county required program used during reading instruction that allowed the teacher to work with small groups, while other students used iPads to work on reading skills based on their individual needs. Students completed an initial assessment, and the program adapted the instruction based on student performance. She had access to a teacher dashboard that provided reports on usage, current data, and information on each student's progress in the program. Mrs. Smith expressed her appreciation for the reports because she was able to immediately see what the child did, knew they worked on something that would increase their reading skills, which let her focus on the small group instruction. This immediate feedback was beneficial for all of her students. She also said the students enjoyed the program, which helped to keep them on task, and caused fewer interruptions during reading groups.

When I walked in the room there were 16 students (eight boys and eight girls) on the rug in front of the SMART Board. Mrs. Smith told the students what they were expected to do at each station and who was in each group, then dismissed them from the carpet. It took approximately two minutes for the students to get settled in their groups. The reading interventionist sat at the kidney-shaped table with five students, and the teacher sat in the rocking chair with five students on the rug in front of her. The remaining six students were the independent group.

The teacher first reviewed flashcards with sight word phrases, then had the students partner-read a decodable reader. The interventionist worked on words that had the "th" sound. Students read words with "th," decided if the sounds were at the beginning, middle, or end of

the word, then cut out the words and glued them under the correct category in a journal. I focused on the independent group that used iPads.

Before the students in the independent group came to the back area of the room, they went near the hallway door and got an iPad and headphones from the shelf. The headphones were in large baggies with their names on them. The iPads were in tubs next to the headphones. There was not a specific iPad assigned to each child. Later, in a discussion with Mrs. Smith, I found out that she did not have a specific iPad assigned to each student, but had enough for everyone in her class. Her class set consisted of two different types of iPads: iPad Minis and iPad Pros. The iPad Minis were older and some programs did not run on them. She felt it would be unfair to assign an iPad to each student because those that had the iPad Mini would not have the same access to all of the programs.

The students got the iPads and headphones and found spots around the room. Three students went to the sitting area in front of the windows and the other three found a spot on the back rug near the outside door. They moved around throughout the observation between the rug, sitting area, and the tables. Each student accessed *Smarty Ants*. They had to login, and a few of them looked to the front of the room where there was a large paper with the username and password. Two of the six students had difficulty logging in, which caused them to begin a few minutes after the other four students.

Throughout the time I observed, there was not a lot of interaction because it was independent work and the students had headphones on, so I took time to sit near each of the students and watched what they did on the program. One reflection I made in my notes was that each child was doing something different. A girl with short, curly brown hair played a race game with “dge” words. The program would say a word and show three different words, she

tapped the correct word and the character jumped over a hurdle. A girl with blonde hair played a car racing game with words that had "y." A boy with short brown hair cashed in tickets and bought things for his avatar. There was a girl with long brown hair that read a story out loud. This did not seem to distract the other students since they each had headphones. A boy with brown hair played a game that had him restructuring sentences with "dle" and "tle" words, putting the words in the correct order. The final student in this group, a boy with short, curly black hair, played a bike race game where he practiced recognizing syllables.

The interactions between the students in this group consisted of showing each other the rewards they earned, talking about the changes they made to their avatar, and showing their peers a trophy if they earned one. During this first rotation, the students did not walk up to the teacher or the reading interventionist to ask questions. This rotation lasted approximately 13 minutes. Mrs. Smith rang chimes and indicated it was time to switch groups. The group on the carpet moved to the independent group, the group with the reading interventionist came to Mrs. Smith, and the independent group put the iPads back in the tub, placed their headphones in the baggie with their name, and came to the reading interventionist. The total time for this transition was approximately two minutes.

During the second and third rotations, I noticed Mrs. Smith did the sight word phrase flashcards with the students, but then had a discussion about the West Virginia word web that was on the easel. The students generated a word web of popular locations in West Virginia. They used the words when they created a presentation in *Pages* for their West Virginia PBL. Later, I asked Mrs. Smith why she did not do this with the first group. She said the first group was the only group that completed this activity the previous day. It was important for her to finish the word web because the students were supposed to start work on the PBL later that day.

The reading interventionist completed the same word journal activity with the other groups, but each group made different progress and she provided a different amount of support. The first group needed more examples from the teacher, and she had them do the first two words together, which caused them not to complete the lesson. She also told them not to use the glue until she checked their journal. The last two groups she provided fewer examples and each of those groups finished their journal entry.

The last two independent groups were similar to the first as far as the types of *Smarty Ants* activities they played. The skills were different for each student, with only a few of the same skills worked on during the rotation. In the second rotation, a brown-haired girl read a story titled *Houndsley and Cantina*. She read the story out loud, but once again, the other students in the room did not seem to be distracted by this. One boy worked on a story about families that had follow-up questions he answered. There was a girl with light brown hair that read the *Houndsley and Cantina* story, but she was further ahead than the first girl. She went to the program store and used her tickets to buy new clothes for her avatar. During this rotation, Mrs. Smith stopped her teaching to redirect two boys because they were not doing their work. After approximately 16 minutes, Mrs. Smith sounded the chimes and indicated it was time to change groups. This transition took approximately three minutes. Each group moved to the station they had not visited, while the previous and current independent groups returned or got their iPads and headphones.

While Mrs. Smith and the reading interventionist resumed their instruction, the independent group during this rotation was not as "on-task" as the other two groups. Three of the five students got right to work on *Smarty Ants*, but two of the students were distracted. One boy did not login to the reading program, but logged in to a program called *Accelerated Reader*

(AR). This program featured quizzes on books students read to earn points. It also kept track of the amount of points earned. The school provided rewards for students when they reached their grade-level goal. Speaking with Mrs. Smith, I found out an *AR* party would be the following Wednesday, but many of her students had not reached their goal. There was a little girl with blonde hair and blue eyes that tried to strike up a conversation with me. She asked me why I was there, how old I was, and whether or not I played *Smarty Ants* when I was a kid. I attempted to redirect her, but she followed me around the room. Mrs. Smith noticed her following and told her to find a spot away from everyone. She sat at a student desk and tried to login. She was unsuccessful, and during the first five minutes of the rotation, she interrupted Mrs. Smith three times to ask for assistance. Once she finally got into the program, her attention was on the other students. She did very little work during the rotation. I overheard Mrs. Smith at the end of the group time tell her she would look at how much she finished today. She reminded her that when it was independent group time, she was supposed to stay in her own area away from others. She could move around the room, but had to be away from the other students.

The final rotation took approximately 18 minutes. The additional time on the last two groups was caused by the extra task of completing the word web. When Mrs. Smith sounded the chimes, the students immediately cleaned up their area by putting away the journals, scissors, glue, headphones, and iPads. This transition took approximately four minutes; then the students joined Mrs. Smith on the carpet and my observation ended.

Observation 2: Mrs. Smith

My next visit to Mrs. Smith's room was on a Tuesday, later in the morning right before lunch. There were 16 students present during the observation, eight boys and eight girls; along with two adults, the classroom teacher and the reading interventionist. I observed another

reading lesson that was in the small group format. Throughout the observation the students used the SMART Board, iPads, an app called *Popplet* (to be described later), and an online portfolio app called *Seesaw*. The students were split into small groups for three different stations, one independent group on the iPads worked on *Smarty Ants*, one station worked with the reading interventionist at the kidney-shaped table, and one station was on the carpet with Mrs. Smith where they researched different aspects of West Virginia and created a *Popplet*. My focus for this observation was on the group working with Mrs. Smith.

When I arrived, the class transitioned from independent work at their desks to whole group on the carpet. Mrs. Smith told the students that they had worked so hard they deserved a brain break. She displayed a *GoNoodle* video on the SMART Board. *GoNoodle* was a free online program that had purposeful movement activities, lasting only a few minutes. The videos gave the students a chance to release energy during transitions. The students followed along with planned movements to contemporary music. It was engaging and visually appealing. The program tracked the amount of movement students completed and gave the class points as a source of motivation. The total time for the brain break was approximately three minutes. Then, the students sat to receive the next set of directions.

Mrs. Smith explained the expectations for small reading groups: one group worked with the iPad completing *Smarty Ants* lessons independently, one group was with the reading interventionist and worked on their West Virginia books, and one group worked with her on the carpet. She named the six students in the independent group, and they went directly to the bins that had iPads. Next, Mrs. Smith dismissed the four students for the reading interventionist group. The remaining six students stayed on the carpet. The students moved to their designated groups and began to work, which took approximately two minutes.

Mrs. Smith explained the lesson would be to create a *Popplet*, which showed what they learned about West Virginia in their research. *Popplet* was an app that acted as a graphic organizer where students created a visual representation of a subject they learned about. It was similar to a word web and was created using photos, drawings, text, and/or video. The students created the web by adding what is called a popple (a box) and then connecting additional popples and organizing them in a way that visually represented how they were related. Mrs. Smith explained that once they finished their *Popplet*, they would upload it to *Seesaw*. *Seesaw* was an online portfolio and communication tool used to organize the students' work. It was the way students kept a record of their learning and showed growth throughout the year. The *Popplet* they created during this observation was on famous places and representations of West Virginia.

Mrs. Smith gave directions about how to create a *Popplet*. This was the first time they used the app, so she did not hand out the iPads at the beginning. She went through the steps of how to create it and what they were expected to add. The only directions about what they had to add was the first popple, which was a picture of the West Virginia state seal. This would be the main popple that the students would use to make a connection to famous places in West Virginia, well-known people, and the state symbols. When Mrs. Smith felt the students had a good grasp on the app, she handed out the iPads. The students got right to work and found the *Popplet* icon. Around the carpet area were resources for the students to find pictures: a map of West Virginia that showed the 55 counties and different objects that represented each, magazines about West Virginia, and posters that displayed the state symbols. The students used the resources provided, taking pictures of different representations of West Virginia, and adding them into their presentations. For the most part, they needed very little direction during their

work time. There was one girl who had a hard time adding photos to the popple. Mrs. Smith walked around to monitor the students, and stopped to help her. During this time she also showed individual students how they could write on their *Popplet.* As the students finished, they uploaded their work to *Seesaw*, then checked with Mrs. Smith to make sure she received it.

This rotation lasted approximately 25 minutes and was the only one I observed for the day because the students cleaned up and got ready for lunch. After the students went to lunch, Mrs. Smith said she tried to see each group every day, or at least two groups each day, but this was the first time they used the *Popplet* app and so she needed extra time to explain how the app worked and to allow for the students to get familiar with it. She would see the other groups throughout the week. I asked her if she was concerned about the progress the independent group made for the day, she stated that she would look at the usage and progress reports available to her to see what those students accomplished. If there was a student that did not have any usage or had difficulty with the lessons, she would pull them aside and talk to them about why they had difficulty. She said this lets the student know that she monitored what they did when they were not with her. Since it was later in the year, the students recognized this. She usually did not have many that were not productive when they used *Smarty Ants*.

Observation 3: Mrs. Smith

My final observation of Mrs. Smith occurred on a Wednesday afternoon. All of the students were present, eight boys and eight girls. There were two teachers in the room, Mrs. Smith and a math interventionist. My time was spent watching a math lesson conducted in two groups. The technology used during this time was the iPad: the camera roll, *Seesaw*, and *ST Math*. *ST Math* was an online program similar to *Smarty Ants* in that students used it to work independently during small group rotation. The activities were set up as puzzles that gave

students visual representations of math concepts with a character named JiJi. JiJi was a penguin that could not jump, and each time the student solved a puzzle it filled in a path at the bottom of the screen that let JiJi cross to the other side. The lessons they encountered were customized to fit their needs, and the teacher had immediate access to the students' progress and usage for the purpose of monitoring when she was not face-to-face with them.

Upon my arrival, the students were not in the room. Mrs. Smith said they were in their pull-out, and she had to go get them. After a few minutes, the students entered the room and went to their desks. Mrs. Smith explained that the students would be in two groups for math rotations. When they were with her they would complete an activity using links to show groups of friendly numbers up to 100. Once they assembled their groups, they were to take a picture with the iPad, upload it to *Seesaw* and include a written or recorded explanation of what friendly number they used, and explain how many groups it took to get to 100. She asked them for examples of a friendly number they had talked about earlier in the week. A few students gave numbers like: five, two, and ten. The other group would use the iPad to work on *ST Math* lessons. She asked if there were any questions, which there were none. She announced the names of those in the independent group; they stood and retrieved their iPads and headphones and found a quiet place around the room. The others came to the carpet, and left space between each other. They waited as Mrs. Smith gave them a group of colored links: manipulatives that were small and plastic with a small opening that would let the students connect them.

The independent group settled into spots away from each other and logged on to *ST Math* without any assistance. The math interventionist did not work directly with a small group of students, but rather monitored the students in the independent group. She sat at the back table next to a boy with black hair and a black t-shirt, and as the time went on, students in the

independent group would ask for help or show her their progress. She was not without a student the entire time of my observation. Later, I asked her why she sat where she did, and she said the student in the black t-shirt usually needed a lot of support when he worked independently. The independent group did not interact very often except to share with each other their success of getting JiJi across the screen.

The group on the carpet got a pile of links, and Mrs. Smith told them they were on their own to decide what friendly number they would use to create equal groups up to 100. Some of them had to take the links apart before they began to make the groups. Mrs. Smith rotated around the carpet and asked questions about what number they decided to use. One girl put her links in groups of five. She put a few groups of five together then stopped to count by fives. Another student used groups of 10. Mrs. Smith monitored and supported the students while they worked through the activity. She asked many questions when a student was off track. One student separated his links by color, but did not have equal groups of colors. Another student took the links apart and began counting individual links. A third student grouped her links in a large line; when asked, she said she was using the number 50.

As Mrs. Smith walked around and assisted the students, I noticed she did not tell them why they were incorrect. She used questions as a source of having the students problem-solve on their own. Some of the students needed a lot of support, while others needed just one question from Mrs. Smith to come to the realization of how to fix the problem. Even though it was noisy, all of the students on the carpet remained on task. They counted out loud or talked to their neighbor about their groups. The boy that organized the links by color continued to keep them in groups according to their color. After Mrs. Smith made it back around to him, she stopped to assist. He wanted to keep the links grouped by color so, through the use of

questioning, Mrs. Smith helped him recognize the friendly number of five would be easier to count. She helped him understand that he could keep most groups with the same color, but needed to have a few of the groups of five with multiple colors since the different colors were not equal. This seemed to appease him, and he continued until he completed the task.

The students used the remainder of the rotation time to count their link groups and take a picture. They uploaded the picture to *Seesaw*. Once the picture was in *Seesaw* the students added a narrative about their picture. They could either add a voice recording or type out an explanation of the friendly number they used, and how many groups of the number it took to make 100. Once Mrs. Smith received the photo, she approved it and it was available for the student and their parent to view. The first rotation lasted approximately 18 minutes before Mrs. Smith sounded chimes that indicated it was time to switch groups.

The children on the carpet immediately began to clean up their work area. They took apart their links and put them in a pile. There was one boy wearing a white t-shirt that was not finished with the links and continued. Some students attempted to help him clean up, but Mrs. Smith advised them to let him finish and only clean their area. He stayed there until he finished, which was a few minutes into the next rotation. The other students from the carpet went to the bins to get the iPads and headphones. Those in the independent group logged out of *ST Math,* placed their tablets in the bin and headed to the carpet. This transition took approximately three minutes. Once everyone was seated on the carpet, Mrs. Smith gave directions for the link activity. The boy with the white t-shirt continued to work on sorting his groups. In the middle of giving directions, Mrs. Smith looked at her *Seesaw* account and realized one boy from the first group did not upload his picture. She stopped directions and asked the boy, wearing a light blue t-shirt, why he didn't upload his picture. He said he thought he did and came over to get the

iPad to upload the picture. Mrs. Smith asked him to wait and finished giving directions to the current group, then passed out the groups of links. She gave her attention to the boy with the light blue t-shirt to help him with his picture upload. He could not remember which iPad he used, and after a few questions from Mrs. Smith, they decided to have him wait to find and upload it after the current group completed their lesson.

The group on the carpet worked in their own area and put the links in friendly number groups. At times it got noisy because they shared what they were doing with their peers. They also moved around the room and worked on different areas of the rug. At other times it was quiet because the students concentrated on the task. Some of the students used the number five, a few used the number 10, and I saw one boy use the number two. Mrs. Smith spent more time assisting this group while they counted their links, and there seemed to be a greater need to support them than the first group. All of the students were able to get their links into groups, take and upload a photo to *Seesaw*, and add a narrative to their photo within the time frame of the rotation. This rotation took approximately 21 minutes, then Mrs. Smith sounded the chimes and the students cleaned up. The group on the carpet put the links in a container and took the iPads to the bin in the front of the room. The independent group put their iPads in the bins, put their headphones in baggies with their names on them, and headed back to their seats. The total transition time for the cleanup was approximately four minutes.

While the students cleaned up, I had a chance to speak with Mrs. Smith. She told me this was the first time they added a photo from their camera roll and to narrate in *Seesaw*. She was pleased with the ease of the picture taking and narration. I asked her why she chose to use the iPad for this activity, and she told me she liked the idea of being able to go back to the photo and hear or read what the students said about the friendly number they chose. She said that

when she did this type of grouping, she did not always get to see the results from each student, so having the students document their results let her see who understood the concept. She turned her attention to the students to get them in line, and my observation ended.

Reflections from the Observations: Mrs. Smith

The observations completed in Mrs. Smith's room gave me insight into the use of iPads with primary students, but it was necessary to gain additional information that could only be provided by Mrs. Smith. I conducted a face-to-face interview once the observations were completed. There was evidence from the data that matched the perceptions Mrs. Smith had about the impact iPads had on her students, classroom, and instructional practices. This section will provide some general thoughts on what I observed during the lessons, the interactions between the teacher and students, how the students interacted with the iPads, and how the evidence matched the teacher's perceptions.

The interview with Mrs. Smith was completed in the classroom during her planning time. First, I asked Mrs. Smith if she felt the use of iPads had an impact on student learning. Her response was:

> I think so. I think it's been very helpful in independent learning, and I also think the problem-solving part of it has been a very good thing too.

Mrs. Smith felt iPads played a part in helping the students learn from each other in small, collaborative groups, which kept them more engaged in their learning. My observations supported the idea of students being engaged, both with the teacher and when they worked independently, or collaboratively, during the lesson. I made notes throughout my observations that most students were on task with minimal disruption. During both teacher-led instruction and independent work, there were only a few instances when I observed a student off-task and

disengaged from the lesson. One was when the blonde girl followed me around during observation one and another was when Mrs. Smith had to redirect a few boys during the same observation.

Mrs. Smith felt the iPads helped in creativity. She stated:

> I think the different apps that the kids have to use allow them to be more creative and think of things in a different way than they would a normal presentation, or putting something down on paper. Also, it allows the kids at this age to do the talking instead of doing the writing because some of them feel more comfortable doing that. I think it allows them to show you what they're capable of doing. I think it's made it possible to become better learners.

Mrs. Smith focused on the independent programs students used, when I asked if she thought the iPads had increased student achievement. Her response was:

> I think so. I think with some of the programs like *Smarty Ants* and with *ST Math*, I think that has helped raise their understanding a little bit more of things, and maybe even put it in a different light than what we would do in the classroom, and I do as a teacher. It definitely helps, it gives them more opportunities to go through that learning again because with young kids, the more opportunity they have to practice that skill, the better off they can become. Especially with *Smarty Ants*, that gives them another check with the phonics. They get phonics in different ways. They get it with Saxon [the county required phonics curriculum], they get it with *Smarty Ants*, and they get it through the reading program as well. They're getting at least three different ways, three times a day.

When asked about how iPads had impacted her struggling learners, she said:

> I think some kids feel more comfortable talking on a tablet or a device as opposed to talking to a person. A lot of times when I'm having them do something on *Seesaw*, I ask them to record their thoughts as well, and some of them seem to do better recording their thoughts that way than they do talking to you face to face. With the struggling learners, like I said, the more opportunity they have to do something, the better I feel that it is for them. It's not like they're practicing and making the mistakes, and nobody's correcting them. If they're practicing on Smarty Ants, they don't move past that until they understand the concept. Then with ST Math, every time they do it, they have to go back and think about what they worked for, and then add to that. I think that helps a lot too.

From my observations, I was not able to really get a sense of which students were the struggling learners. When the students worked on the iPad programs *Smarty Ants* and *ST Math*, they were on different activities using similar games, so it was not clear to me which students needed more support. The programs gave hints and supported the students as they worked through each game or puzzle. When speaking with Mrs. Smith during the observations, she told me that both *Smarty Ants* and *ST Math* have supports built in to assist the students through the lesson. She was also able to see how many times a student worked through an activity. The teacher could intervene when a student was struggling with a concept. All of this information was seen by the teacher in the reports of progress and usage.

In the next part of the interview we had a discussion about the impact iPads had on her classroom. As previously discussed, she felt iPads have not had much of an impact on her classroom management since she had always used small group instruction, even before she had iPads. She noted that in the past it had been a little easier to do more whole group, teacher-led instruction, but now the students were used to moving around and working in small groups.

iPads were used as a tool in her classroom; they were part of her centers. A few things that were different in Mrs. Smith's room, since iPads had become a daily part of her instruction were the noise factor and accountability of the students. It was noisier in her room than when she first started teaching, but it did not seem to bother her students. I made notes during my observations about the noise, and even though there were a lot of things going on, most of the noise was related to what the students were doing in the lesson. As far as accountability, Mrs. Smith said:

> In some ways, it's really good for accountability, especially when I ask them to put something on *Seesaw* because if they're sitting over here with the writing center and I'm asking them to-- Or the word work, and they're supposed to be doing something and they don't get it finished or they only get a little bit, I can see what they've put to *Seesaw* and I can say, 'Okay. Next time you're over here. I need you to add a little bit more,' or, 'Wow, you did a fantastic job doing that.'

Another area related to her classroom management was the physical space. The classroom was designed for students to be able to move around the room, use different areas of the room to work quietly or in groups, and have freedom to be comfortable when they were learning. This freedom to move around the room was observed during each lesson. I made notes about how smooth the transitions were from independent to small group work. Mrs. Smith used chimes for transitions, and when the students switched groups, they did it quietly and with automaticity. All of the expectations established through Mrs. Smith's classroom management were seen during my observations and were supported by the iPad.

The perceptions Mrs. Smith had about how iPads impacted her instructional practices were discussed. As stated previously, Mrs. Smith had always used small group instruction, but she moved from less teacher-led, whole group instruction to more student-centered, small group

rotations. For each observation, the instructional time was spent with the students either working in small groups with teacher support or completing a lesson independently. She felt it was easier to teach students about the iPad in small-group versus whole group. Her feelings were evident during each observation. When she introduced the students to the *Popplet* app, she retaught the app in each small group that she saw. The more the students used the tool, the easier it seemed for them to pick up a new app. She stated:

> I think the more that they use any app, any kind of program, then it's easier for them to adjust to something different. I was really pleased with how well they did.

Having the students work in small groups allowed Mrs. Smith to closely monitor the students and provide support where it was needed. There were several teacher-student interactions, and she scaffolded her support depending on which student was not understanding the concept. She spent the majority of the instructional time walking around the room, having conversations with individuals, and using questioning to encourage students to problem-solve. There was a lot of individual attention given to the students. Mrs. Smith commented during the third observation that there were times when she was unable to talk with some students in her small group because others may be having more difficulty, but she was not worried because she could always go to *Seesaw* later and look at the work to determine if she needed to revisit the concept with the students she did not get to talk to.

One point Mrs. Smith wanted to make during the interview was that there were always some challenges when using technology. The issue with having two different types of iPads could be a challenge. When she wanted to use an app that was not compatible with the iPad Mini, then she had to plan out how they would be able to accomplish this task using only half of the iPads in her room. Her recommendation was to plan ahead and make sure the app allowed

for more than one person to save a project. She also felt it was necessary to be flexible and understand that sometimes lessons were not successful. Her advice was to learn from a situation if it did not work, but do not be afraid to try.

The iPads were a part of Mrs. Smith's everyday instruction. She felt this was because of the support she received from the county and because of the school culture. All of the teachers in the school used iPads every day and shared their knowledge during the Sparks meetings. She was encouraged because of the impact it had on her students, classroom, and instructional practices, and planned on continuing this type of instruction. When asked for any advice she had for other teachers she stated:

> Don't be afraid to start something new and just see how it goes. At first, that was my biggest drawback. I was so worried about, 'What if I make a big mistake and do something wrong?' I would just tell them to utilize the staff development that your county is giving you. Just jump right in, don't be afraid to try something, and just remember that your kids probably know more than you do.

Mrs. Williams

The other teacher I observed at Forrest Elementary, Mrs. Williams, was a kindergarten teacher. She had her bachelor's degree and nine years of experience, including four years at Forrest Elementary. When asked about the types of professional development she was involved in to improve her skills with the iPad, she identified county level iPad professional development offerings during the summer, eight hours of Technology Based Learning (TBL), 26 hours of technology integration, training on iLife and iWork, classroom embedded training with the Apple Professional Development Specialists and county team, county level Apple training, and school level Sparks meetings.

Mrs. Williams pointed out that the professional development offered by the county was very helpful for her to become comfortable using the iPads. She especially liked that the instructors did not just talk about the iPad, but made the participants use them to create something. She called herself a hands-on learner and knew that without this portion of the training, she would not have been so eager to use the iPads with her students. As they created their projects during the PD, she realized it was not difficult and was actually fun. The hands-on delivery motivated her to try using the different apps with her students.

Mrs. Williams taught herself how to use *iMovie* by exploring the different features at home. This enjoyment carried over into her personal life, when she used the app for her son's birthday party and recorded her voice over a scary video, then streamed it on her Apple TV. She said it was a hit. She pointed this story out because she made a connection between her experiences during this process and what she wanted for her students. She stated that because she learned *iMovie* without assistance, the learning was very deep and that knowledge would never go away. She hoped the same would happen with her students.

Mrs. Williams spoke of the monthly faculty Sparks meetings. She said when the school first opened the Sparks meetings were weekly, but as the teachers gained more experiences, these meetings were held monthly unless someone learned about something exciting they wanted to share with everyone. The teachers became more familiar with the apps, so they used this time to discuss how to use a new app with different age groups. Since she was a kindergarten teacher and her students were learning the basics about the iPad, her goal for these meetings was to learn about the types of projects the older students were doing. She wanted to understand how to prepare her students for what they needed to know going forward: taking pictures, uploading pictures, and teaching the students about the different features.

Specific to Mrs. Williams's pedagogical beliefs and instructional practices, she stated that there was a definite change in the attention span of her students in recent years. She believed television had an impact on the students' attention span because cartoons and commercials had a lot going on, the pictures change every four seconds and this affected how students focused. The apps she used during instruction had changed to adapt to this because they had become interactive and visually appealing.

Mrs. Williams felt her instructional practices had not changed very much since she started teaching. She had always been the type of teacher to integrate technology into her lessons, and she used small group instruction as part of her daily routine. Early in her career, she had desktop computers that she used during instruction. Her best advice for any instructional situation with students this age was to not assume they know what you expect from them. A teacher needed to be verbal and concise when giving directions and classroom and instructional expectations. Her philosophy about classroom management and instructional practices was the same as it had always been, the differences are the tools being used. She commented:

> The rules stay the same: sound task, stay safe, be kind, period. Anything you can break falls under one of those, I promise.

Mrs. Williams was motivated to include iPads in her instruction by colleagues and her own interest in technology. She felt the biggest advantage of integrating iPads was that they allowed for every student to be engaged and actively learning while she worked one-on-one or in small groups. This attention to her students helped to fill in the gaps of learning for all, and she was comfortable with what was happening away from her because of the programs they used during the independent time. More specifics about each observation and details of the interview will follow.

The Classroom: Mrs. Williams

Mrs. Williams' classroom was similar to Mrs. Smith's in the design. The room was large with high ceilings and large windows. There was an outside door leading to a play area facing the woods. There was a bathroom and sink with countertops and cabinets for storage. Next to the bathroom door was a storage closet that had ample shelving for supplies. The teacher's desk and classroom aide's desk were located to the right of the hallway entrance. There were other smaller tables around the room, and a kidney-shaped table for small group instruction. The walls had a few reading and math themed posters, but were bare towards the top. There were several built-in cabinets around the room that had student work displayed on the front, with some motivational pictures, children's books, and stuffed animals on top.

There was a built-in sitting area in front of the windows where the students could choose to read or work with the iPads. There were five rectangular tables for students to sit, that had six metal student chairs. All together there were three areas separated by bookshelves, with a rug and bean bag chairs, for students to work or play. The bookshelves held supplies for the play areas such as puzzles, play kitchen supplies, blocks, Legos, and more. One of the areas was bigger to accommodate the whole class and had an adult-sized rocking chair and easel that held big books. In the front of the room was an area for small or whole group work with a rug that had a depiction of a town and roadway the students could use during imaginary play.

When asked about the physical space in her classroom, Mrs. Williams commented about the purposeful design of the room that allowed the students to go anywhere for both group work and independent work. The technology available in the room included: two mounted TVs both having an Apple TV, a document camera, teacher Mac Book, an iPad charging station, 16 student iPads, one teacher iPad, and two iPads she brought from her personal collection. She

said she was not able to get all of the programs downloaded onto the personal iPads, but most of them were on there. Originally, she was one-to-one, but three of her class iPads broke and had not been replaced.

Observation 1: Mrs. Williams

The first time I completed an observation in Mrs. Williams' classroom it was in the morning on a sunny Tuesday. I observed during the reading block and was able to see students as they worked independently on iPads, while two teachers and a classroom aide worked with small groups on phonics and sight word activities. There was the classroom teacher Mrs. Williams, the reading interventionist, and the kindergarten classroom aide. The classroom teacher and the reading interventionist completed a phonics activity, while the classroom aide played a sight word bingo game with her group. The independent group worked on the iPads using *Smarty Ants*.

The class period consisted of only one center time, and when I spoke with Mrs. Williams after the observation, I inquired about her small reading groups. She told me she rotated the class each day so each group worked with an adult three out of the four days she had small group rotations. Daily, the students received new instruction in small groups with the two teachers, and a review of a learned skill with the classroom aide. They had one day during the week for independent work. She completed whole group instruction at a different time of day. This was not the only time they used the *Smarty Ants* program; she gave them other opportunities during the day. Often, her students chose *Smarty Ants* as an option during free time, and she encouraged those that did not stay on task during the independent work time to complete activities during morning work when they first came in the classroom. A teacher dashboard in the program provided reports on usage, current data, and information on each

student's progress. Mrs. Williams spoke highly of the program because it let her focus on small group instruction, working on specific skills, with little interruption. The data provided to her helped to ensure the other students remained on task and worked on needed skills. She explained that she was very comfortable because the independent group worked without wasted time on menial tasks.

When I walked in the room the students were not present. They were outside in the play area. I met Mrs. Williams at the outside door as she walked in, and she told me they just finished up some movement time. We spoke for a minute as she prepared for the reading groups. She was able to see the students through the windows, and the outside door remained open. The reading interventionist and classroom aide monitored the students as Mrs. Williams turned on the iPads, took out the headphones, and laid them at the student tables. Once the iPads were in place, she went to the door, raised her arm and the students immediately began to line up. Once inside they were told to get drinks and find a spot on the back carpet near the rocking chair. This transition took approximately four minutes.

Once on the carpet, I counted 19 students (10 boys and nine girls). Mrs. Williams told the students what they were expected to do for the reading group, reviewed the rules for small group time, announced who was in each group, asked if there were any questions, and then dismissed them from the carpet. The reading interventionist sat at the kidney-shaped table with four students, the teacher sat at a student table with four students, and the classroom aide sat at a student table with three students. The remaining eight students found iPads at their seats, picked them up and found a spot around the room to work independently. It took approximately two minutes for the students to get settled in their groups.

Throughout the observation, I remained with the independent group so I could see what they did with *Smarty Ants*. Each of the students had an iPad and headphones. Three students went to the sitting area in front of the windows, three found a spot on the alphabet rug near the sitting area, one sat on the child-sized rocking chair next to the adult-sized rocking chair, and one student found a spot on a bean bag chair in another part of the room near the play kitchen. I noted that the students did not sit next to one another. They spread out without a reminder. Each student, with the exception of one, accessed *Smarty Ants*. They immediately logged in and began working on the program. The student that did not log in to *Smarty Ants* got on the *ST Math* program. I sat near a little girl with brown hair, and she told me the girl that logged into *ST Math* was new and the teacher had not added her to the class. The students moved around the room during independent work time, but remained on the side of the room away from the other small groups. Most of the time they got up only to show another student a correct answer or what they bought in the *Smarty Ants* store.

Throughout the time I observed, there was not a lot of interaction between the students because it was independent work and the students had on headphones. The interactions between the students in this group consisted of showing each other the rewards they earned, talking about the changes they made to their avatar, and showing their peers a trophy if they earned one. These were conversations similar to the ones I heard when I observed in Mrs. Smith's room.

I took time to sit near each of the students so I could get a better look at what they did on the program. I made similar reflections as I did during the observations in Mrs. Smith's room; each child was doing something different. A girl with mid-length blonde hair bought something in the store and clapped, then showed another student; a boy with short brown curly hair and dark glasses was also in the store, and he bought clothes for his avatar. He turned the iPad so

another boy in the reading area saw his choice. A boy with brown hair played a race game with "wh" words. Another boy with blonde hair played the dash game with "sh" words. The program would say a word, and the player was to jump on a bike with that word. A girl with blonde hair played a car racing game to practice short vowel words. The program would show a word with a letter missing, and the player decided which letter fit in the missing part. A boy with brown hair played a game where he restructured sentences with "dge" words by putting the words in the correct order. The final student in this group, a boy with short, curly black hair, played a bike race game where he practiced sight words.

Approximately 15 minutes into the session, Mrs. Williams announced to the students on iPads that they could choose to go to *Epic* if they wanted. *Epic* was a free, online program that provided several hundred different books, videos, and quizzes. The books came in all genres with different levels to accommodate all levels of readers. The teacher created an account, added her students, and monitored the number of books the students read, the types of books they chose, and how they performed on the quizzes. Out of the eight students on iPads, three of them chose to switch to *Epic*.

A timer sounded approximately 23 minutes into the rotation. Mrs. Williams got the students' attention and told them it was time to clean up. She asked the students to put away the materials and find their seats. The students who worked at the tables assisted the teachers in clearing them. The iPad group put their iPads and headphones into a bin that was on a wooden shelf. I noted the iPad bin was on a short bookshelf that was the correct height for the students. There was noise and movement in the room as the students complied with the directions. The total time for this transition was approximately four minutes that ended when all of the students were at their seats with their heads on the table. As I gathered my belongings to leave, I heard

Mrs. Williams tell the students it was whole group math time, then she called them to the rug in front of the TV. I noticed she displayed her iPad connected to the Apple TV, and it had math problems on the screen. My observation ended as the whole group math lesson began.

Observation 2: Mrs. Williams

I observed Mrs. Williams for a second time, mid-morning on a Wednesday. The instructional time was reading and was conducted in small groups. Some students worked independently on iPads while two teachers and a classroom aide worked with groups of four or five on sight word and word search activities. Three adults and18 students, nine boys and nine girls, were present. The classroom teacher led a sight word bingo game, the reading interventionist led a word search emphasizing letter recognition, while the classroom aide worked on sight words with her group. An independent group of students worked on the iPads with a choice of three activities: *Smarty Ants*, *ABC Mouse*, or *Epic*. There was an additional independent art group that worked with pastels to draw planets.

When I entered the room the students were seated on the rug in the back near the teacher's rocking chair. Mrs. Williams was seated in the chair and gave directions for the different stations and reviewed the rules for each station. The group that used iPads was told they could get on *Smarty Ants*, *Epic*, or *ABC Mouse*, but they were not to get on videos since videos were for playtime only. The group that worked with the pastels was told they were only allowed one piece of black paper, they had to share if another student needed a color they had, and they were to be very careful not to get the pastels on the floor because they were messy and hard to clean up. Three students were disbursed to the blue table to work with the classroom teacher, three students were told to go to the back table to work with the reading interventionist, three students were told to go to the small brown table to work with the classroom aid, four

students went to the pastel station at a student table, and the last five students were the independent iPad group. The time it took for the teacher directions and the students to transition to the groups was approximately four minutes.

My focus for this observation was on the students that used iPads. The five students in the iPad group found spots in the area of the alphabet rug, play areas, and the window seat, but did not sit next to each other. As they logged in, I walked around to see which app choice they made. Two students chose *ABC Mouse*, two students chose *Epic*, and one student logged in to *Smarty Ants*. I sat on the window seat between two boys. One used the *ABC Mouse* app, and the other logged in to *Epic*. Before they began I was able to have a short conversation with them. I asked them why they chose the program they did. The boy on *ABC Mouse* said it was fun, and he liked getting tickets to spend on his avatar. The boy that chose *Epic* said he really liked animals, and he could look at books that had animals. I asked him if he could read the books, and he said that some are "read to me" books. I walked around to the other students. On the rug was a girl that was on *ABC Mouse*. She worked on the sound "aw" that had different videos and games to play for practice. She finished the activity she was on, then showed me that she earned more tickets. She said, "I am moving on my learning path." I went over to a boy, who was also on the rug. He was on *Smarty Ants* when I first walked over but logged out and went to *Epic*. I watched as he logged in and saw him use his voice to text feature to find books written in Spanish. He spent a few minutes looking through them. I asked him if he could read them or if they were read to him. He said only the books with green are "read to me" books. Although he could not read the book, he spent a few minutes carefully looking at the pictures on each page. When he finished, he told me he really liked looking at books in Spanish. After the observation I spoke with Mrs. Williams about *Epic*. She told me she really liked *Epic,* and her students did

too. This app was free to educators and allowed teachers to create a class to monitor. There was also an option to create collections of books for the class or individual students, to create quizzes for the books assigned, and for students to advance levels and earn badges to help motivate them to read. The teacher could give access so parents could use the program at home to see what their child accomplished.

Once the students from the iPad group logged into the program, I noticed they all were engaged in the choices they made. There was only one instance when the teacher had to address students from this group. Two of the boys who sat near the window noticed another class outside on the playground. They discussed the fact that it was early for a class to be outside. Mrs. Williams noticed them from across the room and reminded them they should pay attention to their iPads and not look outside. I was able to scan the room to see what the rest of the class was doing. The groups with the adults were all engaged in tasks at their tables. The group at the art table was noisy and not on task. One boy ran to the area of the iPad group to look over the shoulder of a girl that was on *ABC Mouse*. He made comments about her iPad, then ran back to the pastel station. When he went back to the art station he noticed some pastels had fallen to the ground. He left the area again to get paper towels to clean up. Mrs. Williams had to stop her group to ask what he was doing. He yelled across the room to tell her he was cleaning the floor. In fact, he made a bigger mess by spreading around the pastels even more. Mrs. Williams thanked him for helping and asked him to leave it and get back to making the planet. The majority of the noise came from the art group. They were not talking about what they were doing. A few talked about the mess on the floor while the others talked about one of the girl's shirts. The teacher groups talked, but their comments were associated with the activity they worked on. Comments from the teacher groups included: "I found it." or "I can read that word."

The room remained noisy during the session, and I continued to move around the rug area to watch the students on the iPads. When there were about seven minutes left in the class, I realized it was fairly quiet. The teachers and students from the tables still talked, but when I looked up I noticed the students from the art station had finished their work and gotten iPads. They made their way to the rug, found a spot away from the other children, and logged in to *Epic*. I noted that the only discussions from the same group were about the books they read. The class stayed this way until a timer sounded. The teachers at the table completed what they were doing, and the students who had iPads continued to work. After a few minutes, the teachers got up from the tables and began to put away materials. The students with iPads noticed the movement from the adults and, without a teacher telling them, put away their iPads and headphones. Mrs. Williams told them to line up. The total time for transition was approximately three minutes, and the total time for the small group session was approximately 26 minutes.

Observation 3: Mrs. Williams

My final observation with Mrs. Williams was on a Thursday afternoon. I visited during the math block and was able to observe students as they used the iPad independently while other students worked in small groups with the teacher and math interventionist. There were three adults present, the teacher, math interventionist, and classroom aide, and 19 students (10 boys and nine girls). Most of the students using the iPads were on *ST Math,* with the exception of two girls. The other students were divided into two smaller groups that worked at the tables with the teacher and math interventionist.

When I entered Mrs. Williams's room, the students had already separated into groups. There were three students at the small brown table with the classroom aide, four students with the math interventionist at the kidney-shaped table, four students with Mrs. Williams at one of

the classroom tables, two girls in front of the built-in seat near the window and the remaining six students were scattered throughout the room sitting on bean bag chairs, pillows, blankets, small wooden chairs, and the student tables not being used by an adult.

Mrs. Williams stood by the student table, monitored the action of the independent group and waited on them to get settled. The students in her group sat with dry erase markers and white slates. During the session, they worked on counting up with larger numbers and place value to the tens place. The four students with the math interventionist worked on addition. The three students with the classroom aide had iPads logged in to *ST Math*. The aide monitored the students, kept them focused, and supported them when they had difficulty with the puzzles. Throughout the session I noted that she did not provide answers; rather she used questions to help them discover the answers on their own. The two girls in front of the window had Legos, which I later found out was the result of them being finished with *ST Math*. They completed the kindergarten level, including the challenge activities, and the program would not let them move on. Mrs. Williams provided them with other hands-on activities. The remaining students worked independently on *ST Math*.

To gather information on the independent iPad group, I watched the students for a few minutes at a time and moved from student to student. I sat next to the students, so I could see what activities they worked on. A little girl with short brown hair that I sat next to attempted to have a conversation with me, so I encouraged her to get back to work. I decided to go to the next student, but she followed me. I attempted several times to get her back on task, but she continued this for a few minutes. Finally, I sat next to a boy on the rug in a position that would not allow her to sit down, so she left and went back to her original seat.

The boy I sat next to seemed to be having trouble with the puzzle he was on. He asked another girl sitting closest to him if she could help him. The girl came over, looked at his screen, walked over to the block area and grabbed three small plastic bowls with small colored blocks about the size of marshmallows. She brought them over, placed them in front of him and walked away, not saying a word. The boy did not ask questions but dumped the blocks and set the bowls next to each other. The problem on *ST Math* was a picture of these small alien-looking creatures stacked on top of each other in three columns. The first column had two purple creatures, the second column had a plus sign next to a paint can with a paint brush sitting in it and two stacks of the same creature in white with 10 in each stack, and the third column had an equal sign next to a stack of three creatures painted blue. He was supposed to solve the problem by painting one creature in the middle column to find the missing addend. The boy attempted to talk himself through the problem, but did not recognize that he was supposed to figure out how many of the creatures to paint in the second column. I tried to help him by suggesting he look at the final column and count the total number of creatures, then place that number of blocks in the third bowl. With a lot of support from me, he figured out the answer to be one. After he entered the correct answer, JiJi the Penguin took a few steps across the screen.

There were more problems like the first, and I helped the boy, attempting to lessen my support with each question. I ended up sitting with this boy for approximately 10 minutes before I moved on to the next student. I noted that this boy was unable to figure out this concept without my support, even if it was just a hint. Later, I spoke with Mrs. Williams about *ST Math* and asked about how she could tell if a student struggled with a concept. She said the teacher reports show the number of times a student attempted an activity. She could see if they needed support from these reports.

As I walked around, I saw the students worked on adding and subtracting, place value, estimating the location of two digit numbers using a number line, and different games with shapes. With the exception of the boy I sat with, and the three students at the table with the aide, the other students worked through the puzzles without asking questions of an adult. I saw several students get up and walk over to another to share how they did. There were several comments made by the students that told me they enjoyed themselves. Comments like: "Yes, I got 100!", "I've been on gold two times today!", or "Look, I'm on a new level!". I overheard a conversation between Mrs. Williams and the little girl that followed me earlier. Mrs. Williams addressed the fact that she only completed four puzzles in 34 minutes and would need to make up some of the work during morning work the next time. Other students announced they finished 76, 54, or 56 puzzles. Mrs. Williams told the girl she would work on *ST Math* in the morning and during free time, sitting near an adult to see if she needed help.

After approximately 34 minutes Mrs. Williams announced it was time to put things away and get their book bags. I walked around to help pick up blocks, Legos, and whatever else was on the floor. I was able to speak briefly to Mrs. Williams at this time to let her know that I was surprised about the length of time the students worked, since they were so young. She commented that they really liked *ST Math,* and she rarely had a problem keeping them on task. The transition from small groups to lining up took approximately five minutes, and I ended my observation.

Reflections from the Observations: Mrs. Williams

After completing my observations in Mrs. Williams' room I was eager to speak with her about her perceptions of iPads, so I conducted a face-to-face interview during her planning. There were instances where evidence from the observations matched her perceptions about the

impact iPads had on her students, classroom, and instructional practices. The following section will provide some general thoughts on what I observed during the lessons, the interactions between the teachers and students, how the students interacted with the iPads, and how the evidence matched the teacher's perceptions.

First, I asked Mrs. Williams if she felt iPads had an impact on student learning. Her response was:

> Yes. I think it's a positive one, not a negative like a lot of people think. Okay, they can create on it. My kids are maybe not there yet, but they can. I have to differentiate all my instruction. I have to know where each kid is at all times. I have to make sure that if I get them in another area so that I can be with the small group, that they're still learning and something constructive is being done. A good way to do that for me is through these programs. They have to problem-solve. Then they have to go through a whole series of puzzles where they can figure out different problems. They're learning. I don't have to sit here and say, 'Are they learning?' If they don't get enough puzzles then I know they weren't. If they're getting 60, 70 puzzles in 30 minutes, then I know they were; the whole time they were away from any adults. It's important for me, because my time is not wasted.

Mrs. Williams felt the iPad played a part in helping all students because it allowed her to have more face-to-face time with the students in small groups and to pinpoint exact needs. She also shared that typically each year she had about 80% of her students in mastery for both reading and math. In the last few years this had improved. This year she had all but five of her students above mastery in both reading and math. The five who were not above mastery were at mastery. This was the first year she had this happen, and she attributed this success to the

programs from the iPads. Without them she would not be able to work so closely with small groups, while others were independently learning, problem solving, or getting double and triple doses of phonics and reading instruction.

My observations supported that students were engaged in the activities, both with the teacher and when they worked independently. During both teacher-led instruction and independent work, there were only a few instances where I observed a student off-task and disengaged from the lesson. One was when the two boys during observation two were distracted by the class outside, and the other was when the girl in observation three followed me around for a few minutes instead of working on *ST Math*. Other than that, my notes showed that the students using the iPads were focused and remained on task.

Mrs. Williams did not feel her students were where they needed to be as far as the creative side of things. There was still room to grow in that area. Her main objective was to teach the students the basics of the iPad, to help as they advanced in grades, by completing simple tasks such as uploading pictures, maneuvering through apps, and creating presentations. When speaking on this topic, Mrs. Williams shared a conversation she had with some of her colleagues. They suggested that she try to become more of a facilitator for her students, allowing them to be the creative ones instead of her being the driving force of creativity. She admitted this was difficult for her and she was working on this.

When I asked Mrs. Williams if she thought the iPads resulted in increased student achievement, her response was:

> I do see a change. Nine years ago when I started I had three laptops, and I could go on the Starfall program which isn't- it's more exploratory of the alphabet and they had to stay on that for 30 minutes. Yes, they were still learning, but it wasn't driven like these

programs from the iPads are. When they were moved to iPads and they started making programs that test the kid when they got there to see where they were and learned how to fill in all the gaps and then started going through all these puzzles and programs as a step process to their learning, their achievement went way up here. Some of them, especially if they have a behavior problem, they learn a lot better when the iPad's trying to tell them then when I'm trying to tell them. It's a combat when I'm trying to explain something. They're automatically defensive. They don't want to hear what I have to say. The iPad, they're like, 'Oh well, I get a ticket or I get a coin or I get-- Look at all these things I'm getting.' It's just a machine, so they do it. There's no confrontation with their learning.

When asked about how iPads have impacted her struggling learners or higher achievers, she gave an example of one of her higher achieving students:

I had a kid coming in who could already read way beyond- she was already reading chapter books when she got here. I was like, 'What am I going to do with this child?' I'm teaching the ABCs here. I love *Epic* for that reason. She had already almost mastered *Smarty Ants* because in pre-school they put her in the program, and she had already run through it. *ABC Mouse* wouldn't fit for her because it is basics. I'm just like, 'Where am I going with this?' When I get *Epic* I can say, 'Why don't you pull out your favorite chapter books, start reading it?' Every time she read a book, she can get a badge. Maybe I'm not drilling her exactly on brand new skills. I don't really have the exact time for that because I'm so dedicated, like the strugglers and the middle kids, but she was being driven in her own way.

Mrs. Williams also shared a story of one student that was believed to be very low. He was on the Autism spectrum. In preschool and for part of kindergarten he did not speak or participate in academics. He had poor communication skills, and the teachers, herself included, thought he was very low. She started using the iPad with him. He could easily log in, remembered his passwords, and worked through the activities. He would also leave the programs and get on things he wasn't supposed to. So Mrs. Williams had to lock him in a program, which was something he was not happy about, but she felt more confident that he knew more than he had exhibited. In fact, he had been getting a zero on all of his individual assessments because all he would do was repeat the teacher, but recently he scored close to mastery. She said:

> I think that iPads have a lot to do with it because I know they have programs and resources [when he gets his Autism services outside the classroom]. I'm not sure what they are, but he's been on them because I walked down there one time and saw him working on them. They're talking to him, and he's moving things, and it's more hands-on and hearing and visuals. They have a special program down there for that. He has come a long way when he's with the rest of the class.

During the third observation it was obvious to me which students were struggling because of the support that was provided by the classroom aide, but I did not get a sense that the other students were aware. When the students worked on the iPad programs, *Smarty Ants* and *ST Math*, they all were on different activities using similar games, so it was not clear to me which students needed more support with the exception of the boy I helped during the last observation. Mrs. Williams also pointed out, just as Mrs. Smith did, that the programs gave hints and supported the students as they worked through each game or puzzle. As discussed

earlier, she was also able to see how many times a student worked through an activity. This information could be seen immediately by the teacher and then he/she could intervene when a student struggled with a concept.

In the next part of the interview we discussed the impact iPads had on her classroom. As previously discussed, Mrs. Williams felt iPads had not impacted her classroom management or instructional practices since she had always incorporated technology into her instruction, even before she had iPads. She also had good classroom management and organizational skills, which was needed for a classroom that used small group instruction. She stated:

> Something else that has happened is when I've finished with the work, instead of me making extra copies for extra work for them to do, and they're just slamming through it all, and everything looks sloppy, the iPads give them a place to go and they always have a task to do. It is quiet, and it is engaged, and I don't have to make copies. There's nothing extra I have to do. It's something the whole class knows to just keep moving. Like, 'If you're already finished, this is where you move to. You don't have to come to me. I don't have to make extra plans. This is what you're doing.' Just the routine and the transition. Everything's a lot smoother because of it.

The other questions related to her classroom were about the physical space. Mrs. Williams said the way the school was developed was why she had the opportunity to allow for choice seating. The students moved wherever they wanted during small group instruction as long as there was a space for them, and they were not too close to another student. Because her students got to pick where they wanted to sit there were fewer behavior issues. This freedom to move around the room was observed during each lesson. The students seamlessly moved around the room and chose spots away from one another. On only a few occasions was it necessary to

separate students. Mrs. Williams used a timer for transitions and rarely needed to announce it was time to clean up. Most of the students automatically transitioned from one activity to another when the timer sounded. The observations provided evidence of Mrs. Williams's expectations and classroom management.

Technology had always been a part of Mrs. Williams's nine years of teaching and was a part of her everyday instruction. She felt the reason was the atmosphere of the school, since everybody was on board with technology, and they were well-equipped with the tools they needed. She also mentioned the support she received from the county. All of the teachers in the school used iPads every day and shared their knowledge during the Sparks meetings. She was encouraged because her students looked forward to using the iPad in creative ways as they advanced through Forrest Elementary. When asked for any advice she had for other teachers, she stated:

> Don't be afraid to let your students explore the technology, and don't you be afraid to make a mistake. Also, time management is more efficient. More engagement is more efficient. They [the students] are going to meet all these high level standards that you couldn't get them all to because there's just not enough time in the day? They [iPads] reach all your kids at the level they are at, if you do it right. Because I don't even know how to teach right now and be as successful as I am without them. At this point they are like my best friends. You know what I mean?

Forrest Elementary Principal: Mrs. Tanner

An interview was conducted with the principal of Forrest Elementary, Mrs. Tanner, in her office. The purpose of the interview was to gain insight into the perspective of the school

leader. The questions asked were similar to those asked of the teachers, to gain a comparison of perceptions about the impact iPads had on the students, classrooms, and the school leadership.

The first question addressed whether or not Mrs. Tanner had seen a change in student learning compared to before iPads were implemented. Her response was:

> I see a change when they are involved in those higher levels; when you get into the creation apps, and the kids are applying what they've learned. That's when I see the change in student learning. When they are [all] just put on an app, I don't see it because they get bored, and they are left more independent [with no teacher interaction]. They don't get as much out of it.

When Mrs. Tanner was asked about the impact, if any, iPads had on struggling learners, special education students, or even gifted, she said:

> I do see it with our special needs students. For example, we have one student in first grade, he's very intelligent, but he's not able to express his thoughts with written language or even expressive language.

Mrs. Tanner described how the teachers in the early grades did not think he was at grade level intellectually because of his lack of expression. They did not know what he was capable of. He proved he knew more than many thought because when he used the iPad for the reading and math online programs, he had success completing his current grade level and continuing on to the next level. It was a different way for him to express himself, and he showed the teachers what he was capable of doing.

Mrs. Tanner felt iPads had an impact on another student who had difficulty with his behavior in the classroom:

> We had another student that had a lot of behavior problems, but when he was able to create using the iBook, he's the one that figured out how to animate the pictures. So, he became the leader in the classroom. He's going around teaching all the other students in the classroom how to do it.

Mrs. Tanner was asked for some examples of iPad activities that stood out to her. She gave two examples: when students used iBooks to show what they learned, and when a teacher used the iPad to create an independent station for her students during small group rotations. The second grade was learning about West Virginia history. The teacher started with a pretest on the iPad to determine what the students already knew. They researched topics of West Virginia history, created an iBook, and then used the pretest as a posttest to see how much they learned. Mrs. Tanner said:

> She [the teacher] could immediately see what they learned. It began with a standard, that's what I liked. They're expressing what they learned through creating an iBook.

The other example was about one of the teachers taking pictures of the readers her students used during reading stations and recording her voice reading the story. She stopped every few pages to have the students complete a task that showed they read the story. The students used paper to record their responses, which they turned in after the station. The paper let the teacher see the students' work even though they worked independently, while the teacher was able to work with a small group. Mrs. Tanner said:

> It was constructive. They were able to get something out of it, and she [the teacher] could tell because every few pages she would give them a little assessment that they would have to complete.

Mrs. Tanner pointed out the conversations that students had when they were involved in iPad activities, especially when they used creative apps, were filled with excitement. She said:

> They want to share with each other, and they want to share with me. They say, 'Hey look what I'm doing.' And, when I ask they can tell me in detail what they've learned. They are more engaged.

She gave another example of student engagement when she spoke of a visit this year from the Apple Professional Development Specialist. He worked with individual teachers and students as they learned creative apps to complete a PBL. She and the teachers noticed the students' behavior was vastly different when the specialist was there working with them and believed it was because they were so much more engaged. She explained:

> It's just more sharing, and more learning from each other [that] I see when they are able to create using the iPad. Not just using it as an app, but I see they are getting more out of it when they are able to create, show what they learned through the creation apps.

When asked if iPads had impacted student achievement, Mrs. Tanner did not believe this to be true. She stated:

> To be honest, I don't at this point because it's not pervasive. We're not using it effectively yet. It could have an impact, if you could get everybody there.

In the next questions Mrs. Tanner was asked whether she felt the inclusion of iPads had changed her school culture. She said that the school was developed as a technology school, so the culture and availability of technology had been a part of the school since it opened. In fact, the teachers had iPads before the school opened, so they had some experience when they came here. She did feel that the iPads had provided more opportunity for the teachers to do small group instruction instead of focusing on whole group.

As far as the overall culture of the school, Mrs. Tanner stated:

> It hasn't reached what it should. It starts with me [the leader of the school]. We had a technologist that was very strong, but she moved. We've had a lot of in and out [with the staff] these past couple of years that has affected our progress. We were getting to that, then, I don't know. It starts with the top down.

When the question came up about supports or hindrances when using iPads, Mrs. Tanner said typically they do not have issues with the infrastructure because care was taken when the school was built that included enough bandwidth and equipment for the population. She felt one hindrance was that some teachers used the iPads too much, when it may not be effective. Her belief was that iPads should be used for creation and cooperative learning activities. It was not effective when the teacher was at her desk, not with students, and all of the students were on iPads.

She also identified supports, including:

> Helping with small groups and pushing kids at their own level. Kids are able to work at their own pace. Kids are ready to move ahead and they [iPads] can help you do that; to differentiate [instruction]. It has helped with students showing their learning in different ways, instead of [just] a poster [or something]; with the creation it has helped.

When asked about the classroom set-up and how the teachers met the county curriculum requirements, she said:

> Teachers have to teach the standards. The iPad is just the final product to show what they learned. The classrooms have not changed because they were designed based on what a technology driven school should look like. It is no different because the school was developed for this type of learning. That is how the building was built.

As far as classroom management, Mrs. Tanner believed iPads had provided better organization for both the teacher and student. The assignments were submitted, automatically received, and feedback was immediate. Communication had improved because of the learning management system in place. The small groups allowed for the students to stay more engaged and allowed for less distraction. More attention from the teachers was given to the students sitting in front of them.

I asked her about her pedagogical beliefs, the types of professional development (PD) opportunities she offered her staff, and her style of overseeing and monitoring the implementation of iPads.

In regards to her pedagogical beliefs, I asked if the iPads had changed how students learn. She said:

> Yes. I think that's the struggle. We as teachers have to catch up with that. As far as helping them, they can't sit still with a teacher up there just preaching at them. The students need to be doing; their minds are so active because of TV, phones, and iPads. So, we do have to find those creative ways to use the iPads. The flipped classroom, learning ahead of time, then they can come in and do more hands-on.

When Mrs. Tanner had conversations with her staff regarding their instructional practices when using iPads, she always stressed beginning with the standard. She said:

> You've got to start with the standard. If they are writing a paper, don't just start with the iPad. You still need your graphic organizers. The iPad is not everything; it's not going to teach them everything. So, the teaching has to take place, those conferences have to take place, and then your final project they can turn it into an iBook, but you still need to work with them. It's more about the creative part then just sticking them on iPads.

She believed the professional development opportunity the teachers participated in this year that had the most impact was the embedded PD with the Apple specialist. The process of him planning with the teachers, working side-by-side with each teacher, and being there to support while they were the ones instructing was most beneficial. She said:

> He lesson-planned with them. They did not start with the technology, they started with the standard and then the end in mind. [They used] backward planning. They knew in the end they wanted to use the technology. This is how they wanted the kids to show what they learned. How are we going to get them there? Sometimes it didn't even include the iPad. There is still the teaching. It's a process. The teachers struggled with it, but in the end, what the kids were able to do [was great]. It's not about the tool alone; it's about the standard and the teaching. It leads to a great product in the end.

The teachers at Forrest also took part in Sparks training. This gave teachers in the building, and some outside of the building a chance to teach others about something they used in the classroom with success. This training was helpful because they learned from another teacher.

Our conversation ended when I asked her if she had any words of advice for a principal that was just starting out on this journey. Her advice was this:

> The first thing is getting it in the hands of the teachers to help them feel very comfortable with it. Don't be afraid, and you don't want your teachers to be afraid because they feel like the kids may know more than them. That's a good thing. The kids aren't afraid, so you don't have to know everything. Students aren't afraid to play and learn and figure it out as they go. Just don't be afraid to try new things. It's a process.

LINCOLN ELEMENTARY

Lincoln Elementary is a small school located in a low-income rural setting. To get to the school, one must travel on a two lane, winding road up a rising valley region that many in the area refer to as a hollow. It would not be unusual to pass big coal trucks on the way to the school, even though it is set in a residential area surrounded by small homes and trailers.

According to the West Virginia Department of Education (2018), the school's enrollment declined since 2010 from approximately 220 to 150 students. The school enrollment was 100% White. The low SES percentage for the 2017-2018 school year was approximately 70%, and the percentage of students receiving special education services was approximately 15%.

According to the school's website, the mission of Lincoln Elementary was to provide the life skills and academic success students need to have success. Their vision to accomplish this included using technology and project-based learning (PBL) activities to experience real-world situations, while using collaboration and communication skills to solve these problems. The instructional focus encouraged by the principal and accepted by the staff began with the West Virginia College and Career Readiness Standards (WVCCRS). The expectation was for teachers to develop lessons around the standards, using iPads as a tool to support these lessons, along with county supplied reading and math online curriculum as supplements. The school received state-level grants to become one-to-one with iPads for the 2017-2018 school year. As part of the requirements for the grant, they developed an area in the school that encouraged STEM, or Science, Technology, Engineering, and Math activities. This space was called the Makerspace area. Teachers were required to take classes to the Makerspace at least once a week.

The school had a technology committee that developed a school-wide technology plan, which was unique to this school, compared to the other schools where I observed. The technology committee was made up of the principal, school technologist, and teachers from both the primary and intermediate levels. The plan assigned one iPad app/program to each grade level, so the students in that particular grade mastered the assigned iPad app/program. For example, the kindergarten teachers were responsible for teaching students how to use *Keynote*, the second grade teachers had the responsibility of teaching students how to use *Seesaw*, and the fifth grade teachers were responsible for showing students how to use the learning management system called *Schoology*. The technology team had experience with different apps, and they assigned them according to the age and skill level of the students. *Keynote* can be learned by young children because of its user-friendly design. *Schoology* was a more complex learning management system, and was used in middle school, so the fifth graders needed to master it by the end of fifth grade, and be ready to use it with ease by the time they entered middle school. This did not mean that the teachers only used the assigned app; many used several different apps, but they made sure they gave their students enough exposure to the assigned app that the students had it mastered by the end of the year. All teachers were aware of which app each grade level was assigned, according to the technology plan. This knowledge made it easier for the next teacher because they knew what the students had mastered, and could use those tools without having to teach the fundamentals of the app. This plan allowed the students to become very comfortable with several available iPad tools.

Another expectation for the teachers was to engage students in PBL activities. Each class was presented with a problem or a complex question to answer. The students used technology to complete research, worked independently or in small groups, and created

presentations or projects that demonstrated how they could solve the problem. They presented their findings in a culminating activity and shared with other classes, parents, or community members. As stated in chapter two, the use of a PBL helped students develop core knowledge with the support of collaboration, and learn how to use knowledge to solve problems. This development was often accomplished with the use of digital tools that allow students to create high quality projects. Once again, these projects at Lincoln Elementary all began with the grade level state standards in mind.

Mrs. White

The first teacher I observed at Lincoln Elementary was Mrs. White. She was a fourth grade teacher with eight years of teaching experience. She had a master's degree in elementary education. When asked about the types of professional development she received to improve her skills with the iPad, she indicated being involved in county and school level Professional Learning Communities (PLCs).

The county scheduled PLCs a few times a year. Each school sent three representatives and the principal to attend the sessions. The PLC leaders took what they learned and returned to the school to present the information to the rest of the staff. This year the county PLC focused on Project-Based Learning (PBL), giving the PLC school leaders several opportunities to learn iPad apps in a hands-on, creative way during the sessions.

At the school level, the Lincoln Elementary staff met monthly. Meetings consisted of teacher-leaders facilitating discussions about PBL projects, which were the focus for the county-wide PLC. Teachers had an opportunity to share information about classroom projects, and/or ideas and lessons related to iPads and STEM. Mrs. White described the conversations with her colleagues during these meetings like this, "We all share ideas, you know, beg, borrow,

or steal." These conversations encouraged her to try different things, and "just dive in." When asked about what supported or motivated her to use iPads in her instruction she said, "An encouraging principal, trying new strategies, and learning about different apps." She indicated the atmosphere of the school, and the support from the other teachers, let her feel comfortable enough to try whatever others had tried, even if there was a chance of failure.

Specific to her pedagogical beliefs and instructional practices, she claimed to have come a long way since early in her career, evolving from a traditional lecture-style teacher, with teacher-centered instruction, to more student-led instruction due to iPads. In her first year of teaching she used the textbook as her guide, was in the front of the room lecturing, and had everyone doing the same thing. Currently, she was comfortable giving her students freedom to choose and make some of their own decisions about how they learned. While it would not be unusual to walk into her room and observe the students doing different things, she still used some lecture. She often introduced new concepts using whole group, direct instruction for the first few days, usually without the use of iPads. When it was time to demonstrate their understanding, the students had opportunities to use the iPad apps to practice skills, or create presentations.

One area she felt had not been impacted by iPads was her classroom management. She believed this was a key factor to being an effective teacher. At the beginning of the year she took about two weeks to go over procedures, and she felt that she had good control of behaviors. Throughout the time I spent in her room, it was obvious she was well-liked but firm. Her students were almost always on task. Mrs. White never said an ill word or raised her voice. Her demeanor was friendly and quiet, and her students responded to her and their classmates in

a polite manner. This was an area, she affirmed during her interview that had not changed with the addition of iPads.

Mrs. White approached her instruction in a similar sequence for the first two observations. The first part of the lesson was a quick review of a skill they had learned. The lesson, led by the teacher, began with an activity or discussion of a previous lesson and an explanation of the expectations for the current lesson. She then provided an opportunity for the students to ask questions or request clarification of the lesson. Next, she gave the students time to collaborate and work on the task of the day, which turned out to be the majority of the time allotted. During this time, she walked around the room, monitored progress, and stopped to help each group or individuals. She used a lot of questioning to help the students discover answers. All three of the observed lessons ended with a creative presentation and reflection about the learned skill. The observed pattern of her instruction established a connection to the pedagogical beliefs and instructional practices that were discussed during the interview. More specifics about each observation and details of the interview will follow.

The Classroom: Mrs. White

Mrs. White's classroom can be described as bright and cheerful. When I entered the room, I first noticed the large windows that were the entire length of the back wall, and even though they were all completely covered with white shades, they were transparent so a lot of sunlight was in the room. The room was decorated with several positive and colorful bulletin boards that displayed reading and math information along with student work.

There were a variety of seating options available that included beanbag chairs, stools, child-sized ottomans, cushions, plastic student chairs, and saucer chairs. There were no student desks in the room; instead there were four long, rectangular tables that seated five students at

each. The students' chairs had seat covers with pockets to store books and notebooks. At the end of each table was a bookshelf with baskets for students to store additional materials that did not fit in their chair pockets. When asked about the physical space in her classroom she mentioned she wanted tables instead of desks so there would be extra space for the students to go anywhere in the room, creating areas for both collaborative group work or independent work. She also stated that she had to make room for the large charging station, and desks were "clumpy" taking up more space than tables.

The technology available in the room included: a SMART Board, two desktop computers, 18 student iPads, one teacher iPad, and an Apple TV mounted on the wall in the back left-hand corner of the room. The student iPads were kept in baskets at the end of the student tables when not in use.

The setup of the room had large areas where students worked in groups, or had a quiet spot to work independently. The areas of the room included: a reading corner; kidney-shaped table for small groups; a high-top table; a rug in front of the SMART Board; the computer station with two desktops; and a teacher desk. Next to the SMART Board was a large charging station where the iPads were stored and charged nightly. The reading corner, located in the left front corner of the room, had a smaller rug, two saucer chairs, a bookshelf filled with books, and a spinning book rack that held more books. The kidney-shaped table, located in the back corner of the room under the TV, had short, black stools and a teacher rolling chair. There was a caddie in the middle that held supplies. The high-top table was fairly small and had two high stools with red covers. In front of the SMART Board was a rug that had a map of the United States, teacher stool with a back, two child-sized ottomans, two bean bag chairs, and plastic desk trays that were stacked. Students used the trays when they worked on the rug to have a

place to set their paper. The tray had a storage area on either side to hold pencils, markers, or other writing utensils. The students sat in this area for whole group and/or small group lessons. There were two computer stations with short, black stools, one for each station. A black bookshelf separated the two. The teacher area had a desk and filing cabinet located in the back right corner of the room.

Observation 1: Mrs. White

The first observation in Mrs. White's room was during a math class. Students confirmed their knowledge of lines of symmetry with an activity that included taking photos of real items on the playground, uploading the photos to an app called *Pages*, and using tools in the app to show and describe the lines of symmetry. The technology tools used during this lesson were iPads, the Apple TV, and the SMART Board.

When I entered the room, Mrs. White was not there, but the resource teacher was at the front of the room working with a small math group. Eleven students were present and sat on the carpet in front of the SMART Board. They reviewed a worksheet they completed on fractions as the resource teacher displayed it on the SMART Board, then broke into partners and played board games on fractions. After about five minutes, other students entered the room along with Mrs. White. The resource teacher told her students to clean up and return to their seats. In a conversation after the observation, I found out the students spent math intervention time in groups throughout the building. In total, there were 17 students present, seven boys and 10 girls. I found out later that one boy was absent.

Once all the students were settled in their seats, Mrs. White referred to the assignment they worked on prior to math interventions. Each table worked together to complete a sheet titled *Multiple Lines of Symmetry*. There were five shapes on the sheet: triangle, star, square,

pentagon, and circle. The directions said, “Draw all the lines of symmetry.” Next to the circle was space for the students to explain how many lines of symmetry they felt the circle had. Each table also had a small packet that contained the five shapes made up of a rubber material. Some of the students folded the shapes in half during the discussions about the lines of symmetry. Mrs. White called on each table to explain how many lines of symmetry they found, giving each table an opportunity to discuss one of the five shapes.

The last table was responsible for discussing on how many lines of symmetry they decided upon for the circle. The spokesperson for that table was a girl who stated that her table had not had time to finish, but agreed with the table next to her when they said there were 16 lines of symmetry in the circle. Another girl at the table stated that the circle did not have any corners. A third girl from across the room added, “Because there’s no like, maybe edges so when you fold it, it has to line up perfectly. It’s round so you fold it and it will always be the same.” At this point Mrs. White went to the front of the room, drew a circle on the white board, and had a mini-lesson about how many lines of symmetry were in a circle. She said, agreeing with the second girl, that it was a circle and it had no edges; it had an infinite amount of symmetry. Since infinite was a new word for the students, she explained infinite meant not being able to count; there were more lines of symmetry than the students could count. As long as the line was going through the center, with the exact shape on either side of the line, it had symmetry. The review part of the lesson lasted approximately three and a half minutes.

At this point, Mrs. White asked the students to put the sheets and the packet of shapes to the side and gave directions for a related lesson. She explained that she wanted the students to see that the real world, nature, inside, outside and everywhere, had several examples of items that have lines of symmetry. She explained that the students were going to use their iPads to

take pictures on the playground of things they saw that had symmetry. Each student was responsible for taking four to six pictures outside. Once back in the classroom, she would explain what they were going to do with the pictures. She gave the students an opportunity to ask questions and receive clarification. At one point, she quickly reviewed what they needed to do outside by asking, "Okay, so we are going to take about five minutes while we are out there to get how many pictures?" The students responded in unison, "four to six." The directions and questions section of this lesson took approximately two minutes.

The students lined up quietly and walked outside to the playground area. Once outside they immediately got to work, walking around and taking pictures. There was another class outside having physical education, but the students did not go near them or bother any of the equipment they used. The students used their iPads to take pictures of the fence, flagpole, parts of the playground equipment, and other parts of nature they encountered outside. Once in a while a student would come up to show Mrs. White a picture. All of the students were engaged and on task. I did not observe any questions being asked about how to use the iPad to take pictures. The students appeared to be very comfortable with this part of the lesson. As the students finished, they lined up in front of Mrs. White. When all students were finished and in line, we headed back inside. The time it took from lining up inside the classroom to being settled back in their seats was approximately seven minutes.

Entering the classroom I heard Mrs. White ask the students to put their iPads face down on their tables and to listen for further directions. Back inside the room, when all the students had settled, Mrs. White gave the next set of directions. She told the students they would use *Pages*, similar to Microsoft Word, for the next portion of the lesson. She stated that even though the students were familiar with *Pages*, they were going to use it in a different way. Normally

they used it for note taking or creating graphic organizers, but today they were going to use it to insert the pictures from outside and draw the lines of symmetry on them to illustrate their understanding. She then gave clear, concise, and very quick directions on how to create the document. She directed her students to look at the Apple TV as she demonstrated how, using pictures from her own camera roll, to insert a photo and draw the line of symmetry using the shape tool. Once the directions for *Pages* had been given she allowed for questions. One girl with long blonde hair asked what to do if there were multiple lines of symmetry. Mrs. White confirmed if there was more than one, they could add multiple lines of symmetry using the shape tool. There were no more questions posed and Mrs. White continued the directions for the final step of the assignment.

The final step included the students providing an explanation with the assistance of a sentence starter. The sentence starter was, "I know these are lines of symmetry because…" Mrs. White told the students that they would finish the sentence. She said, "You finish that sentence. How do you know that what you put on there were actual lines of symmetry?" Once again, she provided an opportunity for students to ask questions. No questions were asked, so the students began working. The total time it took Mrs. White to give directions and answer questions for the second part of the assignment was approximately three and a half minutes.

This activity was meant to be completed independently since students had taken their own pictures. As the students worked I noticed there was some discussion, mostly focused on sharing pictures with each other. I expected to hear students asking questions about using the app, but I did not hear any questions about the tool. The lack of questions proved that they were very comfortable using *Pages*, even though this was the first time they used it in this manner.

As the students worked at their tables, Mrs. White circulated around the room, having quiet conversations with each student. I noticed her asking several questions, rather than just giving answers. She spent a little more time with a few students who needed more clarification or direction. Once in a while she would stop to give directions about the tool, particularly after she had two or three students ask the same question. She stopped all of them, had them turn their attention to the Apple TV, and demonstrated how to crop out unnecessary parts of a picture. This stoppage took only two minutes, and then the students were back on task. With about five minutes left, she announced the need to begin the sentence starters so that they would not forget. She also said that they would have additional time to finish, and share a few of their pictures and explanations the next day. As the students finished, I had a chance to talk with Mrs. White about the final assignment. She said once the students finished, they would submit the assignment through their iPads to a program called *Seesaw*, a digital portfolio. The total time allowed for the students' independent work was approximately 14 minutes. A timer went off and the students saved their work, turned their iPads over and got ready to line up. My observation ended.

Observation 2: Mrs. White

The second observation in Mrs. White's room occurred during reading when the students reviewed the characteristics of poetry and drama. For the lesson, students read three different plays in a small group, completed a Venn Diagram that compared poetry to drama on *Numbers*, then individually recorded a video reflection and added it to the same document in *Numbers*. The technology used included the teacher and student iPads and the Apple TV. The specific apps used for this lesson included *Classroom*, *Numbers*, airdrop/airplay, and the video camera on the iPad.

When I entered the room, the only person there was Mrs. White. The students had earned extra recess time for a fundraising event and were out on the playground with the counselor. A few minutes later they entered the room and sat at their tables. A few of the students picked up a book and began to read. Some of the students were whispering to each other at the table. All 18 students were present, with 10 girls and eight boys. The observation began when all the students were seated, and Mrs. White gained their attention to give directions.

Mrs. White reminded the students that yesterday in reading they read a few poems and had a discussion about the elements of poetry. Today they were going to focus on dramas, reading a few plays and learning about the elements. After reading the plays and having a discussion of the elements in their small groups, they were going to compare and contrast the elements in poetry and dramas by completing a Venn Diagram on the iPad. The students took out their iPads while Mrs. White attempted to airdrop the Venn Diagram to the whole class. The intention was for the students to view the Venn Diagram on their iPads while she gave directions. She could not connect to *Classroom*, the app that lets her airdrop documents to the entire class at the same time. Her attempt to airdrop was unsuccessful, so she quickly adjusted her plans. The students would read the plays first while she fixed the issue with *Classroom*, then they would come back together as a group and go over the directions for the other steps in the lesson. Mrs. White asked the students to turn their iPads facedown so she could give the next set of directions. The transition after the failed attempt to airdrop the document took about 30 seconds.

Using the Apple TV, Mrs. White displayed directions for the students. She began to read the directions to the students and noticed she had written the same title for both plays. She caught this mistake and immediately fixed the first title. The directions said the following:

> First, read *The Wind and the Sun*, 1-Wind, 2-Sun, and 3-Narrator. Next, read *The Lost Woman*, 1-Lizzie, 2-Matt, and 3-Jesse and the narrator. After reading, go to *Numbers* on your iPad and complete the Venn Diagram to compare and contrast information about the elements of a poem and a drama. Finally, on your OWN, record a short video explaining which style of writing you prefer reading and WHY.

Mrs. White told the students to stop after they read the second play. They would review the rest of the directions when all of the groups were finished. The directions remained visible on the TV for the students. The students were then dispersed into groups of three, which were determined prior to the lesson; she assigned each person in the group a number: one, two, or three, to coincide with the character they were assigned for each play. The plays were short, only the front and back side, and presented on laminated card stock. The total time it took for Mrs. White to give directions and for the students to get in their groups was approximately seven minutes.

The students moved about the room and got in their groups avoiding getting too close to another group. There was a group in the reading corner, two different groups on the carpet in front of the SMART Board, one group in front of a storage closet located next to the door, one group behind the teacher's desk, and one group that worked on the floor next to the kidney-shaped table in the back of the room. Each group, with the exception of one, went right to work and made sure everyone knew which character they were, then began reading. I overheard the group seated near the kidney-shaped table, as they argued over which number they were

assigned. The argument went on for a few seconds without the teacher interfering. They finally agreed who was who, and began reading.

As the students worked, Mrs. White came back to the area where I was seated to let me know she had three new students added to her class within the last month, and they did not have *Numbers* on their iPads. She also explained that she had a difficult time pulling up *Classroom* on her iPad, so she needed to fix these issues before she could get the document to the class. One function on *Classroom* allowed the teacher to airdrop any document needed by the students. She explained that the airdrop function had been turned off on the student iPads for safety reasons. The *Classroom* app was the only way she could get digital documents sent to her students. The teacher also had the ability to manage all of her students' iPads using *Classroom*. She saw what the students were logged into, whether it be an app or an online site. The teacher could lock all of the student iPads, which was helpful when she needed the students' full attention, including locking the students into one app or website. Links could be sent to one or all of the students at the same time so they would not have to type in long, complicated links, and the teacher had the ability to control the volume on the student iPads. Mrs. White told me that the students had their iPads with them when they had a lockdown drill, and some of the students had their volumes up, so she was able to mute all of the iPads from *Classroom*. As she explained the functions, she worked on getting the iPads for the three new students updated and figured out the issue she had with *Classroom*. This took her just a few minutes, then she told me everything was ready and working. She then walked around the room and monitored the students. The groups finished reading the plays at different times. Mrs. White whispered to the groups that finished, letting them know to go back to their tables and read quietly until the other

groups were done. The total time it took for the small groups to finish reading the two plays was approximately 15 minutes.

The students were all back at their tables and seated quietly, ready for the next set of directions. Mrs. White thanked them for their patience with the technology mishap, then she airdropped the Venn Diagram. She asked them to press the "accept" button when they received it and for those who did not receive the document, to raise their hands. No one raised a hand, so she proceeded and asked them to open the document in *Numbers*. This app is a spreadsheet similar to Microsoft Excel. The Venn Diagram had two intersecting circles, one circle was labeled *Poetry* and the other *Drama*. The part where they intersected was labeled *Both*. Mrs. White briefly reviewed the steps to completing a Venn Diagram: list attributes of each topic in the corresponding circle and attributes they have in common in the intersecting part of the diagram. She asked for one example of an element for poetry, one for drama, and one they both shared. She reminded them how to add text, and called on a student who advised the others to press the plus button to add text. The students were asked to put their iPads facedown and give her attention for the next set of directions. Mrs. White demonstrated how to zoom in and out due to the Venn Diagram writing being very small. The students would complete this part in their small group. When they finished they would find a quiet spot in the room and independently add a video explaining which form they enjoyed reading, drama or poetry, along with a reason why. As an example she produced a quick video explaining why she liked plays better than poems, then showed the video on the Apple TV. The students responded by giggling and commenting that her voice sounded different on the video. They had a discussion about how they could produce their videos if they were not comfortable videotaping themselves. Mrs. White explained they could reverse the camera and talk while filming an inanimate object

(making sure not to film another person in the room). She gave a quick review of how to add the video at the bottom of the *Numbers* document, listing the steps involved, and then opened up the discussion for questions before dismissing them into their small groups. The teacher directions and student questions for *Numbers*, Venn Diagram, and video took approximately seven minutes.

The students went back into their original groups in the same areas from the first portion of the lesson, began discussions about the elements of poetry and drama, and added to their Venn Diagrams. Each student completed a Venn Diagram even though they worked together. During this portion of the lesson, Mrs. White walked around the room and monitored each group. She stopped to have discussions with the groups to make sure everyone was on task. She asked a lot of questions to help guide the discussions, rather than giving direct answers. She spent more time with one of the groups that obviously needed more support. Five out of the six groups were on task with very little side-talk, working cooperatively and completing their Venn Diagrams. The group at the back of the room near the kidney-shaped table was made up of two boys and one girl. During my observation I stopped near their group and noticed that the two boys just copied what the girl said and did not contribute to the conversation. Mrs. White noticed this as well, because this was the group where she spent a little more time, and made sure everyone added to the discussion.

As I walked around the room, I noticed the students' discussions included words like stanza, story line, rhyming words, lines, narrator, good tempo, actors, and developing characters to name a few. Each group completed the Venn Diagrams at a different time. Students moved from group work to independent work on the video with little teacher direction. I noticed a few students wrote a script on scrap paper before they completed the video. Each student found an

area of the room away from the other students where they could produce their video. A few things caught my attention as I watched the students. One boy squeezed himself into an area between the teacher desk and the computer stand to record his video, and his words caught my attention. He started his video by saying, “This was a hard question to answer. Which do I like better?” He was very animated, and I wondered to myself if creating a video allowed some students to be a little more expressive with their thoughts as opposed to writing answers on paper with a pencil. A few of the girls fixed their hair as they got ready to record. There was a sort of energy in the room. I could tell the students were excited to make the video because of comments that were being made and the interactions students had with each other and when recording independently. Another thing that got my attention was the fact that during the directions/questions, whole-group part of the lesson, the students expressed feeling uncomfortable about doing a “selfie” video, but once they were recording the videos, the majority were recording themselves instead of an inanimate object.

Mrs. White used chimes to get the students’ attention. When the chimes sounded, the room got very quiet except one student that was in the process of recording. As soon as he finished, he gave Mrs. White his attention. She announced that she was going to give the groups two more minutes to work on their Venn Diagrams and would give additional time tomorrow if needed. She asked them to use the last five minutes of the class to record their video reflection and to be as productive as they could on the Venn Diagrams for the next two minutes. At this point there were only two groups still working together, and I overheard a boy in one of the groups say, “Okay we better hurry up.”

Mrs. White continued to walk around the room, keeping everybody on task. One girl asked her if she could go out in the hallway to record her video, and Mrs. White told her it

would be best for her to stay in the room because if she went out, then everyone else would want to go out in the hallway.

Mrs. White made her way back to where I stood, and we had a short discussion about what I observed. She told me that she wanted to show the videos the next day, but might not have enough time to do that, so only a few students may be able to show videos. She would be able to see them all since the students would upload the finished documents to *Seesaw*. She also expressed her thoughts on one challenge that presented itself when she used this type of instruction. Everyone worked at different paces, and many students finished a lot sooner than others. It was important to her to make sure all students had something productive to do throughout the allotted time. To her, it was not very productive just to have them go on an individual program on their iPad. She said she found it challenging because she had to think about other things for them to do when they finished, so this became an additional part of planning the lesson. We talked for a few more minutes, then Mrs. White sounded the chimes again to announce it was time for everyone to start recording their videos if they had not started. The remainder of the lesson included the students working on their videos. The total time for the students' group work on the Venn Diagrams, and independent recording of their video reflections was approximately 27 minutes.

Observation 3: Mrs. White

My third observation in Mrs. White's room consisted of presentations from the students' PBL projects. The students presented their PBL projects to another class, and Mrs. White wanted them to present again so I could see the final presentations. I was able to observe 10 presentations in different formats that included: *Keynote*, *TouchCast*, *Chatterpix*, and *iMovie*.

The technology used during this time included iPads and an Apple TV. The students accessed the above listed apps to display their projects, connecting and disconnecting independently.

When I walked in the room only a portion of the students were present and the principal supervised. The eight students who were present were independently using their iPads to work on *ST Math*, with the exception of three girls who sat on the carpet in front of the SMART Board playing a math game. Mrs. White entered the room a few minutes later, along with the remaining students who were out of the room for math intervention. As the students made their way back to their seats, Mrs. White passed out scripts. After they sat down, I realized that all 18 students were present.

The students completed one of their PBL activities and presented their projects the prior week to another class. For my observation, those students that used technology were going to present again for my benefit. Every student was involved in the PBL, but I would only hear from those who used their iPad. Some students chose other methods not associated with technology. Mrs. White gave each student freedom to choose whatever form they wanted to create their presentations, whether it be related to technology, written out, or whatever they preferred. When I discussed this with Mrs. White in a later conversation, she said, "I gave them the freedom to choose, and it was scary, but they pulled it off." Each of the students addressed a guiding question: How can we as botanists or zoologists create a new type of animal or plant based on internal and external structures? There were some suggestions given to the students, but ultimately it was left up to them to decide what they wanted to include in their presentations. The goal was to research two animals or plants, examining the functions of their external and internal structures, and introducing a new creation to demonstrate their knowledge.

The lesson began with a short explanation by Mrs. White, letting the students know all of those that chose to use technology in their PBL were going to present today. She also requested that they address what app they used and why they chose that app. The first to present was a girl with long dirty blond hair. She stood in the back of the room right under the Apple TV with a script in her hands. Her presentation was made using *Keynote*, an app that is similar to Microsoft PowerPoint. She began by reiterating the guiding question and introduced us to her animal, which she called a Caoodle, a cross-breed between a cat and a poodle. She spoke about the internal and external structures, how they helped the Caoodle, and how their basic needs were met. Included, was a picture she drew of her animal, which had the body of a cat and the fur of a poodle. She ended her presentation with a poem. Mrs. White asked her why she chose *Keynote*. She hesitated for a few seconds, then stated, "I just thought it would be the easiest." Mrs. White then apologized for putting her on the spot, and they both chuckled. The rest of the class clapped as she went back to her seat, and the next presenter came to the front of the room.

The next presenter was a girl with light brown hair. She also used *Keynote* and introduced us to her animal called a Panthon, a mix of a panther and a lion. In her presentation, rather than combining both into one animal at the beginning, she explained the internal and external structures of a lion first, then a panther. For each animal she talked about how they caught their prey and listed the animals that each would hunt. She showed pictures of baby lions and baby Panthers. For the final part of her presentation she displayed the picture she drew of her Panthon and talked about the new animal - what it looked like and what it liked to eat. When Mrs. White asked what program she used and why, she stated that she used *Keynote* because she did not like the sound of her voice on TV.

The next presenter was a boy with short blonde hair, wearing blue shorts and a white t-shirt. This presentation was also completed using *Keynote*. He introduced his animal, which was a cross-breed between a dog and a cat that he called a Dogat. He spoke about its basic needs and internal structures. The last part of the presentation included a picture of a Dogat that he drew. The front half of the animal looked like a gray cat, and the back half of the animal looked like a brown dog. The drawing was not part of the *Keynote* but was a paper copy that he showed to the class. When asked why he chose *Keynote*, he said it was faster to add pictures and easier to use.

The next presentation was completed using *TouchCast*, which allowed him to use a green screen to develop his presentation. A photo was inserted in the background, and the presenter placed himself on the screen. It played as a video. The video was presented by a boy with short blonde hair. The audio portion of the presentation was difficult to hear, and the student spoke very quickly throughout the video with a lot of background noise from the other students in the room, making it difficult to understand a lot of the details he presented. The animal he cross-bred was called a Red-Haired Gape, which was a cross between a red deer and an ape. He talked about the internal and external structures of each animal separately, then described his animal. After the video played, Mrs. White asked him to tell us which app he used, and why he used it. He said he used *TouchCast* because he thought the green screen would be cool, but he realized how hard it was so he planned on using *Keynote* next time.

The next presentation was given by a girl with long blonde hair. Her presentation was completed through an app called *Chatterpix*. In this app she uploaded a photograph, used her finger to draw a line on the photo to represent a mouth, and recorded her presentation. The app played her recording and used the "mouth" on the photo to make it look like it was speaking. Each *Chatterpix* message was limited to 30 seconds, so for this presentation the student had to

record three separate messages. Her cross-breed was made up of a sunflower and a rose, which she called the Sunrose. After stating the guiding question, she talked about the basic needs of the Sunrose, described how the basic needs were met, and reviewed the inside and outside parts of her plant. She described the Sunrose as long like a sunflower, with the petals of a sunflower, but they were red like a rose. She detailed how external and internal structures supported survival and growth. When asked why she chose *Chatterpix*, she said she thought it would be easy and fun to use. Mrs. White asked if it was, and she shook her head yes. The audio portion of this presentation was much easier to hear, even though there was still background noise from the classroom as she recorded.

Next was a boy with short, blond hair. He created an *iMovie* for his cross-breed of a tree and a rose, called the Shrub Tree. This presentation was much shorter than the others. He talked about what it needed to survive, described what it looked like, and created a short poem. Mrs. White asked the boy why he chose *iMovie*, and he said he liked it because he didn't have to keep tapping to get to the next picture; it did it automatically. Mrs. White asked him if he could explain the last picture in his movie. He said he created the Shrub Tree out of clay, yarn, and popsicle sticks; he then took a picture of his creation and added it to his *iMovie*.

The next presenter was a girl with long, blonde hair. The animal she created was a Squirtle, a combination of a squid and a turtle. She described what her animal would eat, the internal and external structures of the animal, and the functions of each structure. Her presentation ended with a poem she created about her Squirtle. The video was created using *TouchCast*, because she thought it would be really cool to use a green screen with a picture of her animal in the background, and her video description in the front.

A boy with short, brown hair also used *TouchCast*. His animal was called the Catog, a cross between a cat and a dog. He described the basic needs, what it looked like, and how long it lived. When the video ended, he continued his presentation from a script about the internal structures of his animal, then finished by reading a poem he created. His reasons for using *TouchCast* were that he only had to get one picture and have one background, and he liked to show his face on camera. Mrs. White laughed at his response and thanked him for his honesty.

The final presentation was given by a girl with light brown hair. Her cross-breed was called a Rhuberry. A Rhuberry was made up of a rhubarb and blackberry plant. After repeating the driving question, she discussed what was needed for her plant to survive. She talked about the internal and external structures of both rhubarb and blackberry plants. She went into great detail about how nutrients were transported through her plant. Her presentation ended with a poem she created, then she asked if anyone had any questions. No questions were asked so Mrs. White inquired about the app she used. She said she used *Keynote* because it was fast, fun, and simple. This explanation ended the technology presentations with a total time of 28 minutes.

Reflections from the Observations: Mrs. White

The observations completed in Mrs. White's room presented me with a lot of information about student use of iPads, but it was necessary to gain additional information that could only be provided by Mrs. White, so I conducted an interview when the observations were complete. There was evidence from the data that matched the perceptions Mrs. White had about the iPad's impact on her students, classroom, and instructional practices. This section will provide some general thoughts about the lessons, teacher-student interactions, student interactions with the iPads, and how they matched the teacher's perceptions.

The interview with Mrs. White was completed during her planning time. We met in the teachers' lounge because the music teacher was with her students conducting music in the classroom. I asked Mrs. White if she felt the use of iPads had an impact on student learning. Her response was:

> I definitely think it has impacted - I don't know if this would go with student learning, I think they're more focused and more engaged whenever we do something with the iPad. I don't know if that's because they get to do these kinds of things at home with their iPads. I definitely think they're more engaged.

Evidence from my observations supported the idea of the students' increased engagement. There were several times throughout all of my observations where I noted that the students were all on task with very little outside discussion. When the students worked in groups they were cooperative, moved around the room to get in their groups without confusion and with very little disruption, and most contributed to the lessons. During both teacher-led instruction and small group work, I did not observe any students that were disengaged from the lesson with the exception of the small group noted in observation two.

Mrs. White reiterated the idea of more focus and more engagement when she was asked about the impact iPads had on student achievement. Her response was:

> I don't know if I could say that their grades would be any different, honestly with technology or without, but maybe just because of the engagement, them being more into what we're doing. They might be putting forth a little more effort, which could contribute to their achievement. I think it's more about the engagement.

When asked about her struggling learners and the impact iPads had on them, she said:

> It depends on what we're doing because some of them, ones that struggle anyway, sometimes they do struggle on iPads as well. I don't know. It depends on what we're doing, like the Venn Diagram that we did, I noticed some of my students still struggled a little bit with just being able to come up with their ideas, just like they would do on paper, but the engagement part again, I'm going to keep saying engagement. I think that it does help some of them grasp the information a little bit better just because they're excited about it. They are into it, rather than me standing up and saying, 'okay this is what we're going to do today' kind of thing.

From my observations, I noted several occasions when I could not tell which students were struggling learners. The use of small groups allowed for those slower learners to get peer support when they tried to generate ideas. Mrs. White made comments to the students a few times about being good teammates, and there were several times I noted this in my field notes. For example, students helped each other with spelling; if a student gave an answer that did not fit, the others corrected without ridicule, and if a student had a question about the iPad, another student would assist. From my experiences, the use of small group work benefitted those who were struggling by providing peer support through collaboration. She also noted that the behavior in her room had changed since she started using iPads because there were fewer outside distractions when they finished their work. She indicated that they can, and want, to go to their iPad instead of moving their attention to another student.

In the next part of the interview we had a discussion about the impact iPads had on her classroom. As previously discussed, she felt iPads have not had much of an impact on her classroom management, with the exception of some student behaviors, but had added additional responsibilities to her when it came to acceptable and unacceptable use. She reviewed with her

students, especially at the beginning of the year, what they could and could not do on the iPads. iPads added the responsibility of knowing what her students viewed, what websites they visited, and what they shared with each other. Students accessing non-educational websites was one reason the ability to airdrop had been removed from the students' iPads and why *Classroom* was beneficial, because of all of the features already discussed. It allowed her to have control of her student iPads, so everyone was accountable, and she knew they were always on an acceptable site.

Another area of change related to her classroom, was the physical space. Since iPads had become a part of her classroom, she made changes to her seating from desks to tables, added different types of seating in her room for small group and independent work, and allowed students to move around the room to work where they were comfortable. This freedom to move around the room was observed during each lesson. I made notes about how smooth the transitions were from teacher-led instruction to independent and small group work. When the students moved into groups, they did it without a lot of noise. I did not observe any instances where two groups or individuals wanted to work in the same area. If a group was already in a spot, the others found another place to work. All of the expectations established through Mrs. White's classroom management were seen through the evidence of daily classroom practices and were supported by some of the tools on the iPad.

The perceptions Mrs. White had about how iPads impacted her instructional practices were discussed. Since she used the iPads in her instruction, she moved from less teacher-led instruction to more student-led. This change was evident during each observation. The majority of the instructional time was students either working in groups or completing a lesson independently. The iPads gave Mrs. White the ability to intertwine group work with

independent work. In the first observation the students completed the lesson independently, but there was some interaction. The interaction did not pose a problem for Mrs. White. She allowed the students to interact to help each other. The second observation consisted of group work, then independent work to check for understanding. All three of the lessons ended when the students reflected on their learning.

Having the students work in small groups allowed Mrs. White to have more one-on-one time with the students. There were several teacher-student interactions, and she scaffolded her support depending on the student she checked on. She spent the majority of the instructional time monitoring the students, walking around the room, having conversations with individuals, and using questioning to encourage students to generate their own ideas. There was a lot of individual attention given to the students during this part of the instructional time.

The other area of instructional practice she identified as being impacted by the iPad was how she assessed the students. When asked about assessment she stated:

> I think the way they show me their understanding has changed. I guess maybe my assessment has changed, and so I used to give them a test or something. Now I can give them different opportunities on the iPad.

The iPad provided creative ways for her students to demonstrate their knowledge. When I observed the lessons, it was very easy for me to see that the students understood the concepts by looking at their work. Having the ability to use an iPad gave all learners a chance to express themselves and share their learning in different ways than traditional paper/pencil assessments. I saw students using the voice to text option of the iPad when they completed their reflection. The use of the video during the Venn Diagram lesson allowed the students to be animated and share their thoughts in a fun way. The only negative documented during my observations was when

some students used a video in their presentations, the background noise from the classroom made it difficult to clearly hear what was being said.

The students were comfortable using different apps on the iPad. There were very few questions posed about the apps themselves during the lessons. The questions asked were mostly about the content being learned. When the students gave their presentations in the last observation, the transition between each only took a minute or two. The students easily mirrored their presentation to the Apple TV. It was obvious they had used airplay previously. The ease of use of programs like *Seesaw* to submit assignments allowed for a more eco-friendly environment because Mrs. White used less paper. She also used a program called *Classkick* that let her send a PDF document to her students electronically. They wrote on the document and submitted their work without her having to make copies.

The iPads seemed to be a natural part of her every day instruction. Mrs. White attributed this to the school culture. All of the teachers in the school used iPads every day. When the students went to other classes like art and music, they used iPads. There was a school-wide implementation expected of kindergarten through fifth grade. Finally, she felt having a technology plan that held each teacher accountable sent the message of the importance of iPads in the school.

Mrs. Jones

The other teacher I observed at Lincoln Elementary was Mrs. Jones. She taught second grade, had a master's degree in elementary education, and 18 years of teaching experience. The types of professional development she received to improve her skills with the iPad included: training through school level PLCs, basic iPad training through county level trainers, and

embedded training with Apple Professional Development Specialists and county level Professional Development Specialists who worked with her in her classroom.

Early on, Mrs. Jones's professional development focused mostly on learning the functions of the iPad and learning how to work through some apps. At the monthly school meetings she learned from the PLC leaders about different apps to use in her classroom. She said they were not just limited to the app assigned to each grade level, but could pick and choose different apps discussed during these meetings. They also focused on the standards and discussed how to move their iPad lessons higher up the SAMR model. The professional development she received from the Apple and county level professional development specialists consisted of meeting with them during her planning to discuss the standards she was teaching and develop lessons she could teach with the iPad. The following day, they would come in and co-teach, supporting Mrs. Jones, and meeting with her after to reflect on the lesson.

Specific to her pedagogical beliefs and instructional practices, she felt strongly that students in the second grade still needed to learn foundational skills like reading, math, and learning to write sentences. She felt iPads had not had much impact on how she approached instruction. She thought of the iPad as a tool, a sort of manipulative that helped provide another device for her students to get information, but she did not let it change her instructional practice.

Mrs. Jones stated that her classroom management had remained the same as it was before implementing iPads. The inclusion of iPads with instruction was "not life or death." Some students worked better with iPads than others, so she gave her students a choice when it came to instruction. She avoided worksheets unless they were absolutely necessary, but she also understood that students learned in different ways, so if they wanted to use the iPad, they could

or if they were more comfortable with manipulatives or paper and pencil, then she allowed them those choices.

Mrs. Jones was asked about what supported or motivated her to feel comfortable using iPads. She said her principal expected them to use iPads. She also felt strongly about keeping up with the younger teachers, and she knew how important it was to ensure her students were ready for the next year. The culture of the school allowed her to gain confidence using iPads because everybody is "all in." She was more confident with iPads and was encouraged every day by her principal. The principal knew she was doing what she was supposed to do, and even though sometimes it was overwhelming, Mrs. Forgette told her to just do what she could. She was not afraid to ask questions, and everyone was more than happy to help.

The Classroom: Mrs. Jones

Mrs. Jones's classroom was the last room at the end of the hall. The windows were all the way to the left and covered the entire back wall just as Mrs. White's did. The same transparent shades covered the windows, but were open halfway so there was a lot of sunlight in the room. Under the windows were built-in shelves that she used to store books, bins, and other classroom supplies. The room was decorated with several bulletin boards that displayed reading and math charts along with student work associated with the current PBL on clouds. I also noticed there were traditional student desks and chairs in the room that were set up in four groups of five. There was a different color decoration on each group made up of foil called a spray centerpiece. Each group of desks had a different name displayed on a piece of paper. The names included: Snow Leopards, Creepers, Bat Kids, and Americans. I found out later that the students chose the names. There was a teacher desk located in the back left corner of the room,

under the Apple TV, near the windows. On the front of the teacher's desk were behavior charts with each table group name on them and stickers.

Other areas of the room included a horseshoe table near the window for small group work and a rectangular table pushed up against the wall that had some student work, a few iPads, one student desktop, and a printer. There was a SMART Board mounted on the wall directly opposite the windows that had a large charging station next to it. Most of the seating options available were traditional, metal, student chairs, but there were some small black stools around the room under a few tables. The tables looked to be areas where individual students could work. One had cleaning supplies on top with a broom and dust pan leaning next to it.

When asked about the physical space in her classroom, Mrs. Jones mentioned she was the only one in the school that still had student desks. She liked having student desks so they had a place to keep their stuff with the option of moving a student away from the group if it was necessary; that cannot be done with tables. She planned on keeping them until her principal forced her to get tables. She did mention the fact that she would never go back to putting the desks into rows. She used rows for a long time, but cannot imagine going back to rows because of the type of activities she used during instruction. Even though they were individual desks, they could be put in groups so students could collaborate. The technology available in the room included: a SMART Board, Apple TV, HP Laptop, document camera, one desktop computer, 19 student iPads, and one teacher iPad.

Observation 1: Mrs. Jones

The first observation in Mrs. Jones's classroom was on a sunny Monday afternoon when the students completed a math lesson on recognition of coins, and added amounts up to one dollar. The lesson included a warm-up activity called the Coin Drop Game, and ended with

partners as they used *Money Pieces* to add money up to a dollar. The technology used during the lesson included the student iPads and the Apple TV.

As I entered the room the students finished up their small reading groups and transitioned to math. There was a lot of movement as the groups cleared the areas and returned to their desks. Once all of the students were settled in their desks, I was able to note that all 19 students were present, 10 boys and nine girls.

Mrs. Jones explained that they were going to practice recognizing and counting coins by completing a counting-up activity in partners with the use of the iPad. To begin, they reviewed the coins and their value with the Coin Drop game. The students were asked to take out their slates, markers, and sock they used as an eraser, while Mrs. Jones got a tin can and some real coins. As a whole group, there was a quick review of each coin: quarter, dime, nickel, and penny, and a discussion of what each sounded like when dropped in the can. The students agreed the quarter sounded the loudest because it was the biggest, and there was not much difference in the sounds of the penny and nickel. Then, as the students used their slates, markers and erasers, Mrs. Jones silently showed the students a group of coins one at a time, then dropped the coins in the tin can. The students wrote the amount of the coin on their slates and added all of the coins. When Mrs. Jones said, "Board up and share," the students turned their slates in the air towards the teacher to show their answers. After they completed this task for three rounds, she asked the students to take out their iPads and find *Money Pieces*. The app had pictures of coins and dollars that students moved around and manipulated in order to understand the value of money. The total time for the money review was approximately four minutes.

The students took out their iPads and located *Money Pieces* while Mrs. Jones air played her iPad. She hesitated and announced that someone would have to help her because she forgot

how to get the coins to show without the box. The app gave a choice to have a grid behind each coin or just a picture of the coin by itself. A little girl with shoulder-length brown hair showed her how to choose just the picture of the coin rather than the coin with the grid by picking the icon showing only a coin, which was located on the left hand side under the pictures of each coin. Mrs. Jones told the students to test out their app to make sure they were able to move the money pieces around and quickly reviewed the tools available. She walked around the room and made sure all students were on task and answered questions.

Mrs. Jones gained the attention of the students and held coins up one by one. The students used their app to pull the money over onto the screen. The students clicked the picture of a pencil located on the bottom right hand, and used their finger to write. After they added the coins, they wrote the amount. Mrs. Jones reminded them to use a cent sign. She also told them not to raise the iPad in the air because she did not want them to drop it. When they finished, she asked them to lay the iPad flat on the desk, and she circulated throughout the room to check the students' answers. They continued practicing two more times in this manner, then she gave the next set of directions.

Mrs. Jones explained they were going to get into partners and practice the second grade standard of making change up to a dollar. They could find a quiet place anywhere in the room to work. Each one of the partners was to use *Money Pieces* and their coin box, if desired, to complete the worksheet together. They partnered up and began working together. The worksheet was titled *A Story of Units*, and the directions read, "Count up using the arrow way to complete each number sentence. Then, use your coins to show your answers are correct." The number sentences included one amount smaller than a dollar and one missing addend. Each

answer was 100 cents. For example, the first question read $.45 + ____ = 100¢. The total time for the directions and practice was approximately 13 minutes.

The students found places throughout the room. Some stayed at the desks, there were a few that went to the back of the room and used the top of the bookshelves, a few sat on the ground, one group used the computer area, and another group used the horseshoe table. Mrs. Jones circulated through the room as most of the partners worked with the exception of a few. Two boys who sat in the middle of the room were not cooperating and argued back and forth about the paper, who was going to do the work, and other things not directly associated with the activity. Mrs. Jones recognized the off-task behavior and attempted to get the two boys on track. As I walked around and observed the groups, I noticed most partners understood the skill. One set of partners, two boys sitting at desks, did not understand. I knew this because of their discussion. One boy stated he was done already, and it was easy. When I looked at his iPad I noticed he had 10 nickels. His partner stated, "We don't have to think of another answer. We have to think of a number to equal a dollar." They attempted a few more times before the second boy said, "Let's put out a dollar and take away $.33." They counted out one dollar and used a variety of coins, then moved coins that equaled $.33 to a different part of the screen to finally get the correct answer.

As the students worked, Mrs. Jones occasionally used chimes to get the group's attention and have one set of partners demonstrate how they came up with an answer. When this occurred, the partners would airplay one of the iPads and demonstrate both with the iPad and their words how they got to the correct answer. I noticed as the partners worked together there were a few groups that were able to subtract without using coins as manipulatives. There was a lot of discussion going on between the partners about the specific problems. Mrs. Jones

continued to move around the room, and spent time with groups that needed more support. She asked a lot of questions and scaffolded her support, depending on the understanding of the partners. When the student work time was up, she used the chimes and asked each set of partners to turn in their worksheets, writing both names at the top before heading back to their seats. The total time allowed for the completion of the partner work was approximately 17 minutes.

Observation 2: Mrs. Jones

The next time I visited Mrs. Jones's room for an observation was on a sunny Thursday morning. I observed a reading lesson where students partnered up, read an article, and answered questions. The technology used during the lesson was the student iPads and an online program called *Readworks*. *Readworks* was free and allowed Mrs. Jones to set up a class and assign articles that included comprehension activities. The program tracked the data for each student and included reports that showed their progress.

I arrived a little earlier than expected, and the students were not present. They were in art. After a few minutes, Mrs. Jones left the room and returned with her students after they used the restroom and got a drink. She gave them some time to eat a quick snack and told them if they finished their snack before the others, to continue working on the writing activity they started before art. She set a timer for five minutes and walked around the room having quiet conversations with the students.

When the timer sounded, Mrs. Jones asked the students to clean up and get back to their seats so they could listen for directions. It took a short time for everyone to clean up and get settled. Mrs. Jones reminded the students that yesterday they worked with *Readworks*. They read an article about a storm and worked in partners to answer questions. Today, they would use

the same program to learn about two animals that survived in nature. Later, while talking with Mrs. Jones I found out these were related to their new PBL on animal habitats. She explained to me that this would be a chance for them to learn about specific animal habitats and practice comprehension skills. She told the students they would read two different articles: one on elephants and one about seagulls. Each article would have information about these specific animal habitats. She also told the students that she was having trouble with the Internet and was unable to airplay her iPad so the students had to follow along looking at their own iPads.

The students all took out their iPads as Mrs. Jones asked them to bring up *Readworks*. She reminded the students they could go to the school's homepage to find the link. She walked around the room as the students pulled up the appropriate website. This transition took a very short time for all the students to be ready. It appeared to me they were able to pull up the program without assistance by accessing the school's webpage. I also noticed there were no issues with the Internet, which led me to think that Mrs. Jones had an issue with airplay and not the Internet. She asked the students to give her a thumbs-up when everybody was on *Readworks* and had the story *Sarah the Seagull* ready. The directions were given with an understanding that the students would work in partners, either taking turns reading or letting the iPad read to them, then complete the multiple-choice questions that followed, and finally, they would submit the finished questions by pressing the submit button.

Mrs. Jones gave the students an opportunity to ask questions. One boy asked if they had to complete all 10 questions to which Mrs. Jones replied, "Yes." When no other questions were asked, she took a few minutes to remind the students about going back to the article to find the answers. She said, "Don't just depend on your brain power. You can go back to the article and find the answer like the text mapping activity we do." Mrs. Jones encouraged the partners to

have discussions and reminded the students how multiple-choice questions were set-up; typically with one choice that was the incorrect answer, one choice that was the correct answer, and one choice that could be possible. Learning about the construction of multiple choice items was a study skill to help them when they were taking these types of tests. It was important for them to talk with their partner and look back in the article before making a choice. They were reminded that this was similar to what they did when using comprehension cards during small group reading lessons, but now they were using technology, which was something they would need to master to be ready for third grade. The total time for the students accessing *Readworks*, directions for the activity, and questions was approximately eight minutes.

The students were directed to get with their reading partners and find a spot in the room away from the other groups. Each set of partners found a spot in the room and with very little side talk got to work. I noticed that about half of the groups began the first article by using the text-to-speech feature. The room got noisy from having iPads reading the article at different points. This was very distracting to me as the observer, but it did not seem to distract the students. As Mrs. Jones circulated through the room she stopped to talk with me about how she oversaw this activity with her iPad on the *Readworks* website. I asked her why the students did not use earbuds or headphones, and she told me they broke easily. They had them at the beginning of the year but many broke. She also pointed out that since they worked in partners it was not as easy to use headphones. She stated that the students did not seem to have any issues with the noise because they were used to it, and that typically there were only a few students that used the text-to-speech feature. The noise from the iPads did not last long, and I also noted that I did not observe any of the groups that used the text-to-speech feature for the second article.

Mrs. Jones circulated throughout the room and made sure all of the groups were on task. Periodically, she would stop to demonstrate for me how *Readworks* allowed her to see what the students were doing in real-time. When a student finished the first set of questions for *Sarah the Seagull* she immediately saw the submitted work and the score. Another feature she liked about *Readworks* was that it allowed for article searches on specific topics, by grade level, by Lexile, or by a particular standard. The articles she assigned to the students showed up automatically under the student account, she could assign articles to individual students or the whole class, and there was a place for her to keep a library of articles that may be used in the future. The program was online, and Mrs. Jones had access to all the completed assignments and charts that show individual student progress.

As most of the students finished the first article, she noticed one of her students, one who typically finished first, did not complete his assignment. She approached the pair of boys that worked together near the window and asked them how they were doing because she did not receive one of the student's answers. This student stated that he finished and submitted the article. Mrs. Jones told him she did not have his submission and asked him to go back and look to make sure he hit the submit button. Both Mrs. Jones and this student looked together on his iPad and saw that he had submitted the assignment, but it did not show up on her iPad. She told the student that she saw his work and this was not for a grade so he did not have to worry about resubmitting. Mrs. Jones told me this was one reason she did not have full confidence taking a grade when they used iPads. She felt that her role was to give her students practice using apps and online programs to submit assignments because they would do this more often, if not all the time, when they were in third grade. She said she was not fully comfortable herself with taking grades from assignments done strictly online because, on a personal level, she was not 100%

comfortable doing it herself, so she rarely used assignments from *Readworks* as a grade. She also liked to use this time to allow her students to work in partners so her struggling readers had an opportunity to complete assignments, practicing comprehension skills with support from their peers.

As I walked around the room observing the groups' work, I did not see or hear very much off-task behavior. Two girls that worked together on the seagull article had a discussion about the different states that seagulls traveled through on their journey from New York to Florida. The girls walked up to a map of the United States and traced their fingers from New York to Florida, and verbally listed some of the states they touched. Another set of partners, a boy and a girl, talked about how to explain why they thought Sarah and her mom would fly back again to Florida. This was a written answer, and they exchanged ideas and worked together to come up with an answer they both agreed upon. Then, they typed the answer and helped each other with spelling and grammar. The partner work continued until Mrs. Jones used her chimes to gain the attention of the class. She explained that time was up and asked the students to make their way back to their seats. The total time allowed for completion of the two articles was approximately 20 minutes.

Observation 3: Mrs. Jones

The final observation in Mrs. Jones's room was a little different than the other two because the students were not practicing a skill they had learned, but learning a new app. The other difference was in the presentation. Mrs. Jones recruited the school librarian/technologist to assist her as she taught her students a new app called *Doc Scan*. *Doc Scan* lets individuals scan any document, enter text or write on it, save the document with their work, and send the document through email, air play, or upload it to any learning management system.

The purpose of this lesson was to introduce the students to the app so they would have enough practice with it by the time they entered third grade. The technology used during the lesson included the teacher and student iPads and *Doc Scan*.

Mrs. Jones explained that they would learn a new app used often in third grade. The app was introduced to the students the week before when the librarian/technologist, Mrs. Barker, showed them using airplay. The students, however, did not get a chance to practice using *Doc Scan* on their iPads, so the activity they would complete today would be to practice how to scan and edit a document. Mrs. Jones told the class they would scan and complete a math sheet on money, but first Mrs. Barker would explain how to scan the document.

Mrs. Barker told the students that she would set out a few copies of the math sheet and they were to come up to the front of the room and scan the document with the *Doc Scan* app. The first few students came up, but were unable to find the app on their iPads. Mrs. Jones and Mrs. Barker then realized the students had not downloaded the app last week; they only viewed the app as she air played it on the Apple TV. Mrs. Jones told the students to find the *Doc Scan* app in *Self-Service* and download it to their iPads. *Self-Service* was used by the students to find and download county approved apps. Students used to have access to the Apple App Store when the county first implemented one-to-one iPads with the middle and high school, but then changed the policy and removed the App Store from student devices due to too many students downloading games and non-educational apps, which caused some issues with inappropriate use.

Neither Mrs. Jones nor Mrs. Barker were able to airplay their iPad. Mrs. Barker described what the icon for the *Self-Service* app looked like and told the students to press the "install" link. The time it took for all the students to download this app was less than two

minutes. I noted that both teachers and a few students helped others that had some difficulty. The difficulty was mostly in finding the *Self-Service* app. The students walked around the room and made comments about finishing the download and how easy it was. Mrs. Jones gained the attention of all the students when it appeared they had all downloaded the app, then she asked them to go to the front of the room and scan the document. The students went to the front of the room and waited in two separate lines. Both teachers navigated through the room, assisting those that needed help and monitoring to make sure everyone was on task. A few times they got the attention of the students to make a comment that would help the whole group. One comment was from Mrs. Barker when she explained that the students needed to press "yes" when their iPad asked for access to the camera and "no" when asked about getting notifications, so they would not get pop-up boxes as they worked. She also explained that they needed to hit the save button after they scanned, and then hit the save button again when a pop-up window appeared asking what type of document they wished to "save as." Another comment was from Mrs. Jones when she suggested that they turn their iPad horizontally, or landscape, before scanning the document to give more room. She also asked the students not to begin working on the math sheet until she could go over the directions. Mrs. Barker gave them instructions on how to edit the sheet.

When it appeared the students had all scanned the document and were back at their own desks, Mrs. Jones took a few minutes to go over the directions on the sheet, which had six questions to review the value of coins and recognize the names of the coins. The title was *Under the Seats*, and it had pictures of different animals standing near coins. The directions asked the students to circle the correct names of the coins, count the money, and write the amount on the line. Mrs. Barker then followed up by explaining how the students could complete the sheet

using *Doc Scan*. She explained that after they hit save two times they should touch the picture of the document to open it. The next screen had a menu bar on the bottom of the page. The students were advised that they could complete the math sheet two ways. They could use the keyboard to type, or their fingers to write directly on the paper. To access the keyboard, they were to touch the letter T or, if they wanted to use their fingers, they were to touch the picture of the paint palette. For today's assignment they were to touch the paint palette because they needed to circle some answers and would not be able to do this with the keyboard. They reviewed how to change the color of the text, choose a writing utensil, and how to erase. When they finished, they were to save their work by pressing the "save" button at the top. Mrs. Barker asked if there were any questions, which there were not, so the students began answering the problems. There were not any questions asked about the app or the worksheet.

As the students worked, Mrs. Jones and Mrs. Barker circulated around the room and complemented the students on how well they recognized and counted money. Mrs. Jones stated that the work would be simple for them because they had worked so hard on money this year, but the true purpose of this assignment was more about learning how to use the app. The lesson consisted of two distinct parts, directions on how to use the app and complete the math sheet, including the time it took for the students to download the app and scan the document took approximately 15 minutes. The second part of the lesson, when the students practiced the app and completed and saved the *Under the Seats* worksheet was approximately 20 minutes.

Reflections from the Observations: Mrs. Jones

I conducted a follow-up interview with Mrs. Jones when the observations were complete. My intention was to discuss the evidence from my observations and further investigate the perceptions she had about the impact iPads had on her students, classroom, and

instructional practices. This section will provide some general thoughts on the lessons, teacher-student interactions, student interactions with the iPads, and how they matched the teacher perceptions.

The interview with Mrs. Jones was completed in her home on a Wednesday evening, which gave us a chance to have an uninterrupted conversation in a comfortable setting. I thanked her again for being a participant in my study, and she expressed her excitement over being asked to do it by her principal. She stated:

> I'm not one to 100% push technology even though I use it, and I like it, and I see a place for it. I have to ease into it. I just can't jump into something with the kids. I have to know it for them.

Mrs. Jones told me that she was not 100% comfortable with everything having to do with iPads, but she had help from Mrs. Barker, who was very knowledgeable as a support once a week for 30 minutes to teach the students something new. She said:

> She's in my room once a week for half an hour, helping me get the kids ready because she's very knowledgeable about everything, and I'm just not comfortable enough doing it on my own to teach them something new.

Mrs. Jones told me that next year Mrs. Barker would not be put in any of the teachers' schedules in this manner, but she had requested that this continue in her room. I inquired as to why she thought this happened, did she think it was because the teachers themselves were more comfortable with the iPad? She responded:

> Well, we have so many new teachers, and my principal wants them to focus more on content and what's going on. The third, fourth, and fifth grade teachers have enough experience that they're pretty much on their own as far as technology. With the younger

kids, we just needed more help. I don't jump in, I put one foot in at a time because I just do what I know. I don't get down there and press on this, click on that, or figure something out on my own because I'm afraid I'm going to mess something up.

This statement matched what I observed. There were instances when Mrs. Jones asked the students for assistance like she did in my first observation. She could not figure out how to get the grid off of the coins on *Money Pieces* and did not hesitate to ask the students for help. In the third observation, I noted several occasions where she asked questions to Mrs. Barker about *Doc Scan*. It was obvious she was learning right along with the students. During the interview we discussed the fact that she was comfortable enough to allow the students to help. She stated that some of them knew more about certain aspects of the iPad than she did.

Our discussion turned to focus on the students. I asked Mrs. Jones if she felt the use of iPads had an impact on student learning. She felt it opened up and gave more opportunities for them to learn in different ways. She gave me an example from her PBL and talked about how she gave the students choices to find information about their animal habitats. They could either use books in the room, their reading books, or they could use Google. She made it clear that her priority was to teach them foundational skills, like using the iPad as a tool to assist.

When asked about her thoughts on whether iPads impacted student achievement, she stated:

I don't think so in my grade level because I only use it for practice. When they do things in Readworks and send it to me, I don't take a grade because some kids, it scares them to answer questions online and send it to me, or they can't figure it out. It's more about practice. I'd rather - the same thing - I like to read a book. I have a Kindle, but I don't

use it to read books on, I use it for other stuff and school. I don't know if it [the iPad] has really helped their achievement though.

The evidence I gathered during my observations did not include any uncertainty with the iPad on the part of the students. During all three observations there were questions asked about the content, but I didn't hear very many questions about the tool. To me it seemed the students were very comfortable accessing and manipulating the iPad. Mrs. Jones spoke of her uncertainty at times, even though she was becoming more confident about the iPad, so I could not help but think that her own uncertainty may be what generated her feelings about student learning. Although Mrs. Jones did not directly discuss the engagement level of her students, the evidence from my observations supported the idea of the students being engaged in their learning. I noted several times during both teacher instruction and small group work that the majority of the students were on task during the entire lesson, which, from my experience as an educator, was impressive at that age level. There was an exception with the two boys in the first observation that argued during the partner portion of the lesson. They were not on task. So, looking at the evidence from the observations, there was more support for the student engagement factor and no evidence from either the observations or Mrs. Jones that iPads had impacted student achievement.

When asked about the impact iPads had on her struggling learners, Mrs. Jones said:

It intimidates some of the kids just like it used to intimidate me because I would not ask questions, I would just go take really good notes. I still do that, take good notes if I'm learning something new, then practice on my own. If I can't figure it out then I'm not afraid to go to somebody and ask questions. I won't ask the question in front of the

whole group, it's just me, and some of my kids won't either. Other kids, it gives them confidence, and they can help others, or they would rather use that tool to practice.

The observations did not allow me to see or know which students were struggling learners. According to Mrs. Jones, the use of partners during the first two observations was a chance for those slower learners to get peer support. She commented that the reading partners in the second observation were created based upon their scores from a reading benchmark assessment used in the county called DIBELS. The students helped each other, and there were several occasions that another student would assist if their partner had a question about the lesson. Mrs. Jones stated that the use of partners provided peer support through collaboration and let the students practice a learned skill they did not have success with when working independently.

When asked if there was any difference in her students' behavior since she started using iPads, her response was:

> No, the kids who are going to zone out, are going to zone out. Kids that don't want to pay attention whether it's with the book or with the iPad, it's going to be the same. Some kids love books and want to do things with their hands, whether it's coloring something, figuring out a worksheet, or doing it on the iPad. That's why I feel comfortable giving them choices.

I asked Mrs. Jones about the impact iPads had on her classroom. She felt iPads had not had much impact on her classroom management or her classroom in general. She felt obligated to concentrate on teaching the foundational skills at this age so the students would be able to read, write, and do math. These lessons do not always include iPads.

I asked specifically about the physical space of her classroom. As previously discussed, she used traditional student desks and chairs, but put them into groups of five. She said she did this because it was important to her principal that the students collaborate. Each table group represented a different team for each PBL. She changed the groups when they began a new PBL. After forming the new groups, she let each team decide on the team name. This set-up was different for Mrs. Jones compared to previous years of teaching when she would have the student desks in rows facing the front of the room. One element of her classroom that Mrs. Jones did not mention during the interview, but I noted several times during my observations was how natural it was for the students to move around the room as they worked in partners. There was no indication from Mrs. Jones that the movement and conversation during these times was bothersome in any way. The transitions from teacher-led instruction to partner work were quick and smooth. There was some noise during this time, but it was related to the students getting ready to work together.

The perceptions Mrs. Jones had about how iPads had impacted her instructional practices were examined in the next question. I asked if iPads had changed her instructional practices in any way. She said:

> I don't think really the iPad has changed me much. I mean, I use it as a tool. Yeah, the iPad hasn't changed how I make my lesson plans. It's [lesson planning] not based on the iPad, it's based on the standards. It's just a tool to help get information across. A lot of learning in kindergarten, first, and second grade is developmental. I consider the iPad just another tool to help the kids get more information because they love being on the iPad, and they're not afraid to use it, where I'm hesitant because I'm afraid I'm going to do something wrong.

When observing the lessons, I noticed the majority of the instructional time was spent on the students working in partners or independently. There was not a lot of time when the teacher stood in front of the room to lecture. The directions were given, and the students got with their partners and worked through the problems or articles. Mrs. Jones used this time to move around the room, facilitated the lesson and worked with individuals or partners. The only observation that allowed for more teacher-led instruction was the final observation when the students learned a new app. The students were very comfortable using the different apps on the iPad. The majority of the questions being asked were about the content, with very few questions about the iPad during the lessons.

During our conversations in the classroom and at the interview, Mrs. Jones made a few comments about her principal's expectations for iPad use. She used words like:

> 'We are required to use them.' and 'Mrs. [Forgette] expects us to use them to give the students opportunities to collaborate.'

The culture of the school and the expectations of iPads pushed her to use them more, even though she was not confident. She did state that she was proud of how far she had come. I could not help but think that she did not give herself enough credit. She talked a lot about making sure she was providing her students learning opportunities with foundational skills, but I did not think she realized how experienced her students were with iPads. She provided many chances for her students to learn using iPads. If she did not provide this experience, then it would be obvious to an outsider such as myself. If a student did not know how to use a tool, an observer could tell. My notes throughout all of my observations included things such as "The students did not have any problem with the app.", and "The students helped each other to learn the features and download." The thing that stuck with me the most about Mrs. Jones during our

interview, and my observations, was how willing she was to learn about the iPad, even though it was obvious she did not feel confident. I was impressed by the fact that she was willing to ask questions, not only to her colleague but also the students. She understood her limitations and she used other resources to overcome these limitations. She understood the importance of preparing her students for next year, and years to come.

Lincoln Elementary Principal: Mrs. Forgette

To gain another perspective on Lincoln Elementary and how iPads had an impact, an interview was conducted with the principal, Mrs. Forgette, in her office. The questions asked were similar to those of the teachers to gain a comparison of perceptions about the impact iPads had on the students, classrooms, and the school leadership.

The first set of questions had to do with whether or not she felt iPads had an impact on student learning. Her response was:

> Sure, sure. Yes. I've definitely seen an impact, really with everyone just because it gives them another way of presenting their knowledge and what they've learned, and specifically, I see more of an impact with the students who may struggle with paper and pencil activities. iPads give them another opportunity where they're not necessarily having to write everything out. They may be more techie, so it almost gives them another option that would create more engagement for them.

When asked if iPads had impacted student achievement, she was not as definitive. This was the first year that Lincoln had one-to-one iPads. Prior to this year each classroom had six to eight shared iPads. The state assessments had just been completed, so it would be hard to gauge the impact on achievement at this point. She mentioned engagement again, stating that she had observed a higher degree of engagement with creation-type activities. Her observation was

supported by the Instructional Practices Inventory (IPI) she used as part of her monitoring process. She used the IPI as one method of documenting a snapshot of what was occurring in classrooms. There had been more instances of students being on task and contributing during instruction.

The next questions asked about her views on the effects iPads had on the classrooms in her school or other school facilities, such as set up or management. She said that more students were seated in groups, but that was not necessarily due to iPads, although iPads lend themselves to more group work. As far as classroom management, she stated that they did not have a lot of discipline problems, so there was not much different. The discipline issues she encountered were mostly with students that came from different schools.

She explained that there was discussion at the beginning of the year regarding classroom management because this was the first year they were one-to-one with iPads. The staff was told to consider things like making sure the students knew the rules for the iPad, such as what they could and could not do, and they talked about strategies for managing the iPads, such as telling the students "apples up," which meant turning their iPads upside down when it was time for instruction or directions. She felt this discussion helped the teachers think a little more during pre-lesson planning and made them more aware of management issues in regards to the iPads.

Mrs. Forgette was asked whether she felt the inclusion of iPads had changed her school culture. When speaking about the students she said:

> I think so. I think that, obviously, kids want to come if they're going to be engaged. If engagement has increased, then they're going to be a little bit happier about being here.

When speaking about her staff she said:

I definitely think it's helped our culture. I've given them everything they want, that they could ask for. I think having those tools to teach with is almost like, liberating. You have so many choices now and there're so many different ways you can teach the curriculum, so I definitely think it helps the culture.

Another point she made in regards to school culture was that she was upfront with her teachers about school expectations. They were a fully implemented PBL school. The only subject that was taught separately was math. The staff was expected to study and know their standards. She said:

I tell my staff if you study your standards, and you teach it to mastery, you'll be fine. Whether it's with the county provided curriculum or whether you pull tools in from somewhere else, that's fine but everything you are teaching, every single minute of your day has to be based on a standard. I feel like the teachers have done a really good job of making sure that they're not changing their teaching and not changing their curriculum, I tell them you just have a new awesome tool that you can use in a lot of different ways.

It was obvious that Mrs. Forgette was the driving force behind the success at Lincoln, so I asked her about her pedagogical beliefs, the types of professional development (PD) opportunities she offered her staff, and her style of overseeing and monitoring the implementation of iPads. In regards to her pedagogical beliefs, I asked if the iPads had changed how she thinks students learn. She said:

Not necessarily what my beliefs are. I think pedagogically it's pretty much stayed the same. I mean, I've always felt like kids need to be hands-on learners. There needs to be projects and things like that involved, or you're going to lose them. I think iPads have helped that; it's added to that. Kids make connections with meaningful things. The

> teacher should teach the students, the students get an opportunity to play and practice the new learning, and then there should be an assessment. This should occur with or without iPads. What has changed is more of the product that we get from the students. Today it's more technological, and it's amazing. I think it's amazing just from where we've come in just a matter of five years.

Mrs. Forgette's beliefs played a part in the PD opportunities she offered her staff. The focus was on creative activities that were meaningful. She wanted everyone to walk away with something to use. Her goal was to provide every person on her staff, from classroom teachers to interventionists, with opportunities to look at their standards and develop hands-on activities for their students. Every teacher brought the standards with them and picked them apart, focusing on the SAMR model of technology integration. They worked in teams, looked at each standard, and developed lessons around that standard with the intention of moving past the substitution level of the SAMR.

The role she played was to make sure the staff knew what was expected. She followed through by monitoring each classroom using what she called "walk-throughs." She had a walk-through form she used that focused on the SAMR model. She visited every classroom weekly, looking for specific lessons that were discussed during their PD sessions. She said it was important to spend time talking about what she observed, giving expectations of what she was looking for by keeping an open dialogue. If the lesson needed improvement, she had a discussion with the teacher hoping for progress the next time she did a walk-through. She talked about how overwhelming this process could be on teachers, and so she strived to make it very meaningful for them because if it was meaningful, there would be more of a reason for them to use the lesson.

Our conversation ended after I asked her if she had any words of advice for a principal that was just starting out on this journey. Her advice was to be careful how iPads were being used in the classroom. Her belief was they were not meant for everybody working on the same program individually while the teacher was at his or her desk. There was a time and a place for programs, but they should be used during independent group time. The intention was not to replace the teacher with an iPad. They should be used effectively as a tool for creation and an opportunity to demonstrate student learning. Another piece of advice was that principals should make sure that teachers had good classroom management before using the iPad. Classroom management was the key to successful implementation.

SOFTWOOD ELEMENTARY

Softwood Elementary is a mid-sized school located in a middle income rural setting. According to the West Virginia Department of Education, the school's enrollment declined since 2010 from approximately 380 to 350 students. During 2017-2018, the school enrollment was over 99% White, the low SES percentage was 39%, and the percentage of students receiving special education services was 18%.

According to the school's website, the mission statement focused on: "Unleashing Student Potential." The vision to accomplish this included technology and project-based learning (PBL) activities, providing every student with the necessary tools and strategies to become future leaders able to successfully confront real-world problems. The instructional focus was to meet each student's needs by integrating technology into teaching with the state standards. With the help of all of the stakeholders-- parents, teachers, county support, and the community-- the school was the first elementary in the county to become one-to-one with iPads in 2015.

The teachers at Softwood Elementary completed several specialized training sessions, including: Apple Teachers, Common Sense Media National Digital Citizenship, and the county Vanguard training. Attendance at these trainings resulted in: 100% of the teachers becoming Apple Certified Teachers, a Common Sense Media National Digital Citizenship Award, 10 Vanguard members, and an Apple Distinguished School award for 2017-2019. The county Vanguard team started in the first year of the one-to-one iPad initiative. To become a Vanguard member, there was an application process to be chosen by the county technology team. The teachers completed one week of training (unpaid) in the summer where they developed knowledge of iPads and other technologies they could use in their classrooms. After completion of the training, Vanguard members were recruited to assist the county technology team in training teachers throughout the county and were considered experts of Apple products, working with other Vanguard members across the county.

Softwood Elementary included kindergarten through fifth grade, and had other support staff including a computer coach and a computer specialist that were unique compared to the other schools in my study. The computer specialist worked as both the librarian and the technology teacher. She worked with each class weekly as a pull-out, using her time as an educator in two capacities. The initial part of her class consisted of normal librarian duties, checking in and out library books. When this task was completed, she used the remainder of the time as a computer specialist. She provided lessons in digital citizenship, taught the students about the functions of the iPad, and provided time for students to work on PBL activities by collaborating and creating presentations. The computer coach spent additional time with each class to teach about the iPad functions and different apps. She shared the responsibility of providing lessons in digital citizenship. The classroom teacher was present during this time,

which was a chance for the computer coach to work with the classroom teachers, providing extra guidance and support.

The staff at Softwood made a commitment to include STEAM, or Science, Technology, Engineering, Art and Math, activities in their curriculum. Their Makerspace area was located in the library where sessions occurred every Friday, called Tinker Time. By revamping the master schedule, each class, third through fifth grade in the first semester, and kindergarten through second during the second semester, met for their Tinker Time with the computer specialist, computer coach, and the classroom teacher for 40 minutes, once a week. The teachers worked collaboratively to teach the grade level standards using hands-on STEAM activities. They incorporated the "four Cs" of learning during this time: communication, collaboration, critical thinking, and creativity. Both the computer coach and specialist were Vanguard members and borrowed strategies from their training sessions. The students worked in groups to complete an activity; when it was complete, they met on the carpet (without iPads) to have their "campfire time" as the teacher projected a video of a campfire on the SMART Board. The "campfire" was a time for the group to share through discussion, about their own learning and experiences of the four Cs encountered during Tinker Time. As an exit slip, the students independently used the iPads to journal by writing a reflection about their experience. They included photos and videos, along with their thoughts about the learning. The principal, Mrs. Gerhart explained that Tinker Time was a time for creativity, thinking outside the box, and learning that even if you fail, you can learn from it. The computer specialist, Mrs. Lake said the Makerspace was a safe place that, as Thomas Edison quotes, "I have not failed. I have just found 10,000 ways that don't work."

Another aspect that was unique to Softwood was the student leadership. The school had a Tech Force team of fourth and fifth grade students who assisted with technology throughout the school. The team consisted of 10 students, chosen through an application process, which required a presentation of their skills with technology. These students assisted with iPad maintenance, troubleshooting with SMART Boards, and demonstrated apps in some classrooms. Another responsibility was to work with the computer coach to plan and present a county-wide staff development session for teachers to demonstrate activities they completed in the Makerspace. They met weekly after school and spent time each morning visiting classrooms that needed help. Four of the Tech Force members also completed and received certification for the Apple Student Mentor program.

Mrs. Gerhart, and the teachers, planned times for the students to showcase everything that was going on with technology during Breakfast Bytes, a time when parents and community members came to watch students demonstrate their learning using the iPad. The students used digital portfolios like *Seesaw* in the primary grades and *Schoology* in the intermediate grades. On Digital Learning Day, students from the intermediate grades paired up with primary students, taking on the role of the teacher by preparing lesson plans and teaching an iPad app. Finally, Softwood received many visitors throughout the year from other parts of the state since they were a West Virginia Model Technology School.

The combination of a dedicated staff, continuous professional development, staff leadership through the computer specialist and computer coach, student leadership, Tinker Time, and a strong leader in Mrs. Gerhart contributed to the success at Softwood. They were viewed throughout the county as an example for other elementary schools.

Mrs. Snow

The first teacher I observed at Softwood Elementary was Mrs. Snow. She had a master's degree in elementary education, taught third grade, and had been teaching for two years. When asked about the types of professional development she received to improve her skills with the iPad, she said she had been involved in county-level *Schoology* training. *Schoology* was a learning management system adopted by the county and used to communicate with parents, teachers, and students, as a grading system, and a place to keep attendance. She completed the Vanguard training and had her Apple Teacher Certification. She completed Blended Learning and Flipped Classroom courses as part of her beginning teacher program through the county.

At the school level, she took part in the Softwood Elementary monthly staff meetings called Appy Hour, which provided teachers with additional training on iPads. In after school sessions, teachers shared lessons they used in the classroom and discussed how they could improve those lessons. She also worked collaboratively with the computer coach during her students' weekly class, and with both the computer coach and the computer specialist during Tinker Time.

Specific to Mrs. Snow's pedagogical beliefs and instructional practices, she believed students of today learned differently than when she was in school. Children learned by doing, by making, and by exploring. Her view drastically changed in a short time. The two years she had been teaching gave her the opportunity to experience two very different classrooms, one with only a few iPads, and her current room, which is one-to-one. When she completed her undergraduate and Master's degree she had experiences with both a traditional classroom and one that was student-centered, and effectively used iPads for collaborative lessons. She completed her student teaching in a kindergarten room where the teacher effectively used iPads,

and this had a big impact on who she was today. In her first year of teaching she continued the mindset of a traditional teacher, lecturing in the front of the room while the students were at their desks passively listening, just as she had been taught. The expectations of the school were not at the level of Softwood Elementary. iPads were used, but they were used ineffectively since there were only a few. The students basically used them to independently practice on a program. Teaching at Softwood, and having other educators around her that effectively used iPads, allowed her to feel comfortable enough to try new things.

Mrs. Snow felt her classroom management had not changed that much with the addition of iPads. As far as behaviors of her students and the control she had over her classroom, there was not much difference. The iPad did help with documentation of those behaviors and made it much easier to control the students' use of iPads. She used the program called *Class Dojo* for behavior management. The program was displayed on her Apple TV and had a point system, both positive and negative, that was visible to the students. There was also a communication component where parents checked in to their child's account throughout the day and got updates on their behavior. Parents could also send messages to the teacher. Another program she used for classroom management was *Classkick*, an app that allowed the teacher to monitor a student's iPad in real time and give immediate feedback.

The Classroom: Mrs. Snow

Mrs. Snow had her room decorated with a superhero theme. There were posters, decorations, and bulletin boards with Superman, Captain America, Batman, and many other logos. Two walls were painted completely yellow on opposite sides of the room and two were dark gray opposite each other. The floor was tiled, mostly white, but had yellow and blue checkerboard designed tiles in a square around the room.

There were several built in shelves along one wall that held classroom supplies and manipulatives. Next to the shelves was a computer station that had two desktop computers located on a wooden computer table. There was a bathroom located in one corner of the room and a sink with a countertop along the same wall. The back wall had a door to the outside with no window, bulletin boards, and a reading corner with a small area rug, bean bag chairs, and a bookshelf filled with children's books in front of the only window. The window was covered with curtains and was approximately two feet wide and six feet high, which does not provide very much natural light. Throughout the room there were a few tables, one brown rectangular table with blue plastic chairs that could be used for small group instruction, a tan trapezoid table with no chair and papers and tissues on top, and a single student desk, also without a chair. The teacher desk was located near the back wall close to the window. The desk faced towards the student desks.

The student area was set up in a horseshoe formation with traditional metal desks and chairs. The students were seated in a boy-girl pattern which Mrs. Snow said worked best for her class. The opening of the horseshoe faced the Apple TV that was mounted on top of a whiteboard. Next to the whiteboard was a small metal and wooden desk that had a document camera, laptop, and a small black armless office chair on wheels. Under the Apple TV were student mailboxes with a stack of seat cushions on top, and a stack of small blue children's stools standing next to them. There was also a large cart that held the charging station for the iPads and a metal teacher podium on wheels, painted light blue.

The technology available in the room included: an Apple TV, a document camera, a teacher HP laptop, a teacher Mac Book, two desktop computers, 18 student iPads and one teacher iPad.

Observation 1: Mrs. Snow

I visited Mrs. Snow's third grade classroom early on a Wednesday morning to observe a math lesson. The lesson I observed was a review of turnaround facts in math. The technology used during the observation included the SMART Board, which was used to display *GoNoodle*, and iPads. The app used during the lesson was called *Show Me,* which was a digital white board. The students also completed an exit slip using *Doc Scan* and uploaded it to a discussion post accessed through the learning management system *Schoology*.

It was very quiet as I entered the room and approached the teacher who was at her desk working with a student. I looked around the room and noticed the students worked independently on their iPads in different programs. They were not seated at their desks, but scattered throughout the room. At this point there were 14 students in the room, seven boys and seven girls. After a few minutes two boys left for their gifted program and later, during the lesson, three students returned from their intervention: one boy and two girls, which made a total of 15 students, six boys and nine girls. Mrs. Snow later told me there was one student absent.

The students finished their morning work as Mrs. Snow checked in on different students to ensure they were either working or finished. After a short time, the students were asked to save their work, exit the programs, return to their desks, and turn their iPads "apples up," which was the signal for them to have the iPad turned over so they were not distracted and were ready for the next set of directions. Since the students had worked quietly for a while, she told them they were going to have a "brain break" and move around for a few minutes before she started the math lesson. *GoNoodle* was displayed on the Apple TV. Mrs. Snow's students followed

along with the characters, mimicking the movements to the song *Hello Joe*. The song lasted less than two minutes, and they returned to their seats.

The students were reminded about the practice state assessment they completed the week before. Mrs. Snow explained that several of the students missed questions with multiplication and division, and she wanted to review before the official state assessment, which occurred two weeks later. She asked the students to turn over their iPads and open the app called *Show Me*. She turned to me and explained that *Show Me* was a digital whiteboard. Students wrote on them using their fingers just as they would with a traditional slate and markers, but it was easier to use because they did not have to manage markers and erasers that could get lost or dry up. The app included other features like the ability to record their voice as they worked a problem, and the ability to share the finished product through email or air drop. They could use the app offline because it was downloaded on their iPads. Her students were very familiar with the app because they used it often.

The students indicated that they were ready by showing a thumbs up. I was able to see when the students were ready by quickly scanning the room to look at the iPad screens. One student had difficulty with his iPad and could not open the app. Mrs. Snow tried to assess the problem with the iPad but was unable to figure out the issue. She thought the student had updated it at home and changed some settings. This interruption lasted only a minute or so until she decided she would work on it later and told the student to take out his slate and marker to work the problems.

The lesson reviewed multiplication and division facts, using pictures to show a visual representation of the problem and to recognize turnaround facts. It began as a whole group lesson when Mrs. Snow asked one student to provide a number between 10 and 30 and he chose

12. She told the class to use 12, showing equal groups of two. They drew a picture and showed both the multiplication and division facts with the picture, then wrote the problem and included the turnaround facts. They completed the first problem together with the assistance of a student that came up to Mrs. Snow's whiteboard. Once they completed the first problem, the rest were done one at a time independently by the students, then checked as a whole group. There were four problems finished in this pattern and a lot of discussion happened during this time. During the independent work time, Mrs. Snow monitored the students by walking around the room and provided different strategies for the students like questioning, drawings, iPads, and a lot of positive feedback including high fives.

It was obvious the students were familiar with *Show Me* and had no problems with the exception of the one issue mentioned earlier. In fact, Mrs. Snow was able to fix the issue with that iPad and returned it to the student while the others worked independently. The questions asked during this part of the lesson were about the content. Mrs. Snow was able to work with individual students as the others worked independently. She spent more time with a few students that needed more support. Some of the students finished very quickly while others took more time. Those that finished early talked quietly until it was time to work the problem whole group. When they completed the last problem the students were asked to go "apples up." The total time for the whole group and independent review and practice of turnaround facts was approximately 20 minutes.

The next part of the lesson was a five minute review of multiplication facts. Mrs. Snow gave the students a number and in unison they said the multiplication facts for that number. Mrs. Snow used thumbs up or thumbs down to indicate which direction the students would go. For example, if the number was two and her thumb was up they would recite: two, four, six, etc.

She would put her thumb down, and they would recite: six, four, two, etc. The intention of this activity was a quick review of multiplication facts before the students worked independently. The students were very engaged during this time, and it gave Mrs. Snow a chance to see which facts had not been mastered.

The students were asked to turn their iPads over to find *Schoology* to complete and submit an exit slip independently with the same problems they had reviewed. This exit slip provided Mrs. Snow with evidence of which students knew the skill and which needed more practice. She asked a girl with long blonde hair to airplay her iPad and directed the others on how to get to *Schoology* to locate the assignment. The girl gave the following steps as she and the other students followed along: first open *Schoology*, find the Eureka math folder and click, scroll to the bottom and click on Equal Groups Assignment, hit view attachment, once the *assignment* opened hit the "Sharrow" button (the icon used to send a document to another program), locate the *Doc Scan* icon, and send the assignment. As the directions were given, three students that had been in another room returned. Quickly, Mrs. Snow gave them directions on what they were to open and some students around them also helped. She told them she would review what they missed later that morning in a small group. This interruption took around two minutes, then they resumed the directions. Mrs. Snow went over the features in *Doc Scan* and reminded the students how to save and send the finished document back to *Schoology*. I made a note that it occurred to me, the review of the directions on *Schoology* and *Doc Scan* were more for my benefit. I knew this because as the blonde girl and Mrs. Snow were giving directions, many of the students had already gone ahead, which told me they were comfortable finding the documents and moving in and out of the programs. The students were given an opportunity to ask questions about the expectations. When no questions were asked, they worked

independently to complete the exit slip. After about 10 minutes, Mrs. Snow gained the attention of the entire group and asked a different student, a girl with long brown hair in a ponytail, to airplay her iPad and demonstrate for the rest of the students how to send the completed document from *Doc Scan* back to *Schoology*. The girl gave the directions with no assistance from Mrs. Snow. After she disconnected from Airplay, she and the other students completed their review and sent the document back to *Schoology*. As the documents were uploaded, Mrs. Snow was able to see the assignments in real-time.

The final step of the lesson was a reflection of their learning. Mrs. Snow asked the students to give her their attention even though not all of them were finished. She did not give the "apples up" signal because they needed to use their iPads for the next part. She asked all the students to go back to *Schoology* to find the math folder again. They were going to complete a discussion question that stated: "Explain how equal groups and/or drawing a picture can help you solve a mathematics problem." She reminded them to use complete sentences and correct punctuation. *Schoology* had a feature that allowed teachers to set up a discussion post. This post was within the *Schoology* program and was a way for the teacher and students to communicate. Once a discussion was posted, the students sent their reply as a thread to the post. Every member of the group could see all of the responses. The students were given a chance to ask questions, but there were none. Mrs. Snow advised the students that they only had a few more minutes to complete the exit slip and the reflection discussion. The total time for directions on *Schoology*, *Doc Scan*, and the discussion took approximately nine minutes. The independent work time for the students lasted an additional 10 minutes.

Observation 2: Mrs. Snow

The second observation in Mrs. Snow's room happened on a Monday morning. I observed a reading lesson that included a pre-reading discussion on heroes, the first reading of a play, and a comprehension check using a program called *Kahoot*. The technology used during the lesson was the iPad and SMART Board. The teacher created a discussion post in *Schoology* as a pre-reading activity. The students used a worksheet through *Doc Scan* to answer a question and uploaded it to the *Schoology* discussion post.

Kahoot was a free, online, game-based educational program teachers could use as a way to formatively assess their students and build knowledge through quizzes. It also served as an interactive game where students used their devices to answer questions created by the teacher. There was also a community feature to share *Kahoot* games and find games created by people across the world in any subject or grade level.

The lesson began with a pre-reading discussion created in *Schoology*. Mrs. Snow recruited a student to airplay his iPad and demonstrate for the class how to get to the discussion post in the English/Language Arts folder. This student described for the others two different ways to find the post containing the directions. There were two questions posted: "What causes someone to be a hero?" and "What can you learn from champions?" Mrs. Snow reminded the students they needed to include complete sentences with correct grammar and punctuation. Once again, I believed this demonstration to be more for my benefit rather than for the students because many accessed the discussion post before the demonstration was completed.

Mrs. Snow asked the students to answer the two questions independently. The students worked on the questions quietly as she walked around and monitored. At this point one student had difficulty accessing *Schoology*. This was the same student that had similar difficulty during

the first observation. I overheard Mrs. Snow ask him questions about whether or not he had changed his password. She told him she was not the one who created the account for this program, it was done at the county level and she did not have access to his personal information. She asked him if he went into the settings and changed the password himself. The student could not remember if he changed the password. Mrs. Snow told him to get out paper and pencil and answer the questions. I noticed she was able to walk around the room helping other students while she attempted to fix the issue. She was able to get him in, but there was not enough time to work on the questions so he turned in the paper copy of the answers. One thought that crossed my mind was the fact that the teacher or student could take a picture of the responses and upload the picture to the post. She also told one student that had his iPad taken away for a short time, to complete the questions on paper and pencil. Later, she informed me this student was not using his iPad appropriately, so he lost his privileges for a few weeks.

The responses to the discussion post were visible both on the Apple TV being air played by the student, and on each student's iPad. Mrs. Snow could see who had and had not responded. She encouraged the students to post their answers, and continued to walk around assisting individual students. After most of the students had posted their responses, she got the attention of the group and read some of the responses herself, but also called on individuals to read their responses. Mrs. Snow and the students had a lively discussion about heroes, which included a lot of questioning from Mrs. Snow, connecting some of their experiences in their personal lives and in the classroom to heroes. One point she made was when she reminded them about a video they watched presented by first graders from their school. The video demonstrated things these students did to be champions. One girl was able to do a back handspring, and a boy was able to catch a football and run it back for a touchdown. Mrs. Snow

used questions to help the students realize how much hard work and dedication was put into being able to do a back handspring and score a touchdown at such a young age. There were also connections made to famous people like Michael Jordan, Steph Curry, and JK Rowling on how they worked hard to accomplish their goals. The purpose of this part of the lesson was to generate ideas about heroes and build background that the students would connect to the story when they started reading. The total amount of time dedicated to the *Schoology* demonstration, answering the discussion questions, and making connections and building background with a discussion took approximately 15 minutes.

Next, Mrs. Snow asked students to turn their iPads "apples up" and take out their Reading Adventures magazine, which was part of their reading program, to turn to the play titled *A Team of Heroes.* She then took out a tin can filled with popsicle sticks with the students' names on them to determine which students would get parts for the first reading of the play. If a student's name was chosen, and they did not want to read out loud, they did not have to, but they did have to follow along as the story was read. She also told them they would be reading this story multiple times during the week, and every person would get a chance to be a character. Mrs. Snow took the character of narrator, and the five other characters were chosen using the popsicle sticks.

They began to read the play orally when there was a knock at the door. Two teachers were there to take some students to begin a reading benchmark assessment called DIBELS, which was done individually. The interruption lasted approximately three minutes, and ended when two students left with the two visiting teachers. The class started to read again from the beginning. The story was about a young soccer team that had a really good player named Carla. There was a new player named Manny who joined the team for the game. Some of the students

did not talk to Manny and assumed he was not a good player because he was small and shy. During the game Manny proved the other players wrong by figuring out the opposing goalie's weakness and scoring the winning goal. When they finished reading, there was a follow-up discussion to determine the themes of the play. There was open communication and some of the students suggested themes: work together, don't judge a book by its cover, and always be proactive. The total time it took to read the play orally and complete the follow-up discussion was approximately eight minutes.

The final part of the lesson was to check comprehension of the story. Mrs. Snow reminded the students they had used *Kahoot* often, but today would be the first time they used it immediately after the first reading of their weekly story. Normally they only played *Kahoot* as a review right before they took an assessment. She asked the students to turn their iPads over and log in to *Kahoot*. Students accessed the game through the app, and the teacher displayed the game from her online account. The Apple TV screen showed a code that the students used to join. After typing the code, they were asked to enter their name. As they entered the game their names appeared on the Apple TV. Mrs. Snow was able to see all of the students once they joined. The questions were displayed on the Apple TV with four choices underneath; each choice was a different shape and color. The students' iPad app only showed the four shapes and not the question or choices; therefore it was important for the students to read from the Apple TV. There was also a time limit of 20 seconds to answer each question. There were different time options that Mrs. Snow could choose when she created the quiz in *Kahoot*.

The *Kahoot* Mrs. Snow created for *A New Team of Heroes* had 20 questions. The first 10 were a review of the vocabulary, and the last 10 were comprehension questions related to the story. Mrs. Snow read the questions and choices out loud as the students worked through the

quiz and discussed each question as a group. After every question there was a graph that showed how many students chose each answer along with a check next to the correct answer. The graph gave the students and teacher immediate feedback. To generate a discussion, Mrs. Snow asked the students why they chose a wrong answer, if they did, and asked others to give a reason for the correct answer. There were comments shared and connections made for each question. The teacher was able to access, through her account, the results of each *Kahoot* played and could save it to the Google Drive. The results could be used as a formative assessment to let the teacher know what needed to be re-taught. At the end of every *Kahoot*, the students were asked for feedback on their learning, their feelings about the game, and whether they would recommend the game. The time it took to complete the *Kahoot*, including answering the questions, discussion after each question, and feedback from the students, was approximately 22 minutes.

Observation 3: Mrs. Snow

The last observation in Mrs. Snow's room took place two days before the end of the school year on a Wednesday morning. During this lesson I observed the students as they used iPads to complete an augmented reality activity through an app called *Metaverse*. The lesson ended with a whole group discussion on how she could make the activity better, and whether they thought *Metaverse* should be used again.

When I entered the room the students were scattered around finishing their morning snack. Some students were sitting in pairs playing on their iPads, some were sitting in groups of three or four talking quietly, and some were drawing. Mrs. Snow approached me to let me know that I would be observing a review lesson in math. She said the students were excited because this would be the first time they used augmented reality. They were going to complete two

activities in a program called *Metaverse*. Mrs. Snow prepared two separate activities, one had 10 questions to review the math skills they learned in third grade, and one had 10 questions with fourth grade math skills. She wanted them to get a feel for the skills they would be learning next year and to compare the difficulty of those skills.

There were not very many directions given to the students once they finished their snacks and returned to their seats. They were told that there were two QR codes on the front board that they were to scan. Once they were taken to the activity, they needed to follow the directions on the screen. Mrs. Snow also told them to take paper and pencil as scrap paper. When the students looked at their iPad screen, they received directions from the program on which way to turn in order to locate the characters. The background of the screen was the classroom, and as the students found characters they would show up as part of the classroom. For the third grade review questions, different Pokémon characters appeared on the screen and above the character was a speech bubble with a question. The fourth grade activity had fictional characters like wizards and ninjas. Each question was different and had different choices; some were multiple choice and others were written answers. The student responses were immediately sent to the teacher account so she could see the answers in real-time. One example from the third grade skill activity was: "Pikachu has the following Pokeballs. Is that an even or odd number?" Under the question was a box containing four rows of six Pokeballs. Underneath the Pokeballs were three choices for the student: odd (23), even (22), and even (24). When they clicked on the third choice they received a message indicating they were correct. A question from the fourth grade activity was: "I fly 157 mph. How many miles can I fly in three hours?" The character was a Wizard flying on a cloud, and under the picture were three answers for the students to choose from. Mrs. Snow also included a question asking the students: "How can you

use this tool in the classroom to best fit the students?" A few students asked what that question meant, so she got the attention of the group and told them she wanted their opinion on how they felt, as a student, this program could be used in the classroom. The last question had the students take a selfie. As the students walked around the room, Mrs. Snow monitored their progress and gave accolades to students as they got correct answers. The students were quiet, only talking about the *Metaverse* and saying things like: "Cool!" and "Mrs. Snow, I got the right answer." They all remained on task to complete both of the lessons. This portion of the lesson lasted approximately 16 minutes.

The students went back to their seats when they finished both math activities. Mrs. Snow asked the students to use the scrap paper to reflect on the lesson and tell her in their response which math activity they liked better and why. They would share their ideas after everyone finished the reflection. The room got very quiet as the students began to write their thoughts. After about five minutes, Mrs. Snow got their attention and asked for discussion. She told them it was important to her that the activities they did in the class were interesting. The *Metaverse* was a little difficult to create, so she wanted to make sure that it was worth the time she put in to create it. If the students did not enjoy the lesson, then she would not use it again. She asked for volunteers to share their thoughts. In total, seven students shared. Their responses were positive. A few said they liked the third grade activity better because the problems were easier. Others said they liked the challenge of the fourth grade activities. One boy said even though he liked the problems in the third grade lesson, he liked doing both in general because it was fun. A girl said she liked the third grade problems better, but really liked doing both. She wished she could sit down instead of having to stand the whole time. Mrs. Snow told them, when they found the

characters, they were able to sit after they clicked the link. The only thing they had to continue to do was hold the iPad.

In the final part of the discussion, Mrs. Snow asked how she could make the lesson better. There were a few suggestions of which characters she could use in the next *Metaverse*. One boy suggested that she randomize the problems because as he worked through the lesson he and another boy were standing next to each other and he could see how the other boy answered. This statement caused a few more to talk about how they could see other students' iPads on their screen, so a girl suggested that Mrs. Snow put a background to block out the classroom, that way they would not be able to see other iPads. Mrs. Snow took a few minutes to explain to the students how to create a *Metaverse*. She said it was similar to how they created a presentation in *Keynote*, but there were lines that connected each of the screens, and she had to follow the lines to see what screen would be next. She said she would share the lesson plan with the fourth grade teachers. The reflection and discussion that followed took approximately 15 minutes.

Reflections from the Observations: Mrs. Snow

The observations completed in Mrs. Snow's room provided a lot of information about her classroom integration of iPads. I wanted to gather more information about the students' use of iPads that I was unable to observe, so I conducted an interview when the observations were completed. The evidence gathered matched the perceptions Mrs. Snow had about the impact of iPads on her students, classroom, and instructional practices. This section will provide my reflections on the lessons, focusing on teacher-student interactions, student interactions with the iPads, and Mrs. Snow's perceptions about the effect iPads had on her classroom.

The interview with Mrs. Snow was completed during her planning time. I was curious to hear if she felt the use of iPads had an impact on student learning, and if so, how. She responded:

> Oh my goodness, yes. They can be used improperly, obviously, but I feel like it makes such a difference for what they can do. It's teaching them 21st-century skills and skills that will make them more comfortable in a job when they're older. I didn't even know how to type in elementary school. They can whip up a paragraph in five minutes… So, they do learn different things, like coding skills, the total way that they can break down problems now is totally different. I've been in a school that didn't have iPads at all, and you can a see a difference in - it is a lot more technology-related. We do a lot of technology stuff here, but they're learning. I can see a difference in their comprehension…the way they break stuff down. Like, for example, on ST Math, it wants them to do it in a certain way, so they have to see how it goes wrong to fix it. Well, it does that with anything when we use the iPads. They get to create. I feel that they get to use higher order thinking skills because they get to create their own. It's not just, 'Here's paper, pencil and a worksheet.' They get to create their own presentations. They get to create their own videos. They made a brochure in third grade. They had a 3D brochure. They've done augmented reality, so they get exposed to everything. It's not just, 'Here's an iPad. Play games on it.'

The evidence from my observations supported the idea of the students using higher order thinking as Mrs. Snow pointed out. When the students in observation three discussed how the lesson could be improved, they came up with thoughts on their own like randomizing the questions or changing the background of the screens so students could not see each other's

answers. There were several occasions where the teacher and students were able to make connections to their learning, which was a higher depth of knowledge skill. One example was when they were talking about heroes, a student made a connection to his grandfather being a hero in the war, and another student connected something she learned in a previous presentation they watched. I made a note in my fieldnotes that I was surprised that third graders were able to think outside the box.

Mrs. Snow felt she did not have enough experience currently to determine whether the iPads effected student achievement. There was some evidence that her class made gains in math. The average class scores on an online math benchmark test called Scholastic Math Inventory (SMI) more than doubled from the beginning to the ending of this year, from 248 to 590 quantiles. Mrs. Snow went completely digital for math this year. They used online materials in *Schoology*, moved to *Doc Scan*, worked the problems, and then uploaded the completed sheets back to *Schoology*. They also used an app called *Math Manipulatives* when they worked the problems. Even with this evidence she felt she needed more time and experience in the classroom before determining whether the iPads were the reason for gains in achievement.

This discussion led me to ask about her struggling learners. I asked her if being completely digital was a problem for these students, or perhaps others that may prefer paper and pencil. She said:

> [Boys name], he gets distracted really easy. I've made these little things that said focus, or I call them little focus squares. Anytime he was off, I would slide him one flatly, and he would get back on task, but as far as having trouble with it, no. How I reflected with them today, I reflected with them in Math too, 'Do you guys want paper? Do you want

this worksheet?' Some of them would say, 'Yes.', …but for the most of the lessons, they would log in. They were able to download the lesson, write it out and send it back.

From my observations, I noted several occasions where Mrs. Snow was more attentive to that particular student, but the issue was more about focus and not about his ability. She also shared her thoughts on her struggling learners:

> If it was very wordy or something that they had to read very carefully, there's two that are extremely, extremely low, on a first grade [reading] level. They would have a hard time keeping up, so you have to constantly go there, read it out loud and help them with that.
>
> [Boys name], for example, for the West Virginia study lesson with the Metaverse, it came up with the little flash cards and it had all this information about West Virginia, and then there was a question related to the card. It was only, like, two paragraphs, but he is so low when it comes to reading. He's dyslexic so he really struggles. He's only at the kindergarten reading level. On those, I wish I would've done something like read it for him. It [*Metaverse*] had the option to hear me talking, but I couldn't figure that out.

When asked about the gifted students, she said that some of them knew more about the iPads than she did, and that was what got them into trouble at times, like with her student that had his iPad taken. He was one of her gifted students. She said this was where apps like *Classkick* helped because she could control the students' iPads and see all of the apps and sites they visited. If they were not where they were supposed to be, she could lock the iPad.

Regarding whether iPads impacted student behavior in her room, she commented:

> Yes, because they always want to be on them. I say that, and then sometimes no, but it does change them because they're ready to be on them first thing when they walk in.

> Then one day, I did away with the iPads because everybody was just not focusing, so the next day, we did straight paper and pencil, and you would have thought that would've been the worst thing in the world for these kids, no, they loved it. Just something different. But overall they get excited to use iPads. The general classroom behavior is good.

The next part of the interview included a conversation about the impact iPads had on her classroom. Mrs. Snow felt it allowed the students to do a lot more and provided her with the ability to do centers. She gave me an example where she planned a week addressing area and perimeter. She used a program called *Prodigy* that aligned with the math curriculum. It was both online and available as an iPad app. By typing in the standard of area and perimeter, the program provided several lessons that students could do independently. She was able to have three groups; she said:

> It allowed me to do centers and to really work with my lower kids more. If you give them something to do, and you're working with a small group, you've got, 'Mrs. Snow, Mrs. Snow, Mrs. Snow, what do you do?' like that, because they need constant -- In third grade, they're still not very independent.

The independent groups that had some knowledge of area and perimeter, but needed practice, used *Prodigy* and rotated through the program to *ST Math*. Mrs. Snow worked with the struggling learners to give them the extra time they needed to learn the skill. When she pulled the other students into small groups, her struggling learners had time to practice using *Prodigy*. She was comfortable with this process because even when the students were not in front of her, they were still getting the support they needed. She was pleased because she did not feel as if she neglected anyone.

Another area of change related to her classroom was the physical space. The observations I made about the physical space of her room matched how she responded to my question. I noted during the observations that the room had a traditional feel to it; with metal student desks arranged in a horseshoe and traditional furniture, but as the observations continued I made notes about how the atmosphere of the room was more student-centered, even when they were completing a whole group lesson. I attributed this difference to the number of years she had been teaching. Funding for flexible seating and furniture may be a factor as to why she did not have a more contemporary, student-centered classroom. Since she had only been teaching for two years, she may not have the funds to change her room. Mrs. Snow's response when asked if she made changes to her room because of the iPads was:

> Not really changed anything, but we move around a lot. I've got the corner, the area in the corner where they can go with their iPads and sit and read. We do that a lot because they read on *Epic* on their iPads, but as making it accessible, not so much. No difference.

Mrs. Snow was asked about her classroom management and how she was able to integrate iPads while continuing to use the county required curriculum. She said she would not be able to answer how her classroom management had changed because teaching with iPads was the only experience she had as a teacher. She completed her student teaching at Softwood and only taught at one other school for a short time before getting a position at Softwood. The school as a whole was known for its expectation of technology use, and the entire staff used iPads daily, so she did not have any frame of reference to compare. In regards to using iPads with the county curriculum, the expectation from her principal was to begin with the standards, integrate iPads using effective strategies that included collaboration, critical thinking, creativity,

and communication, and supplement it with the county provided materials when appropriate. She explained:

> I always love to see what the curriculum is or the standards. If there's a way for me to use it, I do. I think I've just been so used to integrating technology, I don't really -- I don't just pull up an app and say, 'Hey, we're going to do this,' just for whatever. It's always connected to a standard.

Mrs. Snow proceeded to give me an example. One standard for third grade was to be able to plan, revise, and edit a paragraph with help from peers and adults. She said:

> When we practice it in here, they would write it and they could send it to a friend for a rough draft. The friend could edit it in a different color and send it back to them to their iPads. That was their rough draft process. Someone editing it, looking at it, talking to them and sending it back. It's like peer editing.

The next topic dealt with challenges and supports encountered when using iPads. The challenges included:

> The internet dropping sometimes. That's always frustrating because then if you don't have a backup or you didn't make a copy of something that you want to use, that's always challenging.

She also described supports:

> Supports are like, Mrs. Lake is always here to help. She is the technologist/librarian. The computer coach -- we have a technology specialist here, and she actually takes the class for 30 or 45 minutes. Every week she takes each class, and they do some common sense media, stuff like that. They develop good habits with the iPads from the start, which helps.

The culture of the school was most influenced by the principal, Mrs. Gerhart.

> We are a technology school. Mrs. Gerhart pushes it. We are Apple certified. I wrote the data section for the certification book. I knew when I took this job it was 'you will use technology or you do not want this job.' That's what we're known for. Tinker Time and Makerspace I feel has really helped push us even more into using the iPads because it's hands-on, but it's hands-on with technology also. You can see how you can use it in the classroom. For teachers who don't do it as much, you can see ways that it can be incorporated. It started my first year teaching. Before that, they didn't have it. Before that they were just trying to get everybody to use the iPad's and come up with ways to do it. The more that we've had the technology the further we took the kids with it.

The perceptions Mrs. Snow had about how iPads impacted her instructional practices and pedagogical beliefs were discussed. I was surprised when I asked her if her beliefs in how students learn had evolved since first becoming a teacher.

> Yes. Two years ago, before student teaching, I was totally against the use of iPads in a classroom because I had never seen it used the correct way. I had seen, 'Here, you have 15 minutes go get on what you want.' Before coming here, yes. I was very traditional in my thought of teaching, paper and pencil, the way I learned. That's not how kids today learn. They learn by doing. They learn by making. They learn by exploring. Totally the opposite of me standing up here saying, 'You copy this down.', and then finding it for themselves. Yes. It's a big change. When I was in the classroom I would have thought that kids can't do this. It blew my mind when I was [teaching] in kindergarten, and I saw how much a kindergartener can do with it, with an iPad.

Mrs. Snow's instructional practice was impacted by some of the conversations she had with her colleagues. She said:

> We share ideas with each other. That's pretty cool because everybody teaches differently. For example, my first year of teaching spelling last year, I had no clue that there was this thing called Spelling City where you could type in the spelling words for kids to practice all week long. That first week I was making hands-on activities and matching activities, and one of the other teachers was like, 'Use Spelling City. Let me show you how to use it. The words are already in there.' Just being able to share and collaborate with each other and bounce ideas off each other with the iPad and technology.

To end the interview, I asked Mrs. Snow if she had anything else she would like to share that may be helpful to another teacher contemplating the use of iPads in the classroom.

> A new teacher? Don't be overwhelmed about technology. Don't feel -- I always hear when I try to share something, 'That's not my thing. I'm too old to learn this.' That's not true. You're not too old to learn it. It might take a little bit of time, but if you give it the time it's very satisfying to see your kids, just to see what they can do, but you have to be open about it. As a new teacher don't be overwhelmed. It's easier said than done. Don't be afraid to try something new in your classroom with technology. That's really about it.

The students in Mrs. Snow's classroom were comfortable using the different apps on the iPad. I noted that when Mrs. Snow was faced with any issue related to the iPad not working properly, she handled it while she continued instruction. The students easily mirrored their iPads. It was obvious they had used airplay previously. There was an ease of use of programs

like *Schoology* to complete and submit assignments, and also *Show Me*, and *Kahoot*. The iPads were a natural part of instruction.

Mrs. Lake

Mrs. Lake was a teacher at Softwood Elementary. She had a master's degree in elementary education and 11 years teaching experience. A former classroom teacher at the school, she held the position of Library/Computer Specialist. She met weekly with every class, kindergarten through fifth grade, for 40 minute sessions. She worked in the capacity of both the librarian where she managed books, and the technologist, where she combined teaching social studies standards of West Virginia history with functions of the iPad.

When asked about the types of professional development she received to improve her skills with the iPad, she mentioned an Introduction to Web 2.0, being a member of the county Vanguard team, attending various county sponsored iPad professional development sessions as a participant and facilitator, and attending the technology academy offered by the county in the summer. A training that first introduced her to iPads and started her journey was offered at the state level called Infusing Technology. More discussion on this training will be included later.

At the school level, Mrs. Lake had several opportunities throughout the day and after school to meet and share ideas about iPads with her colleagues. She took part in Appy Hour sessions, and she was involved with the Vanguard team that met monthly at her school or other Vanguard members' schools to plan and explore different lessons, and to collaborate on multi-school projects. She collaborated daily with all of the teachers and the computer coach at her school. She described the computer coach as someone she heavily relied on to collaborate with, to ask questions and share ideas. They worked very closely together as a team and created the activities for Tinker Time. Mrs. Lake felt the atmosphere of the school and the expectations of

not only the principal, but the county, made it easy to incorporate technology. iPads had been a part of her instruction for more than half of her teaching career and she became more and more comfortable using iPads each year.

When asked about what supported or motivated her to use iPads during her instruction, she said her principal expected all of the staff to use iPads. Mrs. Gerhart was the driving force for innovative technology and provided anything the teachers wanted that she was able to purchase. The county was also a large support. They provided replacements or maintenance when iPads got broken. The county professional development specialists acted as a strong support. The Vanguard team was like a family and was always there to help. But, her biggest motivator was the computer coach. Mrs. Lake had a strong desire to lead students into the twenty-first century and felt she had the right group of people around her to keep striving for this.

Specific to her pedagogical beliefs and instructional practices, Mrs. Lake claimed to have come a long way since early in her career. She considered herself "anti-iPads." She did not think children would be able to work effectively in a classroom with an iPad as a part of their everyday instruction. That belief had drastically changed. She was comfortable with using the iPad and had been surprised by how all students, kindergarten through fifth grade, were able to manipulate through and create with an iPad. She felt there should be a difference in what was taught to each age group. It was important to her that the foundational technology skills for students in kindergarten through second grade were developed, while she allowed for creation and exploration for students in third through fifth grade. For her, the focus of instruction for younger students should be on learning the functions of the iPad, becoming familiar with how different apps work, and practicing the skill of keyboarding. This instruction gave the students a

good foundation for future use which included creativity and proper use in the intermediate grades.

The Classroom: Mrs. Lake

Mrs. Lake conducted all of her classes in the library. The room was very large with high ceilings and large windows that ran along most of the front wall and contained items that allowed it to act as a library, technology, and Tinker Time space. The main part was square but had a small extended section on the far wall opposite the entrance that served as a reading corner with filled bookshelves lining the three walls, small tables for very young students, and bean bag chairs.

The student area was made up of five hexagon-shaped tables that sat six students at each table. There was an Apple TV mounted in one corner and another mounted on a TV stand with wheels. There was a large carpeted area in front of the TV stand for students to gather as a group on the floor. The walls in the main area of the room were lined with bookshelves filled with library books. There was a small student computer station near the teacher area with two desktop computers and two plastic student chairs. The wall where the windows were located had shorter bookshelves filled with library books under the windows. One area of the main room was separated by a row of back-to-back bookshelves and had an eight-foot by eight-foot Lego wall mounted where students could build Lego designs during Tinker Time. It was titled *Epic Lego Wall* spelled out in Lego pieces.

The teacher areas included counters that had a desktop computer for checking library books in and out. There were built in wooden cabinets and storage shelves on the inside of the teacher counter. Opposite the teacher area was a door that led to a storage closet and another door that led to the teacher work station, with a copy machine, storage containers, and a laptop

computer cart with wheels. The walls contained posters with positive messages about being kind and creative. There were stuffed animals and knick-knacks on top of the bookshelves around the room that gave a kid-friendly feel to it.

The technology available in the room included: two Apple TVs, two student desktop computers, one teacher desktop computer, a teacher Mac Book and one teacher iPad. There were a variety of tools used during Tinker Time such as the Osmos and drones. There was an iPad cart and charging station in the teacher workroom, and a school set of laptop computers in a cart that could be used by any teacher. The student iPads were not located in this room because each class brought their iPads with them when they came for instruction.

Observation 1: Mrs. Lake

Mrs. Lake invited me in for my first observation on a Monday morning. I observed a kindergarten class that had 23 students, 12 boys and 11 girls. The students were not present when I first entered, but arrived shortly after with iPads in their hands. There were two teacher's aides that accompanied the students. The students arrived and sat at a table. It was apparent that the seats were assigned because they went immediately to their seat.

Since Mrs. Lake was both the librarian and technology teacher, she started class by checking in returned books and allowing the students to check out new books. There was a desktop computer and a scanner that read a barcode on the books. As Mrs. Lake called the tables to come one at a time, the other students had a choice of looking at the books laid out on the tables or logging into *Epic* to read a book of their choice. Several of them chose to use *Epic*, but a few looked through the books. The students were quiet with just a little noise from some sharing thoughts on the books they read. The whole process of returning books lasted approximately five minutes.

When the library duties were completed, Mrs. Lake called the students by table to find a spot on the carpet in front of the Apple TV. With assistance from one of the kindergarten teacher's aides, the students found spots on the floor, sat with their legs crossed, and put their iPads "apples up" in front of them. Mrs. Lake addressed the students and gave an overview of what the class activities would be for the day. The class would continue a *Keynote* presentation on the best places to visit in mountaineer country. This lesson was a continuation of a project they began in a previous class that covered the West Virginia standards. Mrs. Lake told me later in the observation that the presentation completed during this class was not part of the school-wide PBL, but it gave the students another chance to practice the presentation tool, *Keynote*, that they used to complete the PBL in their classroom. Mrs. Lake finished describing the lesson and had the students turn over their iPads and open *Keynote*. She displayed her iPad on the Apple TV and pointed to the picture of *Keynote*.

The general idea of this presentation was an invitation for other people to come and visit West Virginia, often referred to as Mountaineer Country. Each slide contained a photo and a short description of a famous location in West Virginia. Mrs. Lake reminded the students about some of the other places they had already discussed and added to their presentations. At this point she monitored the students' iPads and noticed a girl in the back row that did not have *Keynote* open. After a few questions, Mrs. Lake found out this girl had deleted her *Keynote* app to make room to download a game. To avoid disruption, Mrs. Lake told her to work with the girl beside her for the class and reminded her not to delete apps that they used often. Mrs. Lake then addressed the classroom aide to let her know the classroom teacher would need to reinstall *Keynote* at another time.

The remainder of the activity included Mrs. Lake directing the students step-by-step when they added slides to the presentation. She used the mirroring of her iPad on the Apple TV to help the students follow along, monitored the students' progress by moving through the area where the students sat, and provided verbal prompts when the students needed correction. The classroom aide assisted, keeping students on task and repeating directions given by Mrs. Lake. As they added each slide, Mrs. Lake asked the group how to add the slide, how to add a photo from the gallery, and how to get to the keyboard. For the first two slides, Mrs. Lake said the word and asked for the sounds in the word when they typed, then she would spell the word out loud, one letter at a time, while pointing to her keyboard on the Apple TV. For the final few slides, she would spell the word out loud and let the students complete the word by looking at the Apple TV.

The completed slides contained pictures and titles for the following West Virginia locations: Prickett's Fort State Park, the International Mother's Day Shrine and Anna Jarvis' birthplace, and Valley Falls State Park. The final slide did not include a photo but included the slogan: "Come Visit Mountaineer Country Soon!" The activity was a combination of learning famous places in West Virginia, and learning about the different features in *Keynote*. As Mrs. Lake introduced a new mountaineer country location, there was discussion about where the place was located in West Virginia, what sort of place it was (shrine, state park, etc.). They talked about the history of the location, and why it was famous. Throughout my observation, the students used the following features of *Keynote* while completing their presentations: they located and opened the app; they located the presentation they had previously saved; they were able to add different slides; they located and added photos; they were able to pull up the keyboard and type; they practiced finding punctuation marks that shared a key with a letter (the

letter k key has an apostrophe); they learned to slide the k key down to add the apostrophe; they saved the project; and after closing *Keynote*, they double clicked the home button to close all apps that were open to save on battery.

Mrs. Lake informed the students they would upload the finished presentations to *Seesaw* next week because they ran out of time. She asked them to put the iPad to sleep, collect their books and iPads, and line up at the door. As the students exited, I overheard Mrs. Lake tell them to hug their iPad as they walked down the hall. The total time for the presentation creation and instruction on *Keynote* was approximately 30 minutes.

Observation 2: Mrs. Lake

The second of my observations in Mrs. Lake's room was also on a Monday when I observed a first grade class. The lesson focused on the West Virginia Standards and was a continuation of a project they began in a previous class. There were 16 students in the class, evenly distributed between boys and girls, with three absent. No additional adults were present. The technology I observed during the lesson was the SMART Board, iPads, *Book Creator* and *Clio*.

The students entered the room and went directly to the tables to sit, putting their iPads "apples up." Once they settled, Mrs. Lake took a few minutes to remind them about the *AR* party that was at the end of the school year and encouraged them to continue to check out and read books so they could get points towards their goal. *AR* was an online program that lets students take a quiz on a book they read, awarding points for passed quizzes. Each grade level had a point goal they needed to reach to get rewarded for their effort. The first grade goal was to get 50 points for the school year. The reward for meeting the desired goal was a bowling and pizza party for those students that earned enough points. After the brief discussion she began to

complete the library duties of checking in/out library books. The students were called up to the teacher's desk to return books and walked around the room, browsing the available books. Students who did not need to check in a book remained seated and looked through the books on their tables. A few students opened *Epic* on their iPads and began to read. The library duties took approximately five minutes.

Afterward, Mrs. Lake explained they would continue their research on historical places in West Virginia using two tools on the iPad: *Clio* and *Book Creator*. She reviewed which students were partners and realized there were a few absent, so she told those whose partners were absent that they would work alone. She asked them to sit at the same table to make it easier for her to help them individually. Mrs. Lake reminded the students about how important it was for them to use their own words when they wrote the information found on *Clio*. She asked the students what would happen if they copied the words from *Clio* and used them as their own. The students said they could get in trouble and possibly go to jail. Mrs. Lake said that it is called plagiarism and they could get in trouble, but probably would not go to jail as a first grader. She said, "…and we don't want to get anybody in trouble for stealing other people's words, so we are going to change it to sound like a first grader, something that you would say." After checking with the students to see if there were any questions, which there were none, she said she would be moving around the room to help, and asked the students to be patient until she could make it to their table to assist them.

Mrs. Lake assigned roles by asking the taller of the two partners to open *Clio* and the shorter would open *Book Creator*. *Clio* was a free iPad app that used your location to introduce users to historical places around them. It had many features, such as the ability to make entries of locations that were not currently in the app, set up a walking tour for the user to learn about

landmarks, historical buildings, and monuments as they walked or drove around the city, or research and read about historical locations. *Book Creator* was an app that allowed the user to create, publish, or share their own book. The free version of the app only allowed for the creation of one book. The purchased version of *Book Creator* for the iPad could be used to create unlimited books. Users could include text, photos, sound, video, music, or recordings of their voice.

The students quickly moved around the room to get into partners. There were three individuals working by themselves, five sets of partners, and one group of three. As they worked together, each group researched a different location or monument. One partner had the iPad on *Clio* and they read or listened together to the description. The other partner had *Book Creator* open and would type the sentences they decided to include. The goal was to find at least three interesting facts about their location and develop sentences around those facts. As I observed, I walked around spending a few minutes at each table. I heard a variety of discussions, most of them were about the historical location, but a few groups were off task in the beginning. One set of partners were not cooperating with each other. This group had a boy with very short brown hair and a girl with long light brown hair in a ponytail. The boy wanted the iPad to read the description to him, but the girl wanted to read it out loud. They went back and forth a few times, but ended up listening to the description. When it was time to write each sentence, the boy would again want to listen to the entire description.

Another set of partners were two boys, one with short brown hair and the other with light brown hair. They spent the first few minutes off task; they did not open the apps and get started until Mrs. Lake came to their table and prompted them to begin. One of the boys said he did not have *Clio*, and Mrs. Lake told him to go to *Self-Service* to download it. After she walked

away, he realized he had *Clio* and opened it to begin. The other groups were all on task. They helped each other read the descriptions and discussed which facts they wanted to include. They helped each other spell difficult words by using the information they read on *Clio*. There were some conversations about the structure of the sentence: capital letters, punctuation, and how to word the sentence. One set of partners, a boy with short brown hair and a girl with shoulder-length blonde hair came up with a sentence, and the girl stated, "That sounds like a first grader." referring to the earlier conversation on plagiarism.

Mrs. Lake made her way around the room and stopped at each table to assist the partners. She spent longer amounts of time with students that needed more support, including the two boys that I discussed earlier that were not on task, and the table of individuals that worked alone. When she was with the students she would read the sentences they already wrote and asked questions that helped them make a decision about what information was important enough to include in their book. She made comments to some of the groups and asked them to reread the description, stating that when you did research you had to go back and reread several times so you did not miss any important information. In a few instances, the sentences were copied word-for-word, so she would read the sentence aloud and ask for other words that meant the same thing as the original word. One example of this was the word discovered. She asked the students for another word that meant the same thing as discovered. When the students could not think of one, she said, "If we went outside, and we discovered some butterflies, you might say that you *what* the butterflies?" The students responded, "Found them."

There were conversations about both the content of their projects and the iPad app. When the students asked Mrs. Lake how to spell a word, she did not tell them, but pointed out that they could find it on *Clio*, or they could attempt to spell it in *Book Creator*, and if it was

misspelled, it would be underlined in red and they could right-click and find the correct spelling. Mrs. Lake helped a set of partners, made up of a boy with short blonde hair and a girl with black shoulder-length hair with bangs. They had two sentences about a glass factory, but did not have a sentence that told what the factory manufactured. They just had the name of the factory that did not include the word glass. Mrs. Lake read the two sentences out loud and asked the students, "What does (factory name) do?" The students said they make glass, so Mrs. Lake told them to use that as the first sentence. She noticed the girl typing all of the sentences on one page. She explained to the girl that she could touch the next page and type the next sentence, and she also showed her how to highlight, cut, and paste so the girl did not have to re-type the sentence. Another thing I noticed about Mrs. Lake was that as she monitored the classroom, she would assist one group, get them to decide on what they were going to write, then leave the table to help another group. She would then return to the previous group to ensure they completed the task. The students worked in this manner for the remainder of the class. The total amount of time they worked in partners on *Clio* and *Book Creator* was approximately 30 minutes.

Some of the historical locations they researched included a cemetery, a state park, a baseball field, a bridge dedicated to a famous West Virginian, a glass factory, a historical log cabin, Civil War trail markers, and statues of famous Americans. Out of the five sets of partners and group of three, four were able to finish developing at least three sentences about their topic. As the class ended, Mrs. Lake got the attention of all the students to tell them they would continue this activity the next time they met. Those who had the sentences completed would be able to begin designing and editing their book. They would include photos, clipart, recordings, color changes, or whatever they wanted to make the book visually pleasant. The students got

excited, some clapped and others smiled. She asked each group to make sure they saved in *Book Creator* and clicked *My Books* at the top. She asked them to close the app, double tap the home button and swipe up to close all open apps. She asked them to line up and hug their iPads as they walked down the hall.

Observation 3: Mrs. Lake

The third and final observation in Mrs. Lake's classroom lasted one hour and 20 minutes and allowed me to observe two different classes, a second grade and a fourth grade. Each group was in the library for 40 minutes and included both a brief time for library book exchange and a technology lesson on West Virginia Standards. The second grade class had 20 students, 12 girls and eight boys. The fourth grade class had 19 students, six boys and 13 girls. The technology used during this time included the student iPads, *Seesaw*, the internet for research, *Book Creator*, and *Pages*.

The first class that came to Mrs. Lake was second grade. They entered the room with their iPads, went to the tables, sat down, and turned their iPads "apples up." Mrs. Lake began with some quick reminders about the available time left to check out books, the end of the year AR party, and schedule changes. They would be meeting two times that week due to state testing. She asked the students that needed to exchange books to bring them to her before browsing. Those who did not need to exchange were told to read or take an *AR* test while they waited. Mrs. Lake went behind her desk and began the process of checking in the returned books. The students were either quietly walking around looking at new books or were seated reading or taking an *AR* test. There were several more students in this class on their iPads and as I walked around, I saw that several of them were on *AR* taking quizzes, a few were on *Epic*, and others were looking at their library books. The library duties lasted approximately five minutes.

Once the library duties were completed, and all of the students seated, Mrs. Lake went to the front of the room and gave a brief overview of what they were going to accomplish during this class period. The students had started a research project on a famous West Virginian, working independently; each student had a different person. They were given a graphic organizer titled *Famous West Virginian Character Sketch* that Mrs. Lake referred to as their guide. This organizer had different boxes with topics the students had to research and address in their presentations. The topics were: date of birth/death, a physical description and character traits, major goal in life, greatest strength, greatest weakness, significance to West Virginia, and community/society contributions. Some of the students had completed the guide in the last class, and others needed to complete more research. Mrs. Lake had reviewed all of the guides over the weekend and circled the areas that still needed attention. She told the students with completed guides to choose a student that was not done to help. The student notes and a shortcut to the websites they used for research were saved in *Seesaw*. The helpers brought their iPads and were able to get to the same websites. Once the students were paired, and Mrs. Lake handed the guides to each student, they moved to a spot in the room where they would not be interrupted and began working.

Mrs. Lake circulated around the room to make sure everyone was completing the expected assignment. There was one boy that was still taking an *AR* test. Mrs. Lake reminded him of the work he was supposed to be completing. He quickly logged out of *AR* and opened *Seesaw*. There were a few different students that had some trouble with the part on character traits. Mrs. Lake used this opportunity to give a mini-lesson on character to the individual students. She said it was not enough to say they were "a good person." She talked about being more specific and finding out from the details in the research what kind of person they were:

brave, scared, etc. There was one boy that gave a physical description of "pretty." Mrs. Lake spent a few minutes and helped that student understand that pretty was an opinion, and he needed to describe exactly what she looked like. Another conversation I heard was about the major goal of a famous West Virginian. The partners stated that his major goal was graduating from high school. Instead of just telling the pair the answer, Mrs. Lake reread a section of the article about this person being an African American preacher and activist in the 1960s, then she asked questions until the pair came up with a major goal of wanting to make black and white people equal. She went around the room, stopping at each individual, to give a brief description of an area they did not complete. She made sure the students understood what they needed to look for in the research. She gave examples, asked questions, or gave non-examples.

Even though there were a lot of conversations going on, I had the opportunity to move to different groups and listen to partners. As I did, I heard many different aspects of learning taking place. Many students made connections to the reading. One boy was reading about his famous West Virginian and said, "Hey this guy was born seven days after my birthday." His partner said, "He was born in 1922. You weren't alive then." The first boy stated he knew the difference in the year, but the month was the same birthday month. There were several conversations addressing literacy skills, research skills, the importance of rereading when completing research, and conversations about being good digital citizens. One set of partners, a boy and a girl, worked on the guide and discussed differences between a graphic organizer and the presentation. The boy was reading and said a significance of the famous West Virginian was "Preaching." The girl stated, "Preaching is not a sentence." The boy retorted, "You can use just one word for the guide, but when you do your presentation, you make it a sentence." There was another conversation about reading the research. One boy said, "This crap is so hard." His

partner said, “If you can’t remember something you just have to go back and read it again.”, and then helped him to locate the information they were looking for. In another conversation I heard two boys working through the physical description and character section. One boy indicated his person graduated from Grant High School, so he must be from Grant County. The other boy looked at his sheet and realized he wrote the man lived in Charleston, so he could not have gone to Grant High School. They both went back to the research, found the section the first boy referred to and reread. It turned out the first boy was incorrectly reading the word Grant, it was Garnett, which was a career and technical school in Charleston. The students had conversations with Mrs. Lake about rewording their sentences instead of copying what was on the website. Many students helped each other with spelling and grammar as they referred to the website for difficult words. Two girls worked together, and the helper told the girl writing that she could not read her paper. Mrs. Lake came over and briefly talked about the importance of having a space between words to make it legible. As different groups finished, both partners went to help another group.

This partner work continued for approximately 24 minutes. Mrs. Lake then got the attention of the students and explained that she would look over the guides and return them on Wednesday when they came again. She explained that they would begin to create a presentation in *Pages*, using the information from the graphic organizer. The helpers that finished were told to collect their guides from their seats and return them to the folder and line up. When those students lined up, the remaining students brought their papers and pencils to the front and lined up. Students left the room holding their iPads to their chest.

The fourth grade class was lined up along the wall in the hall and waited until the second grade left before they entered the room with their iPads. When all the students were settled,

Mrs. Lake reminded them of the same information she told the second grade. She advised them of the time they had left to check out books, the information about the *AR* party, and schedule changes. She asked those who needed to check out books to begin browsing and the others to read a book, take an *AR* test, or read on *Epic*. The students were very quiet during the time it took to complete the library duties. I walked around and saw several students reading on their iPads, a few taking an *AR* test, and only two reading a book. The library check in/out time lasted approximately five minutes.

The technology lesson began when Mrs. Lake gave a quick overview of the activity. In the last class they finished their research on an industrial leader of West Virginia; each student researched a different industrial leader. They used the iPad and took notes using *Pages*. All of the students had finished the research, so they began to create their presentation using *Book Creator*. She explained that they had the free version so if there was already a book completed in the app, they would have to delete the app and go to *Self Service* to download it again. The free version would only allow for one book. She gave the students time to locate the app and download it if they did not have it on their iPad. There was only one student that needed the directions for downloading the app.

When all of the students were ready, Mrs. Lake explained that they were not to begin with the pictures for their book. She wanted them to add the information they found in their research first. Once they were happy with the words, they would find pictures to match what they wrote. She asked them to identify the first thing they see when they look at a book. They responded with, "The cover." She asked them what should be on the cover and they responded: title and author. They were allowed to make up their own title, but the name of the industrial leader had to be a part of it. Next, she reviewed a few of the features in the app: how to add text,

change colors, add photos or video clips, draw with the pen tool, and add sound. She gave the students a few minutes to work on the title page and encouraged them to be creative and make sure the title was bigger than the author's name. After two minutes, she stopped the students so they could discuss what the page set up would look like, but she told the students they would be allowed to go back and work at their own pace. The information that was included in the book was: background information, career choice, legacy, and one page for credits. She asked if anyone had questions, which there were none, and told the students they could move around the room and work where they were comfortable. The total time for whole group discussion was approximately 11 minutes.

The students moved around the room, some sat on the floor, some in the saucer chairs, a few girls went to the reading area that had beanbag chairs, and others remained at the table. Mrs. Lake circulated around the room and assisted students; once again, she did not tell the students what to write, but asked questions to allow the students to discover the corrections on their own. The majority of the conversations between the students and teacher were about the content of the book, not the app. She gave suggestions on wording and grammar, reminded them to use their own words, encouraged the students to use their notes, and told them the book had to be written in complete sentences. Occasionally Mrs. Lake would gain attention from the whole group to address some things she noticed as she worked with individuals. The students worked very quietly, even though some were sitting close to each other. As I walked around to observe, I noticed the students used the tools from the app appropriately with very few questions. There was very little conversation going on since the students completed this independently. When time was up she reminded them how to save the work they completed,

asked them to hit the home button twice, swipe up to close all of the open apps, and line up. The total time for the independent student work time was approximately 21 minutes.

Reflections from the Observations: Mrs. Lake

During my observations in Mrs. Lake's room, I witnessed many different grade levels using iPads, but I wanted to gain additional information that could only be provided by Mrs. Lake, so I conducted a follow-up interview when the observations were complete. There was evidence from the data that matched Mrs. Lake's perceptions about the impact iPads had on her students, classroom, and instructional practices. This section will provide some general thoughts on the lessons, teacher-student interactions, student interactions with the iPads, and how they matched the teacher's perceptions.

The interview with Mrs. Lake was completed in the library during her planning time. After some small talk, I began the interview. I asked Mrs. White if she felt the use of iPads had an impact on student learning. Her response was:

> More than half my career has been with iPads-- because when we first started I was in year three here when we first got our iPads and now I'm into year 11. I don't have as much pre-iPads, but it has made learning better for the students. They are more engaged. A lot of them are taught more on their own level because you can adjust a little bit more to their personal learning styles. They have more opportunities to do games that are actually learning. I know with the old math curriculum it was very much game centered to reinforce the skills, and I think the iPad games and apps and activities allow them to reinforce these skills too in an interactive way. I've just seen kids seem like they are more engaged. They'd rather type a lot of times than write things out, and they enjoy it more. It's a lot easier, and I was very anti-iPads when they first came in, very much so.

Evidence from my observations supported the idea of the students being more engaged. There were several times during my observations where I noted that the students were all on task with very little distraction. When the students were working in partners they were cooperative, openly discussed the assigned task, moved around the room without disruption, and completed what was expected. In observation one, the kindergarten lesson using *Keynote*, the students contributed to the lesson, stayed on task, and were engaged in the lesson. As I observed, I thought about what the situation would be like if they were doing the same lesson using pencil and paper. In my experiences working with children of this age, this would have been a tedious task to have the students write, word-by-word, all while keeping everyone together and focused. The use of the iPads allowed the students to create the *Keynote*, learn about famous places, and practice letters and sounds.

Mrs. Lake had mixed feelings about the impact iPads had on student achievement. Her response was:

> Yes and no. For the higher level kids, it's really helped a lot because they are able to be advanced a little bit more so that they can actually go above what their level is and have that challenge. I think yes for the lower level, because it gives them a different outlet to express themselves and talk. The middle level varies. Sometimes it helps and sometimes it doesn't really make that big of a difference. I know that sounds weird but you have some of them stuck in that middle, and they have a hard time staying there or rising above it, instead of dropping down.

I made a comment that those in the middle may be focusing too much on the tool, and she agreed:

> Yes. Instead of maybe getting the authenticity of the lesson.

When asked if she felt her struggling learners and special education students had been impacted by iPads, she said:

> I think so because a lot of times with the special education kids, they have a hard time communicating on paper and so with the iPads they can record themselves, they can do videos and posts all those kinds of things, and they are able to just be more authentic with themselves.

Just as in other observations, I noted several occasions where I could not tell which students were the struggling learners. The use of partners in the second grade lesson and the adult support in the kindergarten class, allowed for those slower learners to get support when they tried to generate ideas. The students helped each other with spelling, and through discussion they helped with sentence structure. When a student had a question about an iPad app, other students assisted.

She also noted that the behavior in her room had changed since she started using iPads because they were excited about what they were doing. She said:

> Like I said earlier, a lot of them are more engaged. You also can use it as a discipline tool as, 'If you can complete this task then you can have five minutes of iPad time or if can show me how to do this on the iPad then we can go on to this next level.' A lot of times it just depends on the child because there are some kids that yes, it's going to work and help their behavior, but then others no matter what you do so it's not going to change it, sadly. Overall, it does make them more engaged and more focused and enjoy it more.

Our discussion turned to the amount of time the students spent on iPads. She said they really tried to consider how much they used iPads:

> Okay, we try to really even limit that. We love our iPads, but we also think there's a time and place for them. There's sometimes where you just need to put the iPad aside and manipulate things. Touch and play. This past activity [in Tinker Time] we had was building castles out of pattern blocks. They had to count their shapes and know their shapes. That wasn't iPad related. Then my group was Osmos, where they would play on the Osmos to do math skills. We try to really balance that because we have noticed some kids can't write, but they can type, so you've got to get that balance in there and not iPads 100% of the time, or 0% of the time.

In the next part of the interview I addressed the impact iPads had on her classroom. I asked her if the iPad had caused there to be any differences in her classroom:

> I think it has because we are able to do more group activities where they each are able to pull in their strengths. If they each have one topic that one kid can talk about, they're really good at public speaking. The other kid is better at behind the scenes, and the other one is taking pictures. I think it has allowed for collaboration to happen a lot more without having to run to books or run to the computer or something like that. They have it at their fingertips where they're able to engage. Also, we do a lot of things on *Seesaw*, so they're able to see what other kids are doing and their parents can see it. When they know mom and dad are seeing it, they get excited like, 'Oh, look at this.' I just think that they enjoy it more, and they're more into it, and I just think that the whole classroom just wants to have the iPads.

The other area related to her classroom was the physical space. iPads had changed the way Mrs. Lake set up her room. She talked about the fact that she switched from being a classroom teacher to the librarian and had made changes to her seating, from putting desks into

a horseshoe design to using tables and adding different types of seating in her room for small group and independent work. She had used the set-up of her room to enhance the type of interactions the students had with each other. There was a lot more group work, which lets students move around the room and work where they are comfortable. In observations two and three, when the students worked in partners or independently on their research and presentation, the students moved around the room, sat in different areas, but remained on-task.

When the students did independent work, she allowed them to move around and find a quiet spot to work. They had even used pop-up tents, where the students could get in and work quietly. *Classroom* allowed for the teacher to have full control of the students' iPads. In the past, she said she would have hesitated to let students move around the room because she would not be able to have her eyes on them, and they might not be doing what they should. Having the students work in partners allowed Mrs. Lake to have more one-on-one time with the students. She used her teacher-student "conference" time to support and scaffold her assistance. She spent the majority of the independent and partner time monitoring the students, walking around the room, using questioning to help students to discover answers, and having conversations with individuals. There was a lot of individual attention given to the students during this part of the instructional time.

The iPad had an effect on her classroom management. She intertwined the management of the tool within her instruction. The little features of the iPad were part of the instructional process. An example was when she worked with the kindergarten class, she told the students that if they needed help, then they should have their keyboard visible. She then could scan the group and look for the visible keyboard and help that student. Looking for the keyboard was a subtle way to avoid the students yelling out for her attention. Each time a class left her room,

she told them to 'hug their iPads' as they walked down the hall. This technique was a way to stress the importance of caring for their iPads. When each class finished and saved their projects, Mrs. Lake had them double tap the home button and swipe up to close all open apps. This was a good way to show the students how to help save on battery life. Finally, she managed all presentations and lesson submissions with the use of a learning management system, *Seesaw* for the younger students and *Schoology* for the older students.

The next questions asked about Mrs. Lake's perceptions of how iPads impacted her instructional practices, including her pedagogical beliefs and any differences in her feelings about how students learn:

> I think so, because when we first got the iPads I was like, 'This is never going to work. These kids are never going to pay attention. They can't do this. They can't do that.' And, then I felt like a big idiot right after that [laughs], because I think that if you just give them a challenge, most of the time they're going to rise up to it because they're used to it. I think that, for me, I've been able to see, 'Okay, I've put these kids short in a lot of their things and they're actually able to do a lot more than I had actually anticipated.' We had a tech force team that did basically all the editing and everything for our videos that we were doing and I was like, 'There is no way this kid can do that,' knocked it right out of the ballpark. The transitions and everything. We have nine kids that are fourth and fifth grade that excel in technology and get along with each other, and we meet with them once a week most of the time. It's been two, lately. We just train them how to do an Apple Student Mentor Program so they get really good at Apple and *Numbers*, *Keynote*, *Pages*, *iMovie* and all of that. I think, for me, I've realized, they can do a lot more than I expected them too. They can really surprise you.

One part of Mrs. Lake's instructional practice that caught my attention was how much she integrated research and writing into each lesson. She included research no matter the age of the students. The first grade, second grade, and fourth grade classes had to read from articles or websites to find information. There were several conversations about using the information from the websites, but putting it their own words. Mrs. Lake thought that teaching research skills at a young age was very important because with the amount of information that was at the fingertips of every one of her students, it was very important they understood what plagiarism meant. She emphasized the idea that copying from the internet is "stealing other people's words."

When she was asked about how she managed integrating iPads with the county curriculum, she told me she does not have state standards as part of her position, but explained how she came to be the one who teaches the West Virginia Standards. Her response was:

> Well, I did it to help the teachers, because they all can't get to all these standards because they are so many. I told them that I would take the West Virginia Standards and cover them because a lot of times they didn't get to it. This year was an exception with the PBL because they all had to get to it, but the iPads have allowed us to be able to find information about West Virginia we didn't know, about people we didn't know. Our focus here has been strictly on West Virginia. We found symbols. We found places within the county to visit. We found famous people, we've learned about the history of the people here like different clothing, all that kind of stuff. We really just try - I take the standard and I'm like, 'Okay, how can I make that interactive for them and how can they show it in a way that's interesting to them?' The iPads allow a lot of that freedom to be able to pull in that information, for them it is good.

She explained that when she first took the position, Mrs. Gerhart wanted her focus to be on the iPad. She said:

> When I first came out I was like, 'What do you want me to teach, you don't want me to do library, what do you want?' 'Just teach the iPad.' I was like, 'Well, that gets kind of boring teaching *Numbers* all the time or *Pages* or *Keynote*.' I'd heard of somebody else in the county that did that and I was like, 'I love that, I love West Virginia. I've been here my whole life. That will be awesome for the kids to learn.' I post everything that they finished to *Schoology* or *Seesaw*, so the teachers can pull it down if they need it to take a grade, credit, or whatever they need to do.

When asked about the supports and challenges she was faced with due to iPad implementation, all of the challenges she listed had to do with the maintenance types of issues: internet going down, iPads not being charged or crashing, or apps getting deleted. Her supports included websites like Pinterest, Twitter, or Word of Mouth. The biggest support she had was the computer coach. This person was always available and willing to share ideas. They worked together to plan and implement Tinker Time on Fridays. Mrs. Lake felt motivated because she had the support of a colleague who was willing to try different things, even if it meant the activity may not be successful. She also had the support of her Vanguard team. They communicated electronically, both through email and Twitter.

The school culture was a driving force in Mrs. Lake's success with iPads. Mrs. Gerhart had high expectations for her staff and pushed the use of innovative technology lessons. She wanted them to use iPads daily and discouraged them from ineffective uses. The expectation was for them to be used in collaborative lessons. Having a room full of students on a program

while the teacher sat behind his/her desk was not viewed as an effective way to use iPads. This expectation went beyond the school walls and was expected at the county and state levels.

Professional development sessions that made a difference in Mrs. Lake's teaching included the Infusing Technology class. This class was her introduction to iPads; in fact, this was the first time she had an iPad in her hands. The Vanguard Training was also impactful:

> I think Vanguard honestly was the most helpful because I think we had to create an ideal classroom, so I think that forced me to think of, 'Okay, what does each classroom need, or what can I add that I don't have to help these kids and everything?'

As in the other rooms I observed, the iPads were a natural part of everyday instruction. Mrs. Lake attributed her daily use to the school culture. All of the teachers in the school used iPads every day. There was a school-wide implementation expected for kindergarten through fifth grade. Tinker Time had increased the interest and enthusiasm of everyone at the school and brought the staff together to learn, succeed, and fail.

When asked what advice she would give to someone interested in the use of iPads in their classroom, she said:

> Just do what needs to be done and you'll eventually get there, and don't underestimate the kids. I mean, like I said, they'll shock you [laughs]. They can do a lot. Give them choices. I've told them before, 'What do you want to do with this one? How do you want to show this?' I gave them some options. The fifth graders, recently they picked a texting story app where it's like they're texting with the person that they were researching, the West Virginia Advocate. They loved it. I'm sure they learned probably more than they would have if they just read about it. I would just say take it slow. Just stick with it. I think a lot of it is, the more you play with it, the more comfortable you get

with it. Talk to other people that have done it. Get some ideas from them. I think a lot of it is just patience, talking to other people, playing with it yourself and not to stress out. I don't think that you have to meet a certain goal at a certain time.

Softwood Elementary Principal: Mrs. Gerhart

Mrs. Gerhart was the principal of Softwood Elementary. I made arrangements to interview her, and we met in her office on a morning after the students were out for the summer. The interview questions were similar to those of her teachers so I could make a comparison of her perceptions about the impact iPads had on the students, classrooms, and the school leadership.

In the first part of our discussion I asked Mrs. Gerhart if she could talk about some of the iPad lessons she observed that were memorable. She spoke of some general lessons her teachers used such as individual programs like *Smarty Ants* and *ST Math*, which were a part of the county requirements. She had observed her teachers using time lapse, stop motion photography, and *iMovie* during science lessons. They used the Osmo in math, which had five different programs that the kids loved using. Osmo was an educational game system that allowed students to interact with the iPad, using hands-on activities. The students loved using the green screen app to present their learning. She told me:

> They really love using the green screen. We painted three green screens around the school in the hallways so that they can just easily walk out of the classroom. They use them all the time.

Another example she gave was:

> One of the best things I saw was they [students] were out in hallway creating a project. I think they were doing a planet project. The person that was videoing actually was

holding two iPads together. On one they were photographing, doing the videotaping of it, and on the bottom was a teleprompter. They put what they were saying on the bottom iPad so it looked like they knew their speech. It was very clever.

Next, I asked Mrs. Gerhart whether she felt iPads had an impact on student learning. Her response was:

I think it has because a lot of the programs that we have are differentiated. They're just right at their level. They take a benchmark test, and it sets them at the level they are working and then it helps them at their levels. I think that they enjoy having those iPads, their own iPads. We are one-to-one here and it's a really big deal to them. Most of our students have never known anything but having their own iPads at school because we got them so early. There's a lot of pride involved in their work.

She went on to tell me about an experience she had with a group of students:

We did this big PBL here at school. Every classroom was involved. They [the students] were to share how they want West Virginia to look when they grow up. I worked specifically with a few groups, and one of the groups was researching microgreens. They were talking about replacing strip-mined lands with lavender fields. One group worked on lavender, and one group worked on microgreens. We actually went to the Farmer's Market, I took a group down there to talk to a gentleman that had an article in the paper about microgreens, and they were just all over that, talking to him and learning about some nutrition involved. The lavender group grew the lavender in the classroom, and the other group grew the microgreens in the classroom. They were again using their iPads all during it, the research to create the final project, and they were sharing out. There was such engagement, the level of engagement is so up, and they were so

involved and proud at the end project because they're working collaboratively. There's lots of discussions going on during the project, sharing of ideas, and gathering information. Just the whole process is just wonderful to watch.

When asked if iPads had impacted student achievement, Mrs. Gerhart said she felt they had. She referred me to an iBook the school created as part of the Apple Distinguished School requirements, and while looking through the information I came across data from the state assessments for the 2015-2016 and 2016-2017 school years that showed significant growth in both math and reading scores. Mrs. Gerhart also spoke of a program they used on the iPads:

> We did have a program called Achieve 3000 and we loved that, but we lost it due to funding. This was a big blow. I feel like it really did improve test scores with ELA because when we lost it our standardized test scores dropped at the end of the year.

The discussion turned again towards the idea of engagement. Mrs. Gerhart felt that the engagement of the students played a big part in their achievement. They learned from each other when they worked in collaborative groups. Even the programs they worked on independently were very engaging, and the students really liked them.

When asked whether iPads had made a difference with student behaviors since Softwood's integration, she said:

> Well, they certainly do. It does seem to have increased the level of engagement, and it excites them. It is something that is in their life anyway. It's very much already present in their life at home. A great majority of them have tablets and phones and are already very good at this. It's bringing in something that they're already enjoying and is very much a part of their life. They just don't know a life without it. They really don't. I just think that it's like the three things they talk about in Apple, you definitely see it: you

have your mountain top where you're sharing out what you've learned, you have your cave moments where you're researching and doing your learning at your own pace and you're finding out the information, and then your campfires where you're collaborating. I see a great deal more collaboration now with iPads than I did before iPads and the higher level of engagement in their learning

Next, I asked about her views on the effects iPads had on the classrooms in her school, such as physical set up, classroom management, or curriculum. Mrs. Gerhart had seen a change in the physical set up of the rooms with teachers including flexible seating and collaborative group spaces. She said:

A lot of the teachers now have gone to the yoga mats, and different things; flexible seating in their classrooms. The kids like to go and huddle together, rugs on the floor and things like that in their learning. Little tables and things that they can gather at, just the way they arrange their desks. All of it, I think, has changed.

When asked about changes in classroom management, she said:

Well, we've just had to be sure that this digital citizenship is taught and that we adhere to that. When we catch a child that is not being a good digital citizen, than they lose their iPad for a while. The biggest thing is just the digital citizenship and understanding, and just learning how to manage that. That's where the technology coach and the technology specialist, now in the library, have pretty much taken over doing all of the digital citizenship lessons, so that takes it off the teachers' plates. That's been a big help, now the teachers can focus more on the standards.

The county provided curriculum was used as a supplement during instruction along with iPads. The teachers based their planning on the grade level standards. Each classroom was

involved in PBL activities. They had 40 minutes each week with the technology coach to learn the fundamentals of the iPad, and had a library/technology time each week with the technology specialist. Finally, there was the Tinker Time each Friday that was previously discussed. iPads had a significant effect on every aspect of the school, with the inclusion of things like the PBL activities, the technology coach and the technology specialist sessions, and Tinker Time. Mrs. Gerhart added:

> They are using the language, the technology language that, before, there was never any reason to use that in instruction.

Mrs. Gerhart was asked whether she felt the inclusion of iPads had changed her school culture. She responded:

> Well, we have an excellent culture here at the school to begin with and we did before iPads. We do the Covey leadership and we have that focus of the seven habits, so that was already there. The iPad and becoming an Apple Distinguished School, we put a lot of work into that and the kids put a lot of work into that too with their learning. The Friday STEM, and that involves a lot of technology. They use apps on the iPad that fly drones, the Osmo, the Spheros, the Dot-n-Dash, all those things are controlled using iPads. The STEM program that we put in, the students absolutely have loved that. That has made a significant impact on our culture because they love that STEM piece, so they look forward to Fridays. It's probably helped attendance and everything else with our school.

Examples of challenges and supports she shared with me mostly focused on keeping up and maintaining the technology. The county provided someone to come in and work with the technology, but that was not every day. She explained:

> Now, the challenge that our school faces is that we have a computer coach that the PTO pays for. This is the main reason that we did our big leap forward and got to be an Apple Distinguished School - because of our computer coach.

The computer coach was both a support and a challenge, the challenge was having to fund her position. She was the reason that the students and teachers got a double dose of technology instruction. The students got a pull-out in the library with the computer specialist, and they got a 40 minute session each week with the computer coach and the classroom teacher. So, the teacher was learning too.

I asked Mrs. Gerhart if she felt the school would have been as successful with iPads if they did not have the computer coach; she responded:

> No, because she's been here for a long time, building the base that we went from. When we were back doing laptops and using Microsoft, we were doing really well then, too. Then we switched to Apple with the county and quickly made the decision to go one-to-one. We had to go write grants and we had to fund the iPads and she went right along with that. We were the first elementary school in the county to do that.

The teachers spend time with the computer coach both in their 40 minute pullout session and during Tinker Time. Mrs. Gerhart explained that the computer coach was a member of the county Vanguard team and had an influence on the teachers in her school becoming members. As of the time of this interview, there were 10 staff members who had already gone through the training, and a few more were planning to become a Vanguard member during summer. She added:

> That is at least half of our teachers that have gone through the specialized Vanguard training. I don't think any school has the numbers like that because our own staff is very

dedicated to that. All of that, just a total infusion of that into all of our instruction, all the time is really what vaulted us to where we are, and we have the computer coach that has made a huge difference in us becoming what we are today.

I asked Mrs. Gerhart about her pedagogical beliefs, the types of professional development (PD) opportunities she offered her staff, and her style of overseeing and monitoring the implementation of iPads. In regards to her pedagogical beliefs, I asked if the iPads had changed how she thought students learned. She said:

> Yes I do. I just think that they are now used to having immediate satisfaction. They love YouTube. When you ask them, 'What do you want to be when you grow up?', they want to be a YouTuber or a game designer. The mindset of career paths is changing. The seating and the classroom management, all of that is very much changing from what it used to be.

Mrs. Gerhart provided PD opportunities for her staff. As talked about earlier, at least half of the teachers were members of the specialized county Vanguard team. As a part of the one-to-one cohort, the Softwood teachers had hosted and attended monthly after school sessions with other schools and members of the Vanguard. The sessions they had with the computer coach and STEM provided other opportunities for teacher learning. The teachers learned about new apps during after school "Appy Hour" sessions. They exchanged ideas and had discussions on how they could effectively use apps during their instruction. Several of the staff were involved in Twitter Chats every Tuesday with people across the state. One person acted as a host and posed questions to the group. There were ideas exchanged and experiences shared. The county technology team and the Apple Professional Development Specialists visited Softwood Elementary several times to work in the classrooms with the teachers. They planned and

demonstrated lessons. The Apple Teacher Certification was included in their PD. As discussed earlier, all of the teachers at Softwood are Apple Certified. Mrs. Gerhart stated:

> All of our professional development has been spearheaded into making us very, very, I don't know, just be able to take the lead in technology in this county. We have done that.

Our conversation ended after I asked if she had any words of advice for a principal that was just starting out on this journey. Her advice was, once your school made the decision to go in that direction, it took a lot of effort and hard work. You had to be prepared to replace the iPads as they got out of date. You had to continue fundraising, grant writing, and investing in the tools and people. It was important to make sure you had the right people on your staff that were prepared and ready to lead this endeavor. There was a lot of preparation to be done in advance. It was important to provide opportunities for teachers to learn, just help each other and have the right people in place to help everyone. You will have teachers that are not comfortable using iPads, so having the correct PD and people in place to move them along is key. She stated:

> I think that's the biggest thing. It's just that the reason most of them [teachers] don't [use iPads] is because they're not confident and they're not sure of themselves. They don't want to look foolish in front of the kids who are already so knowledgeable. I think it's just having good professional development in place to give your staff that confidence to go out there and use them. It's also important to let the kids lead. We have a Tech Force here. It's been about three or four years ago, we went on the fifth-grade trip and I always ask the kids where they wanted to go. They wanted to go to an Apple Store since there are none in West Virginia. We traveled to Columbus to visit the Apple Store. From that evolved, 'We need a Genius Bar here at school and we need to let the

> kids lead with this.' We created the Tech Force and we have 10 kids in the fourth and fifth grades and they literally go out and they help in the classrooms. I've had six kids now that have become Apple Mentor Students. That is a huge award to win as children. That student leadership is wonderful.

Mrs. Gerhart attributed the success at Softwood Elementary to its culture because they had so many people on board with the same mindset and they moved others along. She finished with:

> Having the two extra people, STEM time, and 10 Vanguard members, people that have had that training, has really made this school soar. There's been such an amazing change to our school since these have been added to our curriculum.

CHAPTER 5

FINDINGS AND DISCUSSION

The purpose of this study was to identify and align instructional practices with the Technology Integration Matrix (TIM) (Appendix B) and to gather data during classroom observations and individual interviews to tell a story of how teachers and principals perceived their journey with iPads. This story included how they reached the level of technology integration and how being part of a one-to-one iPad initiative evolved related to their students, classrooms, and instructional practices. Included in this chapter are the findings that support each research question, an explanation of themes that emerged from the data connected to each question, connections to current literature, and suggestions for future research.

Research Question One

How are the various levels of the Technology Integration Matrix – entry, adoption, adaptation, infusion, and transformation, and the classroom attributes of active, collaborative, constructive, authentic, and goal-directed – represented as instructional practices in classrooms of elementary teachers within schools identified as part of a one-to-one cohort?

The TIM was used as a measure to determine the level of technology integration and the classroom attributes for each of the 19 observations completed. The observations provided examples of lessons that the researcher and participating teachers categorized and placed on the TIM, after collaboratively reviewing the TIM descriptors and the extended descriptors for each level. The surface definitions for each identified cell on the Technology Integration Matrix (Florida Center for Instructional Technology (FCIT), n.d.a) are repeated in Tables 3-5; however, review of extended definitions (FCIT, n.d.b, FCIT, n.d.c, FCIT, n.d.d) was required to fully understand each level and attribute and support the placement of observed lessons within the

matrix. Table 2 shows that the observed instructional practices include: two examples of Adoption, 10 examples of Adaptation, and seven examples of Infusion. These examples fall within the Active, Collaborative, Constructive, and Authentic learning attributes. No examples were observed for the Entry and Transformation levels, or for the Goal-Directed attribute. A brief description of each instructional activity is provided, along with a summary of the evidence used to determine each level.

Table 2 *Alignment of Observations to the Technology Integration Matrix*

	Entry Level	Adoption Level	Adaptation Level	Infusion Level	Transformation Level
Active Learning		**Softwood Elementary** Mrs. Lake Obs. 1 - *Keynote* Presentation on Mountaineer Country	**Lincoln Elementary** Mrs. Jones Obs. 3 - *Doc Scan* App Practicing Money **Forrest Elementary** Mrs. Smith Obs. 1 – *Smarty Ants,* Reading Rotations **Forrest Elementary** Mrs. Williams Obs. 1 – *Smarty Ants,* Reading Rotations		
Collaborative Learning			**Lincoln Elementary** Mrs. Jones Obs. 2 - *Readworks* Partner Reading	**Lincoln Elementary** Mrs. White Obs. 2 – *Numbers* App Comparing Poetry and Drama **Softwood Elementary** Mrs. Lake Obs. 2 – *Book Creator* and *Clio*, WV PBL	

Constructive Learning	**Lincoln Elementary** Mrs. Jones Obs. 1 – *Money Pieces* App Counting to a Dollar	**Softwood Elementary** Mrs. Snow Obs. 1 - *Show Me* App Review of Turnaround Facts **Softwood Elementary** Mrs. Snow Obs. 2 – *Kahoot* Review of Reading Story **Forrest Elementary** Mrs. Smith Obs. 3 – iPad Camera and *Seesaw*, Friendly Numbers **Forrest Elementary** Mrs. Williams Obs. 2 – *Epic*, *Smarty Ants*, *ABC Mouse* Apps, Reading Rotations **Forrest Elementary** Mrs. Williams Obs. 3 - *ST Math*, Math Rotations	**Softwood Elementary** Mrs. Snow Obs. 3 – *Metaverse* Augmented Reality Activity, Math Review **Softwood Elementary** Mrs. Lake Obs. 3 (2nd Gr) – *Book Creator*, WV PBL Famous West Virginians **Softwood Elementary** Mrs. Lake Obs. 3 (4th Gr) – *Book Creator*, WV PBL Industrial Leaders **Forrest Elementary** Mrs. Smith Obs. 2 – *Popplet* WV PBL State Symbols
Authentic Learning		**Lincoln Elementary** Mrs. White Obs. 3 - *Pages* Symmetry Review	**Lincoln Elementary** Mrs. White Obs. 3 – PBL Presentations, Internal/External Structures
Goal - directed Learning			

Adoption

With adoption, "The teacher directs students in the conventional and procedural use of technology tools," and "Students exposure to individual technology tools may be limited to

single types of task." (FCIT, n.d.b, p. 1). Two lessons were identified at the Adoption level (see Table 3). The lessons aligned to the Active and Constructive attributes.

Table 3 *Observations at the Adoption Level of the TIM*

	Active Adoption	**Collaborative Adoption**	**Constructive Adoption**	**Authentic Adoption**
Definitions	Conventional, procedural use of tools.	Collaborative use of tools in conventional ways.	Guided, conventional use for building knowledge.	Guided use in activities with some meaningful context.
Adoption Level Observations	**Softwood Elementary** Mrs. Lake Obs. 1 – *Keynote* Presentation on Mountaineer Country		**Lincoln Elementary** Mrs. Jones Obs. 1 – *Money Pieces* App Counting to a Dollar	

Active Adoption. The lone lesson that was represented as Active Adoption was at Softwood Elementary with Mrs. Lake during observation one. She worked with a kindergarten class to teach them the features of *Keynote*. They completed a presentation on Mountaineer Country. The lesson was conducted as a whole group with students working on their own *Keynote*, but completing the same task. Technologically, there was an emphasis on learning how to add slides and insert pictures. Academically, students worked on letter recognition and learning about their state.

During the interview with Mrs. Lake, we reviewed the definition of Active Adoption on the TIM and the extended descriptors. A few keywords generated discussion: "the teacher directs the students" and "conventional and procedural use" (FCIT, n.d.a, p. 1) and "very limited and regulated access to the technology resources" (FCIT, n.d.b, p. 1). These terms helped us decide that this was the correct level. The level of technology integration was determined to be Adoption because Mrs. White instructed the students on the exact content of the lesson and gave step-by-step directions on the procedures needed to complete the *Keynote*. Under the characteristics of the learning environment, the definition included the terms

"actively engaged" (FCIT, n.d.a, p. 1). The attribute was determined to be Active because the students were not passive learners during this lesson. They contributed with responses when asked about the letters, openly asked questions or commented during instruction, and completed the tasks on their own iPads; but the teacher controlled the technology that was being used and the content of the presentation.

Constructive Adoption. The lone lesson that was represented as Constructive Adoption was at Lincoln Elementary with Mrs. Jones during observation one. In this lesson, Mrs. Jones asked the students to practice recognizing and counting coins. After an initial review of the value of each coin, the students worked in partners with *Money Pieces* and manipulated coins to figure amounts to one dollar.

Mrs. Jones and I agreed this lesson fell under the category of Constructive Adoption. The Adoption level was determined because the students used the technology in conventional ways while the teacher instructed the students on the features of the app. Mrs. Jones controlled the type of technology being used during instruction. The Constructive attribute was determined because the students used the app to make a meaningful connection between their prior knowledge and new information. When the students partnered up and had to decide what coins to use to make a dollar, they had to use their knowledge of the value of each coin and connect it to the new concept of making one dollar.

Both examples at the Adoption level consisted of teacher-directed instruction as students used iPads in conventional ways. The lessons guided student learning about the apps while practicing with content related to their grade level standards.

Adaptation

Adaptation indicates, "The teacher facilitates students in exploring and independently using technology tools" (FCIT, n.d.a, p. 1). Ten lessons were identified at the Adaptation level (see Table 4). Related attributes include Active (3), Collaborative (1), Constructive (5), and Authentic (1).

Table 4 *Observations at the Adaptation Level of the TIM*

	Active Adaptation	**Collaborative Adaptation**	**Constructive Adaptation**	**Authentic Adaptation**
Definitions	Conventional independent use of tools; some student choice and exploration	Collaborative use of tools; some student choice and exploration.	Independent use for building knowledge; some student choice and exploration.	Independent use in activities connected to students' lives; some student choice and exploration.
Adaptation Level Observations	**Lincoln Elementary** Mrs. Jones Obs. 3 - *Doc Scan* Practicing Money **Forrest Elementary** Mrs. Smith Obs. 1 – *Smarty Ants*, Reading Rotations **Forrest Elementary** Mrs. Williams Obs. 1 - *Smarty Ants*, Reading Rotations	**Lincoln Elementary** Mrs. Jones Obs. 2 - *Readworks* Partner Reading	**Softwood Elementary** Mrs. Snow Obs. 1 - *Show Me* Review of Turnaround Facts **Softwood Elementary** Mrs. Snow Obs. 2 – *Kahoot* Review of Reading Story **Forrest Elementary** Mrs. Smith Obs. 3 – iPad Camera and *Seesaw*, Friendly Numbers **Forrest Elementary** Mrs. Williams Obs. 2 – *Epic*, *Smarty Ants*, *ABC Mouse* Apps, Reading Rotations **Forrest Elementary** Mrs. Williams Obs. 3 - ST Math, Math Rotations	**Lincoln Elementary** Mrs. White Obs. 3 - *Pages* Symmetry Review

Active Adaptation. Three lessons were identified under Active Adaptation. The first was at Lincoln Elementary with Mrs. Jones during observation three. The students learned a new app called *Doc Scan* while reviewing the recognition and value of coins. In a previous lesson, the teacher showed the features of the app while the students watched. At that time, they did not download the app or explore it on their own. During the third observation with Mrs. Jones, the students quickly reviewed the features, downloaded the app, and explored it with a partner while completing a review assignment on coins.

This lesson was considered Adaptation because the teacher chose the tool but allowed the students to investigate and discover the app functions while working with problems. The students were familiar with the tool as they explored the features. During this observation, the teacher acted as a facilitator instead of directing the students through each step. The learning attribute was considered Active because the lesson allowed the students to actively engage in learning the technology. In my fieldnotes, I noted comments that students made during their investigation of the app, such as "Mrs. Jones look what I found out you could do." and "Did you know that you could…?", that supported their active involvement

The next Active Adaptation lesson was observed at Forrest Elementary with Mrs. Smith during observation one. The entire class was involved in small group reading rotations. The focus of my observation was on the group that used *Smarty Ants* for independent work to support their reading skills of decoding, practicing sight words, fluency, and comprehension.

This lesson was considered Adaptation because the teacher chose the tool, but the students used *Smarty Ants* independently. There were very few questions asked about the app or iPad during the three rotations observed. Students seamlessly transitioned into the independent group, gathered their iPads, logged in, and worked through the app without teacher intervention.

The teacher acted as a facilitator and only intervened when there was a question. In this instance, there was only one girl that needed assistance during all three rotations. This lesson was considered Active because the students were hands-on with the app and remained actively engaged in the learning. Throughout the observation I noted several times that the students remained on task. There was little interaction between the children, except to share with other students what they accomplished while they worked. They talked about tickets they earned, games they played, or levels they finished in *Smarty Ants*.

The last Active Adaptation lesson was at Forrest Elementary with Mrs. Williams during observation one. This lesson was similar to the above lesson, with students working in small, independent reading groups using *Smarty Ants*, while the teacher and reading interventionist worked face-to-face with small groups. The main difference was that the groups did not rotate, so the independent group stayed on *Smarty Ants* for the entire observation.

This lesson was considered Adaptation because the teacher was in control of the app used, but the students used *Smarty Ants* independently with only a little interaction with the teacher. The kindergartners were clearly familiar with using the app and iPad and did not ask questions about any of the features. The students transitioned into the independent group with no disruption and no needed assistance. They accessed the iPad and worked through the app self-sufficiently. The teacher had little interaction with the independent group. When there was interaction, she facilitated the lesson with questioning techniques to get the students to discover their own answers.

Collaborative Adaptation. There were two examples of Collaborative Adaptation. The first was at Lincoln Elementary with Mrs. Jones during observation two. In this lesson, the students used *Readworks* while working with a partner, read two articles with subjects

associated to the PBL they were involved in, and completed comprehension questions. The assignment was submitted through the app, and the students and teacher received immediate feedback on the results.

Mrs. Jones and I decided this was Adaptation because she provided an opportunity for students to explore *Readworks* without interference. They were able to work through the lesson without direct instruction from the teacher. It was obvious the students had experience with the program because the only questions they asked had to do with the content of the articles and related assessment questions. The lesson was considered Collaborative because the students worked in partners to complete the activity. There were several examples of partners supporting each other during the lesson. If one student did not know an answer, the partner provided support, such as demonstrating how to use the app or showing where an answer could be found. For example, there were other instances where I overheard a student reminding a partner which button to push to submit the assignment.

The second Collaborative Adaptation lesson occurred at Softwood Elementary with Mrs. Lake during observation two. The first grade students were involved in a PBL about West Virginia. They used their iPads as a research tool to find interesting facts about well-known West Virginia attractions close to them and as a tool for creation. They used two apps for the lesson: one partner had *Clio* opened as the research tool to gather information, while the other had *Book Creator* opened as the creation part of the lesson.

The level of technology for this example was categorized as Adaptation because the students did not ask questions about the technology, which showed they had knowledge of the apps and features. The teacher was a facilitator, monitoring the students without becoming the central part of the lesson. It was considered Collaborative because the technology was used by

both partners to support each other in the process of researching and creating a book about their assigned West Virginian attraction.

Constructive Adaptation. The Constructive Adaptation level had the largest number of instructional examples. Out of the 19 lessons observed, there were a total of five lessons that fell into this category. The first example was at Softwood Elementary with Mrs. Snow during observation one. During the lesson the students used *Show Me* to practice turnaround facts in preparation for the state standardized assessment. They completed a review of multiplication facts and ended the lesson with a reflection, on how they used pictures to solve math problems, in the form of an exit slip using *Doc Scan.*

This lesson was considered Constructive because the students used the apps as a source of constructing meaning. They used pictures, tally marks, or shapes to gain an understanding of the visual representation of turnaround facts. They also used the tool without direction from the teacher, which showed they were comfortable with the tool. Instead of leading the students in the front of the room, the teacher acted as a facilitator by allowing the students to make choices of how they used the iPad features to represent the numbers, and by letting them use the iPad without teacher-led instruction. Throughout the lesson, Mrs. Snow made comments that encouraged the students to use any means to figure the answer in the way that made the most sense to them. This lesson was considered Constructive because the students used the apps to connect their prior knowledge with the visuals they constructed independently. Once again, the evidence showed that the students were familiar with the iPad and apps. In fact, they completed the activity without asking any questions about the apps; the only questions were about the content.

The second Constructive Adaptation lesson was also at Softwood Elementary with Mrs. Snow during observation two. The lesson started with a discussion post in *Schoology* as a warm-up; then students read a play in their reading book before ending with a game on *Kahoot* that included comprehension questions from the play to check for understanding.

The decision to place this lesson in the category of Adaptation was made because the teacher facilitated the lesson, but the students used the tool independently for both the pre-reading *Schoology* discussion post and as they played the *Kahoot* game. Once again, no questions were asked about the tool which proved they were familiar with the tool and the apps used. The lesson was placed at the Constructive level because the students used the technology to make meaning from their own experiences. The first part of the lesson included a pre-reading question that allowed them to demonstrate their current knowledge of heroes. The final part of the lesson allowed them to make a connection to what they read.

The third example of Constructive Adaptation was at Forrest Elementary with Mrs. Smith during observation three. The lesson was a review of friendly numbers. The students used plastic links to demonstrate a series of friendly numbers that added up to 100, then took and uploaded a photo of their constructions. Finally, they used the recording feature in *Seesaw* to record an explanation on their work. The technology they used was the iPad camera roll and the online portfolio available in *Seesaw*.

We determined this lesson was Adaptation due to the teacher acting as a facilitator and letting the students use the technology without a lot of direction. Mrs. Smith designed the lesson to include technology that allowed the students to show evidence of their understanding in the form of photographs. The students needed little assistance in accessing the camera, uploading the photo to *Seesaw*, or recording their explanation. Mrs. Smith facilitated the lesson with more

of an emphasis on the content than with the tool. The lesson was considered Constructive because the students independently used the iPad in a new way to demonstrate their knowledge of content. This was the first time they uploaded a photo to *Seesaw* and recorded an explanation. They completed their assignment independently even though the task was new. They were familiar enough with the iPad features that they did not need a lot of direction from Mrs. Smith.

The fourth example of Constructive Adaptation was at Forrest Elementary with Mrs. Williams during observation two. The observation occurred during reading instruction. The class was involved in small groups with an independent group working with the iPads. The difference between this observation and the first one with Mrs. Williams, was that the students had the option choosing which program to use: *Smarty Ants*, *ABC Mouse*, or *Epic*.

The label of Adaptation was assigned to this lesson because the students worked independently on the iPad with the teacher acting as a facilitator. The teacher gave directions, separated the groups, and then monitored the students while she worked with her small group. The only interaction with the independent group was to remind the students what their responsibility was during the group time. The students stayed on task during the duration of the lesson and worked through the programs without assistance. The lesson was considered Constructive because the students used the apps to help develop their knowledge. *Smarty Ants* was a prescriptive program that provided an initial assessment to determine the students' needs, and the activities assigned were based on mastery of each skill. *Epic* and *ABC Mouse* also provided students with opportunities to practice needed skills. All of the apps could be used independently, away from their teacher, to work on grade level standards that helped them to build on their conceptual knowledge.

The fifth and final lesson under Constructive Adaptation was also at Forrest Elementary with Mrs. Williams during observation three. During this math lesson, students worked in small groups, including an independent group that used *ST Math*. Students worked through puzzles to try to get JiJi the penguin across the screen. There was problem-solving involved with each puzzle that was based on the skill level of the student. In other words, each student worked on a different skill based on individual needs.

We decided this lesson went under Adaptation because, once again, Mrs. Williams did not directly instruct the students on the app during the observation, but monitored the students as she worked with another small group. She was also able to monitor them through the app, which immediately showed what they worked on, how much they accomplished, and what skills proved difficult for each student. The students were familiar with the app and did not ask any questions about the tool, just a few questions about the content. This lesson was also considered Constructive because the students independently constructed their own meaning with the help of the iPad and in some cases, the use of manipulatives. During this lesson I noted a few students that required manipulatives to help them visualize and understand the problem presented. The iPad was a tool to help them develop an understanding, but the manipulatives were also a tool for those who needed that hands-on approach. They did not seek out the teacher for help, but rather used the program and/or manipulatives to assist them in developing their understanding.

Authentic Adaptation. One lesson was categorized as Authentic Adaptation. It occurred at Lincoln Elementary with Mrs. White during observation one. In this lesson students reviewed lines of symmetry. They used their iPads to take pictures, uploaded the pictures to *Pages*, and drew lines and added explanations of how they knew there were lines of symmetry.

This lesson was considered Adaptation because the students used the iPad independently without direction from the teacher. Mrs. White mostly acted as a facilitator. This lesson was the first time they used Pages to upload photos and draw on them, so she briefly instructed the students how to complete the assignment, but the students spent the majority of time exploring the app and completing the activity on their own. We decided the lesson was Authentic because the teacher created a lesson that allowed the students to use the iPad to connect what they were learning in the classroom with the outside world. Using real-world examples, with the inclusion of pictures they took outside, let the students make connections beyond their classroom.

The lessons described above are considered Adaptation because of the change in the role of the instructor. The teacher took on a facilitator's role rather than the center of instruction. The students were comfortable with the apps and knew how to maneuver through them. They worked with the tools independently with a focus on gaining a deeper understanding of the technology and the standards they were trying to master.

Infusion

With Infusion, "The teacher provides the learning context and the students choose the technology tools to achieve the outcome," (FCIT, n.d.a, p. 1) and "Infusion level work typically occurs after teachers and students have experience with a particular technology tool." (FCIT, n.d.d, p. 1). Each definition noted on Table 5 emphasizes "choice of tools" (FCIT, n.d.a, p. 1), which may not seem to fit with some of the interpretations noted below. However, the extended

definition for Infusion allows for use of "a range of different technology tools" (FCIT, n.d.d, p. 1) and promotes enabling students "to make informed decisions about when and how to use different tools" (FCIT, n.d.d, p. 1). Table 5 identifies seven Infusion lessons that were observed during the 19 observations. The lessons related to the Collaborative (2), Constructive (4), and Authentic (1) learning attributes.

Table 5 *Observations at the Infusion Level of the TIM*

Infusion	Active Infusion	Collaborative Infusion	Constructive Infusion	Authentic Infusion
Definitions	Choice of tools and regular, self-directed use	Choice of tools and regular use for collaboration	Choice and regular use for building knowledge	Choice of tools and regular use in meaningful activities
Infusion Level Observations		**Lincoln Elementary** Mrs. White Obs. 2 – *Numbers* App Comparing Poetry and Drama **Softwood Elementary** Mrs. Lake Obs. 2 – *Book Creator* and *Clio*, WV PBL	**Softwood Elementary** Mrs. Snow Obs. 3 – *Metaverse* Augmented Reality Activity, Math Review **Softwood Elementary** Mrs. Lake Obs. 3 (2nd Gr) – *Book Creator*, WV PBL Famous West Virginians **Softwood Elementary** Mrs. Lake Obs. 3 (4th Gr) – *Book Creator*, WV PBL Industrial Leaders **Forrest Elementary** Mrs. Smith Obs. 2 – *Popplet* WV PBL State Symbols	**Lincoln Elementary** Mrs. White Obs. 3 – PBL Presentations, Internal/External Structures

Collaborative Infusion. There were two Collaborative Infusion lessons included on the framework. The first was at Lincoln Elementary with Mrs. White during observation two. The students in Mrs. White's room worked in groups of three to read two plays. In a previous lesson they read poetry and discussed the characteristics of poems. The goal of the lesson I observed was to gain experience with dramas and then use the knowledge they gained in the previous lesson to compare the two genres. After they read the plays, they used *Numbers* to create a Venn Diagram that compared/contrasted the characteristics of poetry versus drama. Students completed this work in small groups. The lesson ended when the students individually recorded videos explaining why they liked either poetry or drama better.

This lesson was categorized as Infusion because the technology was always available to the students, was part of their everyday instruction, and students demonstrated a comfort level with the iPad that showed they had a lot of experience with the tool beyond the Adaptation Level. The teacher provided an opportunity for the students to use the iPad in both a small collaborative group and individually. The students transitioned from the part of the activity without technology, to using the iPad effortlessly. Even though they all used the same app, choice was given in the creation part of the lesson. Each group was left alone when they developed their Venn Diagram and individuals were given freedom when they created their video reflections. The observation confirmed that students' use of the iPad was a natural part of their learning. The lesson was considered Collaborative because the students worked in small groups as the teacher facilitated those groups. They took on the majority of their own learning within the collaborative groups. The comments recorded during my observation validated the fact that the students supported each other through the process. A video example provided for elementary students for Collaborative Infusion, Photo Essays (FCIT, n.d.e), illustrates a similar

lesson where students demonstrate their knowledge with the use of multiple technologies, and "seamlessly" move between sources of information and creative applications to demonstrate their learning.

The second Collaborative Infusion lesson occurred at Softwood Elementary with Mrs. Lake during observation two. The first grade students were involved in a PBL about West Virginia. They used their iPads as a research tool to find interesting facts about well-known West Virginia attractions close to them and as a tool for creation. They used two apps for the lesson: one partner had *Clio* opened as the research tool to gather information, while the other student had *Book Creator* opened as the creation part of the lesson.

The level of technology for this example was categorized as Infusion because even though the teacher chose the tool, the students moved between research tools like the Internet and *Clio,* into the creative part of the lesson with *Book Creator*. The teacher was a facilitator, monitoring the students without becoming the central part of the lesson. The students did not ask questions about the technology, which showed they had knowledge of the apps and features. The lesson was considered Collaborative because the technology was used by both partners to support each other in the process of researching and creating a book about their assigned West Virginia attraction. A video example provided for elementary students for Collaborative Infusion, Space Exploration (FCIT, n.d.f), illustrates a similar lesson where students "seamlessly" move between using research applications as sources of information and creative applications to demonstrate their learning.

Constructive Infusion. There were a total of four Constructive Infusion lessons on the framework. The first was at Softwood Elementary with Mrs. Snow during observation three. In this observation Mrs. Snow used *Metaverse* to create two augmented reality activities for the

students to practice their current math skills and experience the math skills for the upcoming fourth grade year. The students worked through several questions at each grade level through the app and submitted their results to Mrs. Snow. To end the activity, she asked them to reflect on their experiences with *Metaverse*. They were to choose which set of questions they liked better and give their feedback through the app.

We decided this lesson fell into the Infusion category because, even though it was Mrs. Snow that chose the technology, it was the students that took control of figuring out the app. The teacher gave them the learning goal and the students chose how to reach those goals on their own. We felt the level of understanding of the tool went beyond the Adaptation Level. Mrs. Snow said *Metaverse* had not been used in her room prior to this lesson. The students also provided feedback to Mrs. Snow about their experiences with the tool which were insightful. The feedback showed the students were able to transfer their understanding of other apps to a new one and we both felt this put the lesson into the category of Infusion. I noted that there were very few instructions given to the children. The students had the iPads available and took it upon themselves to figure out how to use the app. Mrs. Snow monitored and acted as a facilitator, only giving small amounts of support. The Constructive label was assigned to this activity because the students independently used the iPad to assist in their understanding of the content and used their experience with *Metaverse* as a means for constructing their feedback.

The second Constructive Infusion lesson took place at Softwood Elementary with Mrs. Lake during observation three. During this observation I was able to watch two classes: a second and fourth grade. Even though they used similar programs, for the purpose of the findings I will consider the two lessons separately due to the differences in how they approached the technology.

The first part of the observation was a second grade class that worked on a PBL project to describe the characteristics of a famous West Virginian. In previous sessions, the students were assigned a famous West Virginian and had to create a graphic organizer (paper and pencil version) of the character traits of the assigned person. In this lesson the students used their graphic organizer to create a book in *Book Creator*. Mrs. Lake used *Seesaw* to provide links to websites that would aid in locating the information for the outline. The students completed their graphic organizers using the links provided.

This activity was considered Infusion because the students used multiple tools for the purpose of research, the use of a graphic organizer to collect their data, and a creative app to demonstrate their learning. The students made decisions about what research to use from the websites, when and how to use the research, and decided on what to include as part of their book in *Book Creator*. Mrs. Lake facilitated as she moved around from table to table and conferenced with each student, asking questions or giving clues about where they could find the needed information. There was little discussion about the iPad, *Seesaw*, or websites. The majority of the discussion was about the content. The category of Constructive was assigned to this activity because the sole purpose of the tool was to allow the students to gather the information about their famous West Virginian. Mrs. Lake was not the source of information, but planned a lesson that allowed the students to use technology to gain knowledge and construct their own meaning.

The third Constructive Infusion lesson was the fourth grade that followed. They also worked on their PBL. They researched and took notes on industrial leaders of West Virginia using links provided through *Seesaw*. In previous classes, they completed their research and

prepared their notes using *Pages*. The goal for the current lesson was to begin creating their presentations using *Book Creator*.

This lesson was considered Infusion because the students used multiple methods of research to prepare for creation of their books. They moved effortlessly between the research tools and creation app, making independent decisions on what and how to use the research. Another reason was that they used their previous knowledge of other iPad apps to learn a new app. Mrs. Lake took some time at the beginning to review the features of *Book Creator*, but the majority of the time was spent allowing the students to explore the app on their own and become familiar with the tool. Mrs. Lake's role was facilitator as the students experimented with the features to create their books. The students appeared to be comfortable working through *Book Creator*. Evidence from my notes showed little discussion of the tool. Most discussion centered around the content and creative aspects. The label of Constructive was assigned to this lesson because the students used the apps to connect what they learned to the development of a story. Using *Book Creator* gave them an opportunity to present information they learned in a creative manner. The students' interests lay in the creation of their books, but still included a connection to the learned content. Comments made by students proved that this was a fun way for them to share information.

The final example of Constructive Infusion was at Forrest Elementary with Mrs. Smith during observation two. The activity included the students using the *Popplet* app to create a word web of West Virginia. Mrs. Smith took some time at the beginning to describe the expectations and briefly went over how to use *Popplet*, since this was the first time the students used the app. The students took pictures of places and items that represented West Virginia and uploaded the photos into the *Popplet* app, organizing them in a manner they decided. Once the

word web was complete, they uploaded the finished product to *Seesaw* and added explanations, either in writing or as a voice recording.

The decision to place this lesson in Infusion on the framework was made due to the students using multiple sources of information to create a word web. The teacher chose the tool, but the students used their prior knowledge of other apps to explore and use the new app. Mrs. Smith took the role of facilitator and identified the content, but allowed the students to use the *Popplet* app as they wished. She gave some direction at the beginning as far as telling them about the features, but the majority of the lesson was used for the students to explore the app. The first grade students made independent decisions on what and how to use the information in order to demonstrate their knowledge in an organized manner. The lesson was considered Constructive because the students had the opportunity to use the iPad to both learn the app by investigating on their own and to make the connection to their current knowledge and new learning. They had to take the content and organize it within the app so that it made sense, and they had to verbalize the process they used to organize the content. A similar example is provided as a video, The Ducklings Have Hatched! (FCIT, n.d.g), where students demonstrate their knowledge with the use of multiple sources of information, and "seamlessly" move between sources of information and creative applications to demonstrate their learning.

Authentic Infusion. The only lesson categorized as Authentic Infusion was at Lincoln Elementary with Mrs. White during observation three. The students presented their technology projects for the PBL they completed. The class was given the choice to use any method for completing their end products: technology, posters, essay, etc., and could design them as they wished. The PBL began with a driving question that resulted in students researching and creating a new breed of plant or animal by combining the internal and external structures of two

existing animals or plants. During my observation, the students who chose to use a form of technology shared their presentations. Students' choices varied and demonstrated use of *Keynote*, *TouchCast*, *iMovie*, and *Chatterpix*.

Mrs. White and I determined this lesson to be an Infusion lesson because the students chose the technology to complete their projects, while she acted as a facilitator. The students also reflected on their reasons for selecting the technology they used. For the students who used iPads to create their presentations, the tool assisted them in demonstrating their learning including building on their prior knowledge. For this reason, the lesson was deemed to be Constructive.

The lessons described above are considered Infusion because the teacher provided the learning goals and allowed the students to make choices about the tools. The iPads were seamlessly integrated into the lessons and the focus was more on learning related to the content standards rather than the technology tool. The students knew how to use the iPads and were able to investigate and learn the apps on their own because of the experience they had and the comfort level they exhibited.

Theme One: Student Ownership of Learning

The higher levels of technology integration on the TIM created more student ownership of their learning. As cited in chapter two (Kopcha, 2010), classrooms have been inundated with technology, making it a necessity to look at "how" rather than "if" technology is being implemented. Kopcha also noted that teachers need a guide to compare their instruction, which was the basis of research question one. As stated earlier, the TIM was developed from the Constructivist Learning Environment Framework and ACOT's Levels of Technology Curriculum to promote classroom practices that enable students to develop the ability to

construct their own learning through interactions with technology (Bartoschek & Carlos, 2013). Placing the lessons observed on the TIM allowed us to see the locus of control shift from the teacher, at the lower end of the matrix, to the students as the activities advanced higher on the matrix. The higher level TIM activities provide students with critical thinking, problem-solving, collaboration, and higher order thinking skills that are needed in real-world situations (Harmes, et al., 2016; Schrum & Levin, 2016) which fall under a constructivist view of teaching.

The examples that were in the Adoption level compared to the Infusion level revealed a difference in who was in control of the learning. The roles shifted from the teacher leading instruction to the students taking control.

In the Adoption level, both lessons exhibited teacher instruction as the driving force to the learning. The students were engaged in the lesson, but the teacher determined the activity, technology, and pace. It was a step-by-step process of integrating the technology and learning, solely regulated by the teacher. At the end of the lesson, the main purpose was not to gain new knowledge, but to learn the features of the app while learning something new about West Virginia. Technology integration was a process that included lower levels of student responsibility that were still a necessary step in developing students' skills that would allow them to become more independent in their technology use in other situations. The teachers, especially those in kindergarten - second grade, scaffolded the technology just as they would instructional scaffolding. The learning is personalized to the skill level of the students, and as Glowa & Goodell (2016) point out, teaching that is personalized can be considered student-centered.

In the Adaptation and Infusion levels, the teacher acted as a facilitator and the students proved comfortable with using the iPads to learn. The conversations between the students

throughout these observations showed an increase in their own explorations and discoveries that helped them develop their own knowledge. They were given choices, movement, and freedom to discuss both in collaborative groups and as individuals. The students were not passive learners, but used the tools given them to develop their conceptual understanding through collaboration, discussion, and problem-solving. This type of instruction is supported by research because problem-based learning allows students to make connections and acquire a deeper understanding of concepts (Dole, et al., 2016). As the lessons were presented further up on the matrix, they developed into a true picture of student-centered learning. The development of the thinking was evident which, as Staub and Stern (as cited by OECD, 2009) noted, student-centered instruction stresses the importance of this thinking and reasoning process more so than the attainment of knowledge. The authors also stated that the teachers that carry this pedagogical belief are comfortable with students playing an active role in inquiry and problem-solving.

To summarize research question one findings, the examples provided from the TIM showed that when students were provided opportunities to take more control of their learning, as they did in the higher levels of the TIM, then the learning that took place allowed them to make meaningful connections and construct their knowledge. This construction of knowledge was an indicator of a shift to student-centered instruction.

Research Question Two

What are the perceptions that elementary teachers and principals participating in a one-to-one cohort have about their experiences with iPads regarding their students?

The purpose of research question two was to understand the perceptions of the teachers and principals about the effects iPads had on their students. Data was gathered through

individual conversations during observations and face-to-face interviews with each of the nine participants. Responses were positive related to student learning, meeting the needs of different types of learners, and improving some student behaviors, but most felt it was too soon to determine the impact on student achievement.

All of the teachers and principals believed iPads had an impact on student learning, but with different reasons for their beliefs. Six of the nine participants felt the students were more engaged. Five people felt the iPad provided another way for students to present their knowledge. Respondents gave examples of students who had a difficult time writing, indicating that the students were able to share more of what they learned because they either recorded their responses or could show their knowledge as a presentation. Two teachers felt iPads increased student learning because the programs delivered differentiated instruction, which provided constructive, specific, and needed practice of skills. All nine participants mentioned in conversations that iPads allowed teachers to effectively complete small group instruction while some students worked independently on skills. Other statements teachers made regarding the effect of iPads on their students' learning included: opportunities for innovative and creative projects, deeper learning, problem-solving, and creating an atmosphere of collaboration and cooperation.

The discussion about student achievement provided mixed responses. Participants were not as confident in the iPad being responsible for higher student achievement. When asked, three said yes, four responded no, one said yes and no, and one felt it was hard to gauge. Another thing to point out was the fact that all three of the principals felt that achievement had not been impacted; those that did were the teachers. The three that said iPads did increase achievement gave specific examples from their classes. One teacher said this was the first year

she had included the iPad in her instruction almost 100% of the time, and for the first time in her career, she had 74% of her students above mastery in math and reading with the remaining students at mastery. Another teacher also said there was improvement in some of her students reaching proficiency in reading and math when comparing the beginning to the end of the year. The third teacher said her students understood more in different ways because of iPads, and were provided more opportunities to work with content. The four respondents that indicated "no" felt that there had not been enough time and experience with iPads to see an overall improvement with achievement, and thought that more time was needed to see these changes. One respondent noted that use of iPads in her school was not pervasive, but felt it could help achievement if everyone got to a higher level as far as their experience. She concluded that the responsibility of getting the teachers to the higher level of experience rested on the shoulders of the school leader, and her school was not where it needed to be in that area. The respondent that said "yes and no" felt the iPads had improved achievement in higher skilled and lower skilled students, but she did not see the average students progressing as they should. Overall, she felt that she did not have enough information to make a decision.

Another area addressed during the interviews was about different types of learners. I was surprised that the examples given were not just about the struggling learners, but included stories about gifted, Autistic, and special education students. Gifted students used iPads to advance their learning, received lessons that matched their skill levels, and were able to be more creative. iPads sometimes helped special needs students show their teachers what they knew, when the teachers believed they did not grasp the content because of poor communication skills. The iPad helped students with special needs share what they learned without having to write, when writing was difficult for them. In one story, a student became more confident, and his

poor behavior decreased because he created on the iPad and received positive feedback from his teachers and peers. Finally, the iPad supported students that could not read because of the text to speech feature.

The final topic concerning students was whether the teachers and principals thought the iPads had affected student behavior. Eight respondents said behavior was positively affected by iPads and one felt neutral. Six of the respondents said that students were more engaged and on task, which equals better behavior. One person said there was better attendance and behavior because students liked what they were doing in school and wanted to come. Another said that her students were more focused and on task, which kept them from getting into trouble. One teacher pointed out that behavior improved with iPads and got even better once she learned about apps like *ClassKick* and *Classroom*, which allowed her to control the students' iPads. In another case, a confrontational student's behavior improved when he was able to use the iPad because he could not argue with his iPad, and he liked getting coins and tickets for correct answers. The only person that said "no" felt neutral because her students did not seem any different since she started using iPads.

Theme Two: Increased Engagement

The second theme of the study emerged after consideration of the findings described above: iPads increased student engagement, which provided more opportunity for student collaboration. Every observation in this study showed students engaged in their learning and collaborating with their peers.

These findings matched studies discussed by Bloemsma (2013), Greaves (2012), and Mango (2015) that determined iPads engaged students, helped them stay on-task longer, and developed needed skills for the 21st century. Clark and Luckin (2013) also found the mobility of

the iPad gave students opportunities for group work and collaboration. Heinrich's (2012) survey of students in the United Kingdom also showed positive results from the use of iPads. In fact, 65% claimed to be able to work easier in collaborative groups, and 73% reported iPads allowed them to work more efficiently.

Increased engagement for students with disabilities was another finding supported by current research. A study by O'Malley, et al. (2014) also supported that students with disabilities contributed more with iPads because of features like voice recordings that made learning more equitable.

The engagement and collaboration provided to students encouraged communication. When communication is present, as in the examples from this study, then teachers are preparing their students for the future and Fletcher, et al, (2012) "new three E's" of education: enable, engage, and empower.

Research Question Three

What are the perceptions teachers and principals have about their experiences with iPads regarding their classroom or school?

The purpose of research question three was to understand the perceptions of the teachers and principals about the effects iPads had on their classrooms or schools. Data was gathered through individual conversations during observations and face-to-face interviews with each of the nine participants. Study participants indicated that changes had occurred in their teaching practices; particularly, in their classroom environment and the physical set-up of their rooms. Most of the participants felt the iPads had little to no effect on their classroom management. Discussions with participants also revealed challenges related to iPad implementation that fell

into the categories of technical, management, and personal challenges. Supports, organized into the categories of management, leadership, and professional development, were also identified.

Six participants discussed changes in their classrooms and schools and three said there were no general changes. One participant that responded "no" said that not much had changed in her classroom because she had always included technology and had used small group instruction since she began teaching. She considered the iPad as another tool to incorporate in her instruction. Another respondent said she used the iPad for practice only, running her classroom as she always had. There were a few changes, but she indicated that she would have made those changes with or without iPads. Those who responded "yes" to changes gave a variety of reasons. One said the iPads made her classroom more efficient because students knew what to do when they finished their lesson, and could maneuver through the iPad without interrupting small group instruction. Another said that overall efficiency had improved because the students were more engaged, and there were fewer distractions during small group instruction. Planning was easier for another respondent. In the past she had to use time outside the school day to create center activities that took several hours to get ready. Now she could prepare everything in a shorter amount of time because it was on the iPad. One said there were fewer interruptions during instruction because she was doing less lecturing, and the students were working collaboratively. Another felt that students in the school were happier to be there because they were having fun and could do more.

The teachers and principals were asked if the iPads had influenced the set-up of their classrooms or schools. Seven of the nine respondents agreed that things in their school or classroom had changed since iPads were adopted. Two did not think the iPads had caused them to change their classrooms. The most frequent responses had to do with furniture in the room.

Most of the teachers had tables or desks in groups to support collaboration. Since they started using iPads, students moved around the classrooms more to work in groups and to work independently. Another response given by several of the teachers and principals was about flexible or choice seating. The classrooms had several options of seating for students to use during instruction: bean bag chairs, rugs, yoga mats, saucer chairs, and others. One teacher said that although she used small group instruction in the past, the groups were stagnant and remained in the same place. iPads allowed the students and learning centers to go anywhere in the room. She felt that giving the students a choice to be comfortable had made a difference. The two respondents that said no changes had occurred referred to their past practices. Both said they had always used groups and movement, and had just added the iPad into that mix.

The next topic focused on the impact iPads had on classroom management. The responses were almost equal with four yes and five no. Four of the teachers did not feel their classroom management had changed, and one principal had not seen any changes in her school. These respondents felt that they always had good control of their classroom behavior and had always been organized and prepared, which alleviated many issues they faced. Another reason given was the idea of high expectations. A few of the teachers talked about how they had very high expectations and verbalized this to the students. They reviewed procedures, were fair and consistent, and followed through. The three teachers and one principal that acknowledged a change in classroom management discussed the different areas that required their attention when iPads became part of their school or classroom environment. Topics included: management of the apps, collaborative groups, organization, data management, digital citizenship, and accountability. Many of the teachers said that even though the iPads gave them different responsibilities to manage, it also made their lives a little easier for planning and saved

them time on the nights and weekends. They did not have to make as many copies or prepare activities for small groups. Having instruction that included collaborative groups shifted their control and caused them to have to put more time into preparation ahead of the lesson, but freed them up to monitor students during groups. The iPads changed the way they organized their materials and required them to be more conscientious of managing the tools. They were now responsible for ensuring the iPads did not break and were charged. iPads added the responsibility of teaching and monitoring the students' digital citizenship, making sure they were staying safe and using the iPad correctly. The accountability piece that the iPad brought to the role of the classroom added different responsibilities than before, but also made submitting assignments and communication between school and home easier to manage.

The last question asked was about supports or challenges they encountered due to incorporating iPads. When asked about challenges of iPad implementation, the teachers and principals provided examples that could be categorized into technical, management, or personal challenges. The technical challenges included: dropped Internet, broken headphones, uncharged iPads, and broken iPads. Management challenges included: students wanting to use the iPads too much, some teachers using iPads ineffectively (all students were on programs with no teacher or student interaction), and time management (some students finished early and needed to be engaged in constructive work). The personal challenges included: difficulty finding time for professional development and hesitation to try new things that may be challenging to the teacher or not being totally comfortable with the tool.

When asked about supports of iPad implementation, the teachers and principals provided examples that could be categorized as: management, leadership, professional development, or instructional support. The management supports included: accountability for the students and

teachers and eco-friendly features - less copies were made which meant less paper. Many participants spoke of their school leadership providing teaching resources, strategies for effective instruction, and additional staff focused solely on technology and working with both students and teachers. The professional development supports included: county provided professional development, embedded professional development with Apple and county level technology specialists, and school-based professional development. The instructional support iPads provided included: help for students to connect their learning, differentiated instruction for independent work, and hands-on activities in collaborative groups

Theme Three: Student-Centered Instructional Practices

The data for research question three provided a snapshot of how iPads had an effect on the different aspects of a classroom or school. Changes may occur in the general atmosphere of a classroom, the physical space, and classroom management with the addition of iPads. We also read about supports and challenges that school personnel encountered. All of these factors contributed to the third theme developed for this study: effective student-centered instructional practices will lead to more effective iPad integration.

The participants in the study exhibited strong classroom management, high expectations for their students, the ability to be flexible, open to suggestions, willing to learn new things, and were provided support from their surrounding peers and school environments. The ineffective practice of having an entire class working on a program independently without teacher interaction was not observed. All six teachers remained involved in the instructional process, even if the students were working in small collaborative groups or independently. They constantly monitored the students' use and progress. The students understood the expectations, and the teachers and principals were consistent in reminding the students of those expectations.

Many of the characteristics of an environment favorable to effective implementation were present during these observations and were necessary for the success of the lessons. As Coppola (2004) stated, if a teacher does not believe the use of technology fits their pedagogical beliefs, they will not use it. The same is true with iPads. It was evident those examined in this study had a strong belief in student-centered pedagogy. As pointed out by OECD (2009), teachers that hold a student-centered view provide opportunities for their students to problem-solve and be active contributors to their learning. Effective instruction with iPads will not occur in a teacher-centered environment. Global Digital Promise (2016) stated that technology provides a chance for students to become creative thinkers and good communicators, which increases student productivity and better learning outcomes that are not available in a teacher-centered instructional model. All of the evidence gathered from the observations provided a picture of effective, student-centered instruction supported by iPads because the instructional practices were in place.

Research Question Four

What are the perceptions that elementary teachers and principals participating in a one-to-one cohort have about their experiences with iPads in regards to their instructional or leadership practices?

The purpose of research question four was to understand the perceptions of the teachers and principals about the effects iPads had on their instructional or leadership practices. Data was gathered through individual conversations during observations and face-to-face interviews with each of the nine participants. Participants identified positive effects on leadership/instructional practices, and both positive and negative effects related to school

culture. Evidence also showed positive effects of leadership and county and school level professional development on instruction. Shifts in pedagogical beliefs were also identified.

The teachers and principals shared examples from personal experiences that described factors in their school cultures that allowed them to feel comfortable using iPads. Initially, this question was included in the interview under research question three. Upon reviewing the data, I decided to move the findings under research question four because the answers matched the idea of instructional or leadership practices more closely than just considering the classroom environment alone. Participants gave examples of people or situations that contributed to their confidence in iPads as part of their instruction.

When asked for examples related to school culture, one study participant said the school had a positive culture before they started using iPads because of their school-wide positive behavior program. She felt this positive culture was a big reason it was easy for the school as a whole to get to the level they were today. Another person said the principal's leadership played a major role because it was positive, encouraged everyone to work within their comfort zone, and promoted collaboration among the staff to share ideas, successes, and failures.

Five of the participants said the county and school professional development allowed them to gain experience, share ideas, and supported them in the early stages to gain confidence in their practice with iPads. Networking with school staff and at the county level with the Vanguard team was also identified. When they got together they could share ideas and learn from other teachers who had tried something in their own classrooms. Five of the participants stated that learning from another teacher was helpful, and made them feel like they could try things themselves.

Six of the participants mentioned the embedded PD from the county technology team and the Apple specialist. They felt the embedded PD helped them learn new things and made them feel comfortable enough to try something they were not familiar with, without fear of not knowing everything in front of their students. They also credited the county and school administration for providing the needed tools and infrastructure to be successful. One participant shared that she loved iPads and could not imagine teaching without them. They had become a natural part of her instruction.

Other examples of changes to school culture that contributed to their comfort levels included:

- school initiates such as Tinkertime, Makerspace, Appy Hour, Sparks Meetings, and STEM activities
- willing staff that showed everyone was "all in" and colleagues were willing to try, fail, and share their stories so everyone could learn
- effective leadership such as the principal allowing teachers to choose what they wanted to use, the idea of providing more student-centered activities encouraged by the principal and other teachers, and the support of specialized personnel such as the Apple Professional Development Specialists, the county Professional Development Specialists, school level Computer Specialist, Vanguard members, and members of the one-to-one cohort.

Not all of the responses were positive towards school culture. One participant stated that occasionally she felt she needed to put the iPads down for a while and provided the students with some paper/pencil activities, which does not fit the push for iPads. When she did this, the students seemed to enjoy it because it was a little different than what they did each day. Another

participant felt the culture at her school was not what it could be. One of the stronger school level leaders had left and there was not another person to take her place. The school had all of the tools it needed, but was missing that one person or team of people to continue the focus.

I received similar responses when I asked if they would share conversations they had with their colleagues that encouraged or inspired them to continue to develop their instructional practices with iPads. Five of the participants gave examples of discussions regarding apps and sharing ideas and experiences using iPads and STEM activities. Apps noted were *Seesaw*, *Classroom*, and *Classkick*. They also referred to conversations they had with teachers outside their school and with the county technology team. One teacher said her colleagues talked to her about her need to become a facilitator instead of the driving force behind the creative activities she did in the classroom. She admitted that this was hard for her because her students were young, but she was working on it. Two said the conversations that meant the most to them involved talking to a colleague when things did not go well. Instead of judging, the other person gave suggestions on how to make it work next time. They had conversations about changing to meet the needs of the students, how to incorporate iPads into creative activities, creative activities they tried with success, and encouraging comments about their successes. Another participant had conversations about using iPads in creative ways instead of ineffectively by having all of the students on a program and no collaboration occurring. Finally, two participants identified conversations during PD sessions where they felt comfortable enough to share because the sessions were hands-on and allowed them to use a new app to create something.

When considering changes in pedagogical beliefs, seven participants said their beliefs had changed and two said their beliefs had not. Three people felt that children learned best by doing, which was a different view than they had before. They also discussed that children

learned best with hands-on activities. Two respondents said they started their careers teaching in a traditional, teacher-centered manner focused on the textbook with everyone doing the same thing. They changed their beliefs because they saw that students learned better when the instruction was individualized and student-centered. One participant said she never believed that young children could effectively learn from iPads, but she was proven wrong when she began using iPads. Another had observed a change in the mindset of students in respect to their career paths.

Other responses included their take on why they believed students learned differently. One person felt that children today needed more immediate feedback. They had active minds so the lecture format did not keep their attention. Another person said that children seemed to have a shorter attention span due to technology and television, so teachers needed to provide movement and hands-on active lessons. One person said that in the past it was easier to teach in a whole group setting, but students today learned better when they worked in small groups.

The two respondents indicating "no" similarly felt they approached teaching the way they always had. Early in their careers, they used small group instruction. Each of the teachers thought students learned the same, but the tools and products were different than in the past.

Teachers and principals also shared their thoughts about professional development. Five respondents said the most beneficial PD was the embedded support from the Apple specialists and the county Professional Development Specialists. Five favorable responses were for the school level staff development, including the Sparks meetings and Appy Hour where other teachers shared their lessons. Four positive responses listed the county Vanguard training both during the year and in the summer. One said they liked the *Seesaw* training that was provided to their school. Three respondents mentioned PBL and PLC training, giving the reason that they

were hands-on sessions. There were two examples of teachers learning on their own. One completed the *Seesaw* online professional development and the other taught herself *iMovie*. The latter felt that she would never forget how to use it because she figured it out on her own. The types of PD that were not helpful were face-to-face sessions where they had to sit and listen. When they did not get to use an app and have their hands on an iPad, they were not able to make a connection to the learning.

Theme Four: Strong Leadership

The above findings showed that the experiences teachers and principals had with iPads were generally positive when looking at their instructional or leadership practices. This study examined areas of school community that were influenced by a strong leader: a positive culture, changes in pedagogical beliefs that leaned towards a student-centered approach, and effective professional development. These three elements were included as part of a bigger list in the cross case analysis by Levin and Schrum (2013). They established eight contributing factors to successful technology implementations that led to school improvement, all of which can be connected to characteristics of a strong leader or leadership team. Upon review of the data, this fourth theme emerged: strong leadership in a school contributed to the effective implementation of iPads.

The leader that influenced the rest of the staff did not necessarily have to be the principal. A strong teacher leader or leadership team within the school could be just as effective as the principal, as shown through evidence provided in this study. The research from Levin and Schrum (2013) found that the highest impact on the culture and climate of a school was the leadership within that school. The authors showed in their work that school leadership could either hamper or facilitate progress based upon encouragement or support (or lack thereof).

Specific to this study, the teachers and principals shared their insights into the leadership portion of their story. In a few cases, the principal was the influence behind the overall culture of the school and had support from teacher leaders in the building. When a school had one or more individuals that were the driving force behind an effective iPad initiative, subtle aspects of the classroom and school environment made that group investment clear. It was apparent through the atmosphere of the school, interactions between teachers, or teachers and students. In classrooms, the influence of a leader could be witnessed through high expectations, student engagement, and classroom organization. When the teacher felt supported from the leadership, they had success with integrating technology. As Blau and Shamir-Inbal (2017) and Greaves, et al. (2012) point out, schools with increased technology usage can improve student achievement. Although my findings did not support increased student achievement, they did support positive perceptions towards student learning.

All of the evidence gathered from the observations provided insight into the characteristics of a school environment with practices in place that contributed to a positive culture for improving iPad integration. The main factor for success was the instructional leader: the person or persons that encouraged, motivated, provided support, and established protocols for effective iPad instruction.

Participant Recommendations

In the final interview question teachers and principals were asked for suggestions for other educators just starting out on their journey to integrate iPads. Nearly all of the participants mentioned “don’t be afraid” as advice when they use iPads. Related comments emphasized they should “try something new” and “be open to learning new things and learning from others,” even your students. A few of the teachers said that some of their peers were fearful to come

across as weak if they did not know everything about technology, but students sometimes knew a lot about technology, so they could be used as a resource.

Half of the respondents made comments that "it is a process," and suggested to "take small steps and be proud of small accomplishments." They felt this would increase the confidence of the teacher and allow them to get comfortable with the iPads. Other comments related to this were from the principals indicating, "Get the iPads in the hands of the teachers."

A few respondents focused on students and also talked about the transition from "less teacher-led instruction and more student-led." Another respondent noted, "Engagement is more efficient, iPads help you reach more kids, more standards, different levels." A few commented about management, indicating that "good management is the key." A related suggestion from two of the principals was to support new teachers, to "make sure classroom management is in place before taking out the iPads."

The principals all felt strongly about the leadership and staff in the schools. There were suggestions to, "make sure you have the right staff on board" and "make sure your expectations were clear to the teachers about the use of iPads." All three principals mentioned the importance of monitoring iPad use in the classrooms. They said, "Effective use does not include all students working on iPads while the teacher is sitting at her desk."

RECOMMENDATIONS FOR FURTHER RESEARCH

This study examined specific examples of instructional practices within the Technology Integration Matrix. It also provided insight into the perceptions of teachers and principals regarding their experiences with iPads related to their students, schools, classrooms, and instructional and leadership practices. Other questions were raised during data analysis that could be answered through future research:

1. Some data emerged that established a difference in instructional practices for primary versus intermediate students. The teachers of the primary students stated they spent most of their instructional time teaching about the tool; the foundational technology skills. There were more lessons focused on creative apps at the intermediate level. A future study could look at specific practices in teaching students foundational technology skills as opposed to lessons that have a creative component, or the focus could be on tracking lessons taught to younger students versus older students.
2. During conversations throughout the data collection process, the researcher learned that iPad apps have evolved in the last few years to be more individualized, adjusting activities based on student performance. Future research could compare specific apps over time to track the development and effectiveness of those programs.
3. During observations in the kindergarten and first grade rooms, time was spent observing the students working independently on the iPad apps *ST Math* and *Smarty Ants*. Questions arose about how long the students could remain interested in the programs and remain eager to complete the lessons. A longitudinal study could follow a group of students over a two to three year period to see if they maintain the enthusiasm and focus for the same programs as they advance through each grade level.
4. The schools studied have established innovative iPad integration and are considered Apple Distinguished Schools, or are on track for gaining that recognition. These schools include fifth grade students who have been enrolled since they were in kindergarten, and have experienced the progression from no iPads to one-to-one iPads with a developing program of integration at the schools. A future study could follow these students to middle schools to record their experiences of going from a school that has established a

highly integrated program to one that may not be at the level of integration and experience.

5. The participants in this study did not feel that iPads affected student achievement, with some indicating it was too soon to tell. A follow-up study could look more closely at student achievement at intervals to see if evidence of change evolves as a result of iPad implementation.
6. This study focused on three elementary schools in West Virginia that were considered effective with one-to-one iPad implementation. Similar studies in other one-to-one schools at different grade levels and/or in other states could prove interesting, including further study of the other Apple Distinguished Schools.

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APPENDICES

APPENDIX A: MARSHALL UNIVERSITY IRB APPROVAL

MARSHALL UNIVERSITY
www.marshall.edu

Office of Research Integrity
Institutional Review Board
One John Marshall Drive
Huntington, WV 25755

FWA 00002704

IRB1 #00002205
IRB2 #00003206

April 24, 2018

Lisa Heaton, Ph.D
Marshall University, Dept. of Education and Professional Development

RE: IRBNet ID# 1221230-1
At: Marshall University Institutional Review Board #2 (Social/Behavioral)

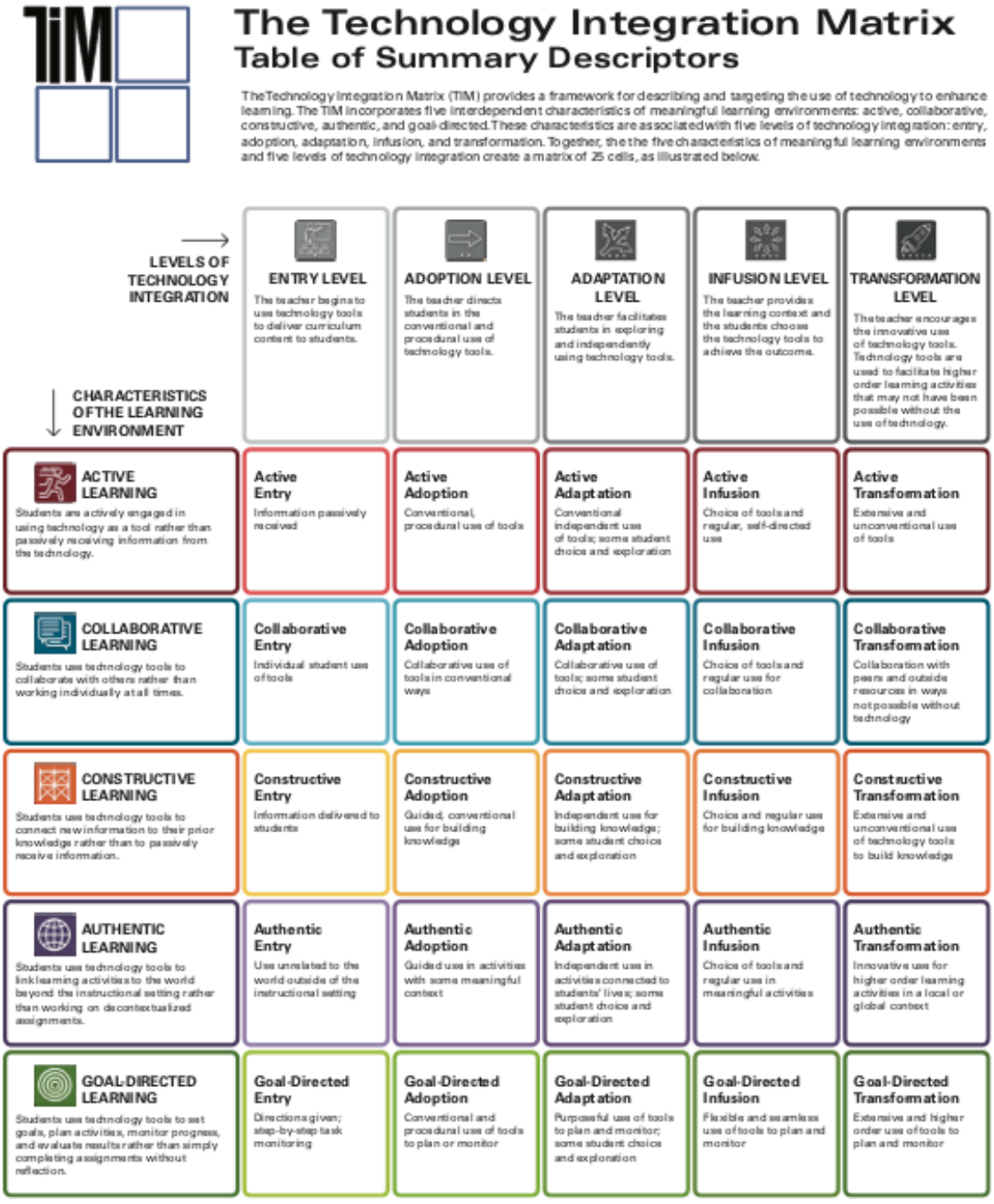
Dear Dr. Heaton:

Protocol Title:	[1221230-1] Effective iPad Instruction: A Qualitative Study Comparing Classroom Practices to the Technology Integration Matrix
Expiration Date:	April 24, 2019
Site Location:	MUGC
Submission Type:	New Project APPROVED
Review Type:	Expedited Review

In accordance with 45CFR46.110(a)(6), the above study wasgranted Expedited approval today by the Marshall University Institutional Review Board #2 (Social/Behavioral) Chair for the period of 12 months. The approval will expire April 24, 2019. A continuing review request for this study must be submitted no later than 30 days prior to the expiration date.

If you have any questions, please contact the Marshall University Institutional Review Board #2 (Social/ Behavioral) Coordinator Bruce Day, CIP or day50@marshall.edu. Please include your study title and reference number in all correspondence with this office.

APPENDIX B: THE TECHNOLOGY INTEGRATION MATRIX



The Technology Integration Matrix
Table of Summary Descriptors

The Technology Integration Matrix (TIM) provides a framework for describing and targeting the use of technology to enhance learning. The TIM incorporates five interdependent characteristics of meaningful learning environments: active, collaborative, constructive, authentic, and goal-directed. These characteristics are associated with five levels of technology integration: entry, adoption, adaptation, infusion, and transformation. Together, the the five characteristics of meaningful learning environments and five levels of technology integration create a matrix of 25 cells, as illustrated below.

LEVELS OF TECHNOLOGY INTEGRATION → / CHARACTERISTICS OF THE LEARNING ENVIRONMENT ↓	ENTRY LEVEL The teacher begins to use technology tools to deliver curriculum content to students.	ADOPTION LEVEL The teacher directs students in the conventional and procedural use of technology tools.	ADAPTATION LEVEL The teacher facilitates students in exploring and independently using technology tools.	INFUSION LEVEL The teacher provides the learning context and the students choose the technology tools to achieve the outcome.	TRANSFORMATION LEVEL The teacher encourages the innovative use of technology tools. Technology tools are used to facilitate higher order learning activities that may not have been possible without the use of technology.
ACTIVE LEARNING Students are actively engaged in using technology as a tool rather than passively receiving information from the technology.	**Active Entry** Information passively received	**Active Adoption** Conventional, procedural use of tools	**Active Adaptation** Conventional independent use of tools; some student choice and exploration	**Active Infusion** Choice of tools and regular, self-directed use	**Active Transformation** Extensive and unconventional use of tools
COLLABORATIVE LEARNING Students use technology tools to collaborate with others rather than working individually at all times.	**Collaborative Entry** Individual student use of tools	**Collaborative Adoption** Collaborative use of tools in conventional ways	**Collaborative Adaptation** Collaborative use of tools; some student choice and exploration	**Collaborative Infusion** Choice of tools and regular use for collaboration	**Collaborative Transformation** Collaboration with peers and outside resources in ways not possible without technology
CONSTRUCTIVE LEARNING Students use technology tools to connect new information to their prior knowledge rather than to passively receive information.	**Constructive Entry** Information delivered to students	**Constructive Adoption** Guided, conventional use for building knowledge	**Constructive Adaptation** Independent use for building knowledge; some student choice and exploration	**Constructive Infusion** Choice and regular use for building knowledge	**Constructive Transformation** Extensive and unconventional use of technology tools to build knowledge
AUTHENTIC LEARNING Students use technology tools to link learning activities to the world beyond the instructional setting rather than working on decontextualized assignments.	**Authentic Entry** Use unrelated to the world outside of the instructional setting	**Authentic Adoption** Guided use in activities with some meaningful context	**Authentic Adaptation** Independent use in activities connected to students' lives; some student choice and exploration	**Authentic Infusion** Choice of tools and regular use in meaningful activities	**Authentic Transformation** Innovative use for higher order learning activities in a local or global context
GOAL-DIRECTED LEARNING Students use technology tools to set goals, plan activities, monitor progress, and evaluate results rather than simply completing assignments without reflection.	**Goal-Directed Entry** Directions given; step-by-step task monitoring	**Goal-Directed Adoption** Conventional and procedural use of tools to plan or monitor	**Goal-Directed Adaptation** Purposeful use of tools to plan and monitor; some student choice and exploration	**Goal-Directed Infusion** Flexible and seamless use of tools to plan and monitor	**Goal-Directed Transformation** Extensive and higher order use of tools to plan and monitor

APPENDIX C: PHILLIPS OBSERVATION GUIDE

Phillips Observation Guide

Date: _____ Time: _____ Length of Observation: _____ School Code: _____ Teacher Code: _____ Researcher: Bridget Phillips
Participant Information: Number of Students Present: _____ Boys: _____ Girls: _____ Grade Level: _____ Subject Being Taught: _____ Standards Addressed During Lesson: _____ Description of Activity:
Physical Setting: Classroom Set-up (include a drawing of the room layout)

Phillips Observation Guide (Can use additional sheets if needed)

Descriptive Notes	Reflective Notes
Teacher Actions/Interactions	Teacher Actions/Interactions
Teacher Comments	Teacher Comments

Phillips Observation Guide (Can use additional sheets if needed)

Descriptive Notes	Reflective Notes
Student Actions/Interactions	Student Actions/Interactions
Student Comments	Student Comments

Phillips Observation Guide (Can use additional sheets if needed)

Descriptive Notes	Reflective Notes
iPad Specifics (include information on apps and other details about the tool)	iPad Specifics

APPENDIX D: PRE-OBSERVATION TEACHER DEMOGRAPHIC QUESTIONNAIRE

Pre-Observation Teacher Demographic Questionnaire

Room Number: _____

Grade Taught: _____

Number of Students: _____

Number of Classroom iPads: _____

1. What is the highest level of degree you have received related to your profession?

   Bachelor Masters Post Graduate

2. What is the number of years you have taught? _____
3. List the name/type of professional development you have attended connected to the use of iPads in your classroom:

   _____

   _____

   _____

   _____

4. Describe the greatest support or motivation for your personal growth in the area of technology integration.

   _____

   _____

   _____

   _____

School Code: (to be completed by researcher) _____

APPENDIX E: INTERVIEW PROTOCOLS

Teacher Interview Protocol

Title- Teacher

Date: _____ Time: _____ Location: _____

School Code: _____ Teacher Code: _____

Interviewer: Bridget Phillips- Researcher

Opening statement: "Thank you for agreeing to participate in my study. The purpose of this interview is a follow-up to the classroom observations I completed. I wish to gather information about what was observed and other details about your experiences with using iPads in your classroom. The answers you provide will be kept confidential. There are no right or wrong answers and my intention is not to judge you in any manner, so please feel free to be honest in your responses. I will use a recorder to record your answers which will allow me to analyze our discussion at a later date. During the interview, please feel free to skip any questions or discontinue at any time if you don't feel comfortable."

Research Question 1: How are the various levels of the Technology Integration Matrix – entry, adoption, adaptation, infusion, and transformation, and the classroom attributes of active, collaborative, constructive, authentic, and goal-directed - represented as instructional practices in classrooms of teachers within schools identified as part of a one-to-one cohort?

Questions:

1. During my first (second, third) observation, you _____, when I matched this lesson (or part of lesson) to the TIM, I decided it fell in the _____. Can you talk to me about where you would place it on the TIM?

2. Can you think of other examples of lessons (not observed) that made an impression on you? If so, after a brief explanation, can you describe where you feel the examples fell on the TIM?

Research Question 2: What are the perceptions teachers and principals have about their experiences with iPads in regards to their students?

Questions:

1. Do you think the use of iPads changed your student's behavior during instructional times? If so, can you explain in what way the behaviors changed?

2. Do you feel iPads have an impact on student learning? If yes, how?

3. Do you think the use of iPads has changed student achievement since being included in your instruction? Can you give specific examples?

4. Do you see any changes in your struggling learners when iPads are part of the lesson? Can you give a few examples? (guide conversation towards gifted and special education students if not addressed by the teacher)

Research Question 3: What are the perceptions teachers and principals have about their experiences with iPads in regards to their classroom or school?

Questions:

1. Do you think the implementation of iPads has changed your classroom? If yes, can you give examples of differences you have noticed in your classroom comparing before and after this implementation?

2. Could you describe how the set-up of your room has changed since using iPads?

3. Do you think your classroom management style has changed since you introduced iPads into your instruction? If so, how?

4. How do you manage integrating iPads and also utilizing the county required curriculum?

5. What supports are in place that allow you to do what you do with iPads in your classroom?

Research Question 4: What are the perceptions teachers and principals have about their experiences with iPads in regards to their instructional or leadership practices?

Questions:

1. Do you think iPads enhance the lessons for your students? In what ways (compared to lessons that do not include iPads)?

2. What are examples that demonstrate the culture in your school that allows you to feel comfortable using iPads?

3. Can you think of any examples of conversations you have had with your colleagues regarding instructional practices that changed your thinking or impacted what you did in the classroom?

4. How have your pedagogical beliefs evolved since iPads have been introduced in your classroom?

5. Are there any professional development opportunities you listed on the pre-observation questionnaire that stand out or were most helpful?

6. Were there any professional development opportunities you listed that were not beneficial to you?

7. Do you think there is something that I have not asked that will shed light on other areas of change in your instructional practices that have been affected by the use of iPads?

Principal Interview Protocol

Title- Principal
Date: _____ Time: _____ Location: _____
School Code: _____ Principal Code: _____
Interviewer: Bridget Phillips- Researcher

Opening statement: "Thank you for agreeing to participate in my study. The purpose of this interview is a follow-up to the classroom observations I completed. I wish to gather information about what was observed and other details about your experiences with using iPads in your classroom. The answers you provide will be kept confidential. There are no right or wrong answers and my intention is not to judge you in any manner, so please feel free to be honest in your responses. I will use a recorder to record your answers which will allow me to analyze our discussion at a later date. During the interview, please feel free to skip any questions or discontinue at any time if you don't feel comfortable."

Research Question 1: How are the various levels of the Technology Integration Matrix – entry, adoption, adaptation, infusion, and transformation, and the classroom attributes of active, collaborative, constructive, authentic, and goal-directed - represented as instructional practices in classrooms of teachers within schools identified as part of a one-to-one cohort?

Questions:

1. What are some examples of iPad lessons you have observed that you would like to share? Where would you place the lesson(s) on the TIM?

2. What are specific examples of what you observe your teachers doing and saying during iPad integrated lessons?

3. What are specific examples of what you observed students doing during activities involving iPads?

4. What are specific examples of conversations you overheard from students after their involvement in activities using iPads?

Research Question 2: What are the perceptions teachers and principals have about their experiences with iPads in regards to their students?

Questions:

1. Do you think the use of iPads changed student behaviors in your school? If so, can you explain in what way the behaviors changed?

2. Do you feel iPads have an impact on student learning with your average and struggling learners? If yes, how? (guide conversation to special education and gifted students if it is not addressed by the principal)

3. Do you think the use of iPads has changed student achievement in your school since iPads have been used in your school? Can you give specific examples?

Research Question 3: What are the perceptions teachers and principals have about their experiences with iPads in regards to their classroom or school?

Questions:

1. Do you think the implementation of iPads has changed your school? If yes, can you give examples of differences you have noticed in your school comparing before and after the implementation?

2. What supports are in place that allow your teachers and staff to do what they do with iPads in your school?

3. What changes, if any, have you observed in the set-up of classrooms because your teachers are using iPads?

4. What changes, if any, have you observed in classroom management since your teachers introduced iPads into their instruction?

5. How do your teachers manage integrating iPads and also utilizing the county required curriculum?

Research Question 4: What are the perceptions teachers and principals have about their experiences with iPads in regards to their instructional or leadership practices?

Questions:

1. Do you think iPads enhance the lessons for students at your school? In what ways (compared to lessons that do not include iPads)?

2. What about the culture in your school allows your faculty to feel comfortable using iPads?

3. What, if any, types of conversations do you have with your staff regarding instructional practices?

4. How have your pedagogical beliefs evolved since iPads have been introduced in your school?

5. Are there any professional development opportunities that stand out to you as most helpful to you or your faculty?

6. Were there any professional development opportunities you felt were not beneficial to you and your faculty?

7. Do you think there is something that I have not asked that will shed light on other areas of change in your leadership practices that have been affected by the use of iPads?

8. Do you have any thoughts about iPads, from the perspective of a school leader that you wish to share?

APPENDIX F: AUTHOR'S CURRICULUM VITAE

BRIDGET U. PHILLIPS

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bphillips@mail.kana.k12.wv.us

PO Box 4412
Charleston, WV 25364

EDUCATION

EDD Marshall University Graduate College — December 2018
Curriculum & Instruction

EDS Marshall University Graduate College — August 2016
Curriculum & Instruction

MS Marshall University Graduate College — May 2005
Reading Education

BS Edinboro University of Pennsylvania — May 1993
Elementary/Early Childhood Education

CERTIFICATION

National Board-Certified Teacher — November 2010
Literacy: Reading and Language Arts Early/Middle Childhood

Multi-Categorical Special Education — February 2018
Emotional/Behavior Disorder, Specific Learning Disability, & Mentally Impaired

Nonviolent Crisis Intervention — September 2018
Certified Instructor

TEACHING EXPERIENCE

Kanawha County Schools — February 2000 - Present

Elementary Curriculum Specialist — July 2018 - Present
Office of Exceptional Students, Charleston, WV

Reading Specialist — August 2015 – July 2018
Office of Exceptional Students, Charleston, WV

Reading Interventionist — August 2008 - August 2015
Chamberlain Elementary, Charleston, West Virginia

Title One Reading Teacher — August 2006 - June 2008

Bonham Elementary, Sissonville, West Virginia

Classroom Teacher February 2000 - August 2006
Various grades and subjects

Kanawha County Schools, Charleston, WV September 2016 – Present
Instructor, Professional Development & Instructional Support

Introduction to Personalized Learning: This is a face-to-face course offered for credit with an agreement from Marshall University. It introduces participants to the instructional strategy of personalized learning in the classroom. Subjects addressed in this course include: Universal Design for Learning, formative assessment, learning inventories, and differentiated instruction.

Marshall University, South Charleston, West Virginia
Adjunct Professor, C&I Computing Education Department

June 2016
Revolutionizing Your Classroom with Multimedia, CIEC 562: This is an online professional development course offered through Marshall University and RESA 3. It introduces public school teachers to Web 2.0 tools and allows them to see how they can incorporate them within their curriculum.

July 2014
Application Software in the Classroom Curriculum Area, CIEC 534: On-line course offered through Marshall University. Participants will learn to use technology tools and programs to enhance their teaching.

University of Charleston, Charleston, West Virginia August 2006 – December 2009
Adjunct Professor, Education Department

Fundamentals of Reading Instruction, *Education 372*: This is an undergraduate course averaging 6-10 students per semester. During this course, students examined curriculum, instructional strategies, methods, and materials used for teaching reading.

Clinical Practice/Reading Diagnosis, Education 374: This is an undergraduate course averaging 6-10 students per semester. This course is a supervised teaching experience that focuses on the identification of reading difficulties, diagnostic techniques, preventive and prescriptive methods and materials for reading instruction.

OTHER RESPONSIBILITIES

Beginning Teacher Academy August 2016 - Present
County Level Trainer

Facilitator for Alternative Certification Training August 2016 - Present
County Level Trainer

Facilitator for Special Education Focus Sessions August 2016 - Present
County Level Trainer

WV Leaders of Literacy Committee May 2016 - Present
County Level Team Member

HMH Journeys ELA Textbook Training September- December 2015
County Level Trainer

Textbook Adoption Committee for Kanawha County Schools February- March 2015
Committee/Selection Committee Member

West Virginia Next Gen Core Task Project February - May 2015
Instructional Coach

Facilitator for Beginning Teacher Mentor Program September 2009 - Present
West Virginia Center for Professional Development

Facilitator of Beginning Teacher Book Study January 2013 – March 2018
West Virginia Center for Professional Development

Lead Interventionist August 2008 - June 2013
Kanawha County Schools

Curriculum Mapping Committee June 2014
Kanawha County Schools

PRESENTATIONS

"SRA Corrective Reading Training" February 8, 2018
Edison Training Center
South Charleston, WV

"Student Panel" September 30, 2017
Marshall University Doctoral Seminar,
South Charleston, WV

"Bibliometric Methods: Can They Be Applied to Educational Leadership" October 7-9, 2016
Southern Regional Council on Educational Administration,
Charleston, West Virginia

"A Graduate Student Needs Assessment: A Mixed Methods February 17-20, 2016

Pilot Study Surveying the Needs of Education Graduate Students at Marshall University"
Eastern Educational Research Association,
Hilton Head, South Carolina

"Next Generation Training for Second Grade Teachers" June 3-5 2013
Kanawha County Schools

"Higher Level Literacy Centers" June 12, 2008
Kanawha County Schools

"Advancing Your Leadership Team" June 11, 2008
Kanawha County Schools

PROFESSIONAL TRAINING

Enhanced Coaching and Facilitating Professional Development: A Direct Instruction Coaching Academy April 25-27, 2018
National Institute for Direct Instruction
Columbus, Ohio

Functional Behavior Analysis and Behavior Intervention Plan November 27, 2017
Dr. James Ball
JB Autism Consulting

Writing with the Next Generation Standards March 5, 2013
Rachel Hull, WVDE- Presenter
Kanawha County Schools

Reading Workshop/Common Core Connection December 4, 2012
Rachel Hull, WVDE- Presenter
Kanawha County Board of Education

Text-Mapping in Reading January 23, 2012
JT Martin, Kanawha County Schools- Presenter
Kanawha County, Crede Location

Active Student Engagement April 13, 2011
Jo Robinson-presenter
Emmanuel Baptist Church, Charleston, West Virginia

Reading First Summer Institutes June 2008 and June 2009
A variety of national, state, and local presenters
The Summit Conference Center, Charleston, West Virginia

PROFESSIONAL AFFILIATIONS

Delta Kappa Gamma Educational Society, Beta Chapter	2010-Present
International Literacy Association	2012-Present
West Virginia Reading Association	2008-Present
Kanawha County Reading Association	2008-Present