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Middle School Student and Teacher Perceptions About the Effectiveness of the Technology Integration in the Classroom

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MIDDLE SCHOOL STUDENT AND TEACHER PERCEPTIONS ABOUT THE EFFECTIVENESS OF TECHNOLOGY INTEGRATION IN THE CLASSROOM

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Chapter 1 - Introduction

Technological tools available to teachers and students grow every year (Lenhart, Madden, & Hitlin, 2005). Teachers and school administrators are continuously trying to improve their ability to integrate technology into the classroom as indicated by the large number of research articles on implementing technology in schools. K-12 institutions spend money and resources each year in an effort to produce a more technology-rich learning environment. Educators do this partly because they are aware that today's students are growing up as part of a global society that is connected by computers and the Internet. This new and rapidly changing environment has the potential of giving students the opportunity to develop their information gathering and analyzing skills, work collaboratively, share and publish their ideas, and most importantly, learn from one another. As administrators consider the many factors that go into technology infrastructure decisions, they are tasked with deciding the best way to prepare teachers and students to leverage technology to improve both teaching and learning.

Internet connected computers can put students into contact with content experts from around the world. Students in a Spanish class could potentially have conversations with native Spanish speakers and then return the favor by helping the Spanish speaking students learn English. Classrooms can be virtualized to allow collaboration among students and their teachers outside of the regular school day. Technology affords educators opportunities, but unless properly implemented, these tools will do little to change the way we teach and learn (Cuban, 2001).

The challenge educators face is to properly implement technology in a rapidly changing world with a fixed budget, and it is not an easy problem to solve. There are

many obstacles to overcome. Teachers need training on how to integrate the technology; students need access to equipment and the knowledge about how to use the equipment to learn; and administrators need to be supportive of the teachers and students who are using technology to improve learning. One could make the argument that schools are spending millions of dollars on technology so it must be an effective tool to promote learning. However, there are very few studies that examine how students feel about the technology integration they are experiencing in school. Understanding the reality of how teachers think about and use technology and how students perceive the effectiveness of this learning opportunity can help administrators make informed decisions concerning staff development and the purchasing/placement of equipment in their schools.

Statement of the Problem

Some educators argue that we are having difficulties effectively implementing technology-rich learning environments. Cuban (2001) cautioned that in many cases technologies are not being implemented in ways that increase student learning. He argues that technologies are placed into the classroom with little guidance given to teachers on how to effectively integrate the new tools into the curriculum. According to Cuban (2001), this misguided use of technology seems to be a pattern that tends to repeat itself. Since the radio was first introduced into the classroom, technology has been underused or misused. Presently, teachers continue to teach and students continue to learn the same way as they did prior to computers in their classroom.

Teachers are given little, if any, opportunity to learn how to change the way they teach using technology. And in some instances, teachers who think they are integrating technology effectively are teaching exactly the same except that they now write on an

expensive whiteboard instead of a chalkboard. In addition to lack of teacher preparation, Cuban (2001) states that the education system has not changed systemically enough to allow teachers to use technologies to their fullest potential. In a recent blog about MOOCs (Massive Open Online Courses), in a blog entry, Cuban (2014) said the following about how K-12 teachers currently use technology devices in their classroom,

> Nonetheless, most K-12 teachers use these devices in different ways every week. Lessons using software on, say, the five desktops in the room or the 30 laptops or tablets on the cart, are common across elementary and secondary schools. Yet these powerful computers have hardly altered the prevailing ways of teaching that have gone on for years.

This recent blog entry reiterates Cuban's current position on technology integration in the classroom. In addition to the low-level uses of expensive technology described by Cuban and others, research indicates teachers face several barriers to successfully implementing technologies in the classroom. Kopcha (2012) cites five known factors that deter teachers from adopting technology integration strategies: access to technology, vision about how to use technology, beliefs about the usefulness of the technology, time to plan and implement new strategies, and professional development on how to truly integrate technology. His research indicates that teachers respond positively towards sustained staff development in terms of having a positive attitude towards overcoming the known barriers listed above (Kopcha, 2012). However, one could argue that lack of staff development itself helps to explain why teachers are still having a difficult time fully integrating technology into their instruction (Gray, 2010).

Researchers such as Papert (1980) make the case that students would benefit from using computers if they use them to begin creating their own mental models about the world around them. Papert (1980) appears to be one of the first educators to advocate for using computers in the classroom for the specific purpose of improving the learning experience. Since his work in the 80's, there is still debate about the best way to utilize technology in the classroom. Much of the literature suggests that if teachers were to improve education using technology, it would require teachers to teach differently and students to think differently than what is found in a traditional classroom. Papert draws on Piaget's (1952) theory and suggests that students learn by actively "reconstructing" their knowledge. They do this by solving meaningful problems. The second part of his theory states that students learn most effectively when they construct their knowledge by creating something. Papert believes that it is through the process of creating and revising the artifact that true learning is achieved. There are educators that still hold this theory to be true. It is logical to see how Internet connected computers in our schools could help promote this type of self-directed, constructivist learning.

Technologies to help students explore the world are being put into place. Many schools are introducing laptops and tablets to their students. Access to the Internet is readily available in most education settings. Books and journal articles are available online. Social networking tools keep society connected. Cloud computing gives people access to their own information from any Internet connected computer. Yet, it is evident that the previously stated positions about the effectiveness and/or potential for technology integration are vastly different. While Cuban, Kirkpatrick, and Peck (2001) state that schools are being oversold on computers and technology that are in turn being underused

or misused, as mentioned earlier, Papert (1980) and other constructivists see computers as a tool to help instruction become more student-centered, thus allowing students to construct their own knowledge and learn more effectively.

Because of this ongoing debate that is still taking place after 21 years of research, and current research that supports both arguments, this researcher believes the effectiveness of technology integration lies somewhere in between these two differing opinions. As administrators make decisions about staff development and purchasing equipment, they need to understand how students and teachers feel about the effectiveness of current technology integration practices. If teachers feel they are underprepared technically or pedagogically to integrate technology in their classrooms, administrators will need to change the way technology is being implemented. If students feel they do not have the opportunity to use technology in their classrooms or their creativity is being stifled, instructional practices will need to be reviewed and adjusted. Understanding how teachers and students perceive the effectiveness of the current uses of technology in the classroom will help educators make informed instructional and purchasing decisions. The following section will provide a description of the purpose of this study.

Purpose of the Study

The purpose of this study is to gain a better understanding of the reality of how computers are being used in today's classrooms from the perspective of the teacher and the student. To examine this phenomenon, a mixed methods study focusing primarily on qualitative research will be conducted. Qualitative research is the focus because it helps

researchers answer questions dealing with the "why" and "how" of the problem being explored (Merriam, 2009).

The researcher chose this design to document the perceived effectiveness of computer integrated instruction because it provides the opportunity to gain a better understanding of the experience of a classroom teacher who actually integrates technology into their curriculum and the experience of their students who use technology to learn. It is my desire that the information gained from this study will help educators make better informed decisions in regard to technology purchasing, adoption, staff development and implementation.

Research/Guiding Questions

Two main research questions were investigated:

1. How do teachers perceive their ability to effectively integrate technology into their curriculum?
2. How do students describe the effectiveness of technology integration they receive?

Several other guiding questions were considered while conducting this research:

1. Do teachers who perceive themselves as effective integrators of technology use technology in the classroom to further students' understanding of a topic?
2. How do teachers report their feelings about the staff development they receive on how to use technology tools?
3. How do students use technology outside of the classroom to learn and communicate?
4. Do students value the use of technology to learn?

Significance of the Study

Prensky (2005) urges educators to take a more student-centered approach to technology adoption. He makes the argument that today's students are digital natives. They have grown up using technology to play games, explore the Internet and learn from digital media. He describes people that grew up without those technologies readily available to them as digital immigrants. He argues that digital natives come into our classrooms with a variety of skills that many of our digital immigrants do not possess. Prensky (2005), argues that teachers need to start listening to their students. He states,

> As educators, we must take our cues from our students' 21st century innovations and behaviors, abandoning, in many cases, our own predigital instincts and comfort zones. Teachers must practice putting engagement before content when teaching. They need to laugh at their own digital immigrant accents, pay attention to how their students learn, and value and honor what their students know (p. 10).

If one of the goals of educators is to teach citizens how to function at high levels in our society, students graduating today need to know how to use computers effectively to communicate and solve problems. As Prensky (2005) and others have stated, there is a school of thought that student-centered learning is the way to accomplish that task. The challenge is to use technology to do something different in the classroom and not to repeat or revamp stale classroom activities. However, studies indicate that even teachers who perceive themselves as using student-centered practices are still using computers at their basic level (Cuban, Kirkpatrick, & Peck, 2001; Hermans, Tondeur, vanBraak, & Valcke, 2008).

There is a need to understand if we are meeting the needs of our students. Do our teachers understand that students in the 21st century are different from any other students who have gone through the American education system? Are students receiving what they perceive as helpful instruction? Are computers helping them stay engaged and explore the world around them? Are computers necessary for students to reach their full potential in our society? Answering these questions will help administrators in K-12 education make informed decisions about how they will purchase technologies, train teachers, and ensure that we are meeting the needs of our students by not putting them into situations where computers are being used in the classroom with no adjustment to teacher pedagogy.

Researchers have already started trying to determine how the beliefs and perceptions about technology use impact technology integration in the classroom (Ertmer, Ottenbreit-Leftwich, Sadik, Sendurur & Sendurur, 2012). Their case study focused on twelve award winning technology integrators. They suggest that there are several barriers to technology integration in the classroom, both internal and external. Notably, their research concluded that teachers felt "the strongest barriers preventing other teachers from using technology were their attitudes and beliefs toward technology, as well as their current levels of knowledge and skills" (p. 423). As their suggestions for future research indicate, we could benefit from understanding how the typical (non-award-winning) teachers perceive the effectiveness of technology integration happening in their classrooms. As we gain a better understanding of the true reality of what is happening in our classrooms, we will be in a better place to answer the questions above. This research study is an attempt to gain that better understanding.

Scope of the Study

To begin to find answers to these questions, this researcher conducted mixed-methods research at several middle schools located in the Midwest that serve an upper middle class community. The research took place November 2015 to March 2016. Teachers were asked to volunteer for the study. The study began by asking the volunteers to complete a self-reporting survey. This survey helped the researcher identify the teacher's current level of technology innovation, their current instructional practices and their personal computer use (Moersch, 2002). A detailed description of the survey is provided in chapter three of this dissertation. After the teachers completed the survey, the researcher conducted several classroom observations. These observations were coded and analyzed in an effort to gain a better understanding of the actual level of technology integration being used in the classroom. After observations were coded and analyzed, the researcher conducted several interviews with the teachers and students in their class. Again, these interviews were coded and analyzed to gain a better understanding of the true realities of technology integration in the classroom from both student and teacher perspectives. Using these three techniques the researcher was able to triangulate his findings.

Definition of Terms

- 1:1 programs – Every student is provided a computing device. These devices can range from laptop computers to smart cell phones.
- Augmented reality - an enhanced version of reality created by the use of technology to overlay digital information on an image of something being viewed through a device (as a smartphone camera); also : the technology used to create

augmented reality (http://www.merriam-webster.com/dictionary/augmented%20reality)

- Cloud Computing - the practice of storing regularly used computer data on multiple servers that can be accessed through the Internet (http://www.merriam-webster.com/dictionary/cloud%20computing)
- Constructivism – A learning theory that states learning takes place when a learner engages in authentic learning activities that allow them to build knowledge by expanding on what they already know and understand.
- Digital Citizenship – Digital citizenship can be defined as the norms of behavior with regard to technology use (Ribble, Bailey & Ross, 2004).
- Digital immigrant - Oxford online dictionary defines a digital immigrant as a person born or brought up before the widespread use of digital technology (http://oxforddictionaries.com/definition/english/digital%2Bimmigrant).
- Digital native - Prensky (2005) defines a digital native as "native speakers of technology, fluent in the digital language of computers, video games, and the Internet" (p.9).
- Flipped classrooms - make available classroom time for one-on-one instruction by having students watch video lectures and participate in interactive lessons from home via the Internet.
- Grounded theory – A qualitative research methodology where the researcher attempts to build theory that is grounded in data (Corbin & Strauss, 1990)
- Integration of Technology - Technology integration is the use of technology resources -- computers, mobile devices like smartphones and tablets, digital

cameras, social media platforms and networks, software applications, the Internet, etc. -- in daily classroom practices, and in the management of a school (http://www.edutopia.org/technology-integration-guide-description).

- Kahn Academy – a not-for-profit organization with the goal of providing free world-class education for anyone anywhere (https://www.khanacademy.org/about)
- Pedagogy - the art or science of teaching; education; instructional methods. (http://dictionary.reference.com/browse/pedagogy?s=t)
- Purposeful sampling – A type of sampling procedure where the sample is selected based on predetermined criteria that the researcher feels will help he or she gain the most information about the subject under study (Marshall, 1996).
- Second Life – A virtual world constructed completely by the users participating in the world. Users interact with one another through the use of avatars, digital representations of themselves (http://www.secondlife.com).
- Technological Pedagogical Content Knowledge (TPCK) framework - This framework explains how teachers need more than a strong content knowledge, technical expertise and pedagogical knowledge to be successful integrators of technology (Koehler, Mishra & Yahya, 2007).

Limitations

The study can only be generalizable to districts with the same demographics as the sample being studied, which is, suburban upper middle class teachers and students in the Midwest. The sample size for this study is relatively small. Because of the qualitative nature of the study, the researcher has to assume that both teachers and students were

honest and forthcoming when participating in one-on-one interviews. The researcher had some previous interactions with several of the teacher participants of the study. The researcher has worked for the district participating in the study for 16 years in various roles. The types of interactions that the researcher had with the teachers included participating in staff development opportunities as the lead or co-participant, and providing technical assistance to them sometime during their career. The classrooms in the sample have a varying range of technologies available to teachers and students which varies each student's overall experience with technology in school.

Delimitations

This study has a relatively small sample size consisting of currently employed middle school teachers and students attending an upper middle class school district in the Midwestern United States. The scope of this study was limited to understanding the perceptions and reality of middle school teachers and students using technology tools to teach and learn.

Summary

There is potential for computers to change the way we teach and learn. Technology in schools is not a new concept. Cuban writes about failed attempt after failed attempt to integrate technology into the classroom in a meaningful way (2001). Current research indicates that we still have teachers using technology at low levels and in ways that may not be much different than traditional teaching practices (Cuban, 2001; Cuban, Kirkpatrick, & Peck, 2001; Kopcha, 2012; Prensky, 2005). Understanding how teachers perceive their use of technology to improve instruction and whether students perceive that instruction as beneficial are key components to improving the way

technology is being integrated into today's classrooms. The following chapter of this dissertation, the literature review, will provide the reader with a summary of the literature pertaining to this study. After this review of the literature, a detailed explanation of the research methodology used to study this problem will be provided. It is the hope of this researcher that the information gained from this study will provide school administrators and teachers with the insight they need to improve instruction and learning in the future.

Chapter 2 – Literature Review

The following literature review serves several purposes. The first is to give the reader a brief overview of the history of technology in the classroom. This will be followed by a review of literature describing current and potential uses of technology in the classroom. Additionally, several topics that impact teaching and learning will be discussed. Those topics are 1) overall effectiveness of technology in the classroom; 2) the effect of computers on self-directed learning; 3) effect of pedagogy and content knowledge on technology integration; 4) digital citizenship; 5) technology and promoting critical thinking; and 6) digital natives versus digital immigrants. Finally, literature addressing the challenges of technology integration will be reviewed.

The information provided in this review will position the reader to understand the current and potential uses of technology, relevant issues surrounding technology and teaching and the challenges associated with implementing technology in a way that will have a positive impact on a student's overall academic success. The discussion will begin with the history of technology in the classroom.

History of Technology in the Classroom

Electronic technology has been a component of education reform since the first radio was installed in the modern classroom (Cuban, 1986). Since that time, educators have sought to use technology to increase the effectiveness of the learning environment.

Cuban (1986) chronicled the early history of technology in schools. He explains that there is phenomenon that seems to repeat itself. New technologies pique the interest of educators and they are quickly adopted. With this adoption, there is hope that knowledge that was previously difficult to attain would be more readily available, thus

giving students a better opportunity to learn. For example, when radios were introduced into the classroom in the 1920s, some felt radio would change the face of the classroom by giving students access to experts from around the world. They felt the same thing would happen when television was introduced. Now the personal computer has become the prevailing technology of the time. However, just like the technologies before, there are educators who have an unrealistic expectation of what technology can provide if it is not implemented properly.

Cuban (2001) explains that in each instance of technology adoption, after the initial excitement was over, the technologies ended up having a similar result on classroom instruction. The face of education stayed the same. Old teaching practices changed slightly to fit the latest technology of the time, but for the most part, changed very little. Cuban argues that history is repeating itself again with the personal computer in the classroom.

According to Cuban (2001), one of the reasons technologies have historically failed to improve or reform our education system is that teachers were not involved in the planning and implementation phase of technology integration. Instead, he argues, policy makers have driven the purchasing and use of technologies in the classroom. They do this mainly in an effort to make education more efficient and productive. However, teachers are not part of the planning or implementation of the technologies, so in each instance, all of these technologies have suffered similar fates. Specifically, they are not being used in the classroom, and if they are, they are being used for tasks that could be completed without the use of a computer.

Oppenheimer (2003) also suggests that schools are underfunding basic educational needs of students and not focusing enough on teacher-child interaction. He argues that schools purchase technology for the classroom while teachers are given little if any staff development and the technology is never truly fully integrated into the curriculum. Although Oppenheimer (2003) sees some potential for technology in schools, he is mainly concerned with the over purchasing of equipment with little or no change to teacher-child interactions and teaching strategies.

The literature describing the history of computers in the classroom has shown that schools are willing to invest in technology to improve the educational experiences of children. However, this happens with very little change to the way teachers teach and students learn. The computer has not proved to be a quick fix for educational challenges. History tells us that quality teaching practices, caring educators, and innovative teachers will flourish with or without computers at their disposal. This researcher would like to point out that the last article reviewed in this section was written in 2003. There has been a lot of progress in the field of technology in the last 13 years. However, this section is not intended to summarize current uses of technology. It is the researcher's intention to point out that there seems to be a history of limited success when introducing new technologies in the classroom.

History has shown us that schools are willing to spend money and time trying to integrate technology into the education of our children. Many think that computers have the potential to change education. However, to this point; there are still many barriers that hinder effective adoption of technology in the classroom.

Current Uses of Technology in Education

Some teachers use technology to explore concepts in ways that that would be difficult, if not impossible, without a computer. Those teachers see the value of technology and how it can excite and engage their students. The next section will highlight the use of games in education, virtual worlds, using cloud based technology for collaboration in and outside of the classroom, the flipped classroom, and augmented reality. These areas were chosen because they represent some of the current and cutting-edge practices being discussed in the literature.

Games in education. Video games are one way creative teachers are leveraging computers to help students learn. Video games that simulate real-life work environments have been shown to teach employees skills that make them more effective and help a company's profit (Sitzmann, 2011). In addition to evidence from industry that video games are a helpful learning tool, there are also a growing number of educators who believe that video games promote learning and student motivation towards learning (Gee 2003; Gee 2005; De Grove, Bourgonjon & Van Looy, 2012; Prensky 2001).

Gee (2005) discusses how video games are motivating to children and adults alike. He states that "Good video games incorporate good learning principles, principles supported by current research in Cognitive Science" (p. 34). Gee discusses several learning principles that are involved in good games and his research shows that the skills gained while playing video games could translate into the classroom.

As students play video games, they are encountered with problems. They have to solve the problems, and the problems are challenging. The learning that takes place when students play video games is very similar to learning that takes place in any classroom.

Interestingly, when students and adults play video games, they can spend hours at a difficult task without giving up. When playing games, users assess problems, try to solve the problems, try new strategies, test them, adjust to the constraints of the game, and build upon skills they have acquired from the past. If all of these skills and learning traits were applied to a subject area, like biology or algebra, it makes sense that students who possess those learning skills and strategies would be successful at academic challenges as well.

Watson, Mong, and Harris (2011) conducted a case study of high school sophomores utilizing the video game, *Making History, to learn about WWII* and found that the classroom climate shifted from a traditional teacher-centered model to more student-centered model and that the students were much more active and engaged than in other lessons. The video game was used in conjunction with authentic documents, maps, text, journal entries, and other classroom activities, to provide students with a comprehensive examination of the events and outcomes of the Second World War. This is just one example of research that points to video games being a positive part of a student's education. Although there is still a need for further research on the impact of video games in the classroom, the literature reviewed describes the potential that video games have to help students learn (Gee 2003; Gee 2005; Watson, Mong & Harris, 2011).

McGonigal (2011) suggests that playing video games is intrinsically motivating. She suggests that gamers are motivated to make sense of the information provided to them during gameplay and continue to try to make sense of the information even after failing.

> In a good computer or video game you're always playing on the very edge of your skill level, always on the brink of falling off. When you do fall off, you feel the urge to climb back on. That's because there is virtually nothing as engaging as this state of working at the very limits of your ability (McGonigal, 2011, p.24).

Her research suggests that this fortitude demonstrated by gamers is what allows them to solve complex problems and that this type of enthusiasm and determination is helpful when trying to solve real-world problems.

Hanus & Fox (2015) studied the effects of gamification on 57 students taking a communications course at a large Midwestern university. The students were separated into two classes. One class had elements of gamification (badges, rewards, leaderboards), while the other class was taught using traditional methods. The authors found that students in the gamification class reported less motivation, satisfaction, and empowerment over time as compared to students in the non-gamified classroom. They also noted that the students' final exam scores in the gamification class were lower than their counterparts, in part because of the loss of intrinsic motivation experienced by the students. Their study suggests that games need to be carefully implemented in order to have the desired positive outcome.

Games have specific objectives that must be completed in order for the gamer to be successful. Virtual worlds, on the other hand, provide students with an open world where they have the freedom to create their own virtual reality.

Virtual worlds. Virtual worlds are 3-dimensional computer-animated spaces, sometimes referred to as simulations or "sims". There are articles describing how universities and other educational institutions are creating writing labs, lecture halls and

virtual classrooms in these environments. Because these worlds are hosted on the World Wide Web and accessible to anyone with an Internet connection, they give people from around the world the opportunity to share ideas, consider alternative viewpoints, and participate in learning environments that are not available in a traditional classroom.

Virtual spaces are not commonly found in K-12 education, however, there is potential for their use in the future. ESMG and companies like theirs create customizable educational work spaces, like auditoriums for lectures, and writing labs for getting assistance with papers. They also provide the virtual tools used in the writing labs (Carpenter, et el., 2010). They customize labs with furniture and other amenities. For example, they created a tool that allows students and tutors to review a paper simultaneously while sitting in a virtual conference room. As the student and the tutor work on the paper together, the changes made to the paper, by the tutor or student, are seen in real time, allowing for a complete interactive tutoring experience. During the tutoring sessions, tutors have the ability to make suggestions which the student can implement immediately and then receive additional feedback from the tutor. Because ESMG and others are beginning to create customized spaces and tools for educators, creating a virtual learning environment has become easier for educators and may become an option to provide educational spaces that are accessible using the Internet.

The virtual worlds in and of themselves do not provide teachers or students with an advantage over those not participating in the virtual world. However, some suggest that virtual worlds work well with teachers who practice the community of inquiry model of learning (Burgess et al., 2010). Others view communal constructivism as the best way to approach teaching and learning within virtual worlds (Girvan & Savage, 2010). Both

studies suggest that when presented with a well thought out learning experience, virtual worlds give students a place to learn from one another, their teacher, and experts from other areas of the world, which in turn allows them to form a community of learners.

Potkonjak, Gardner, Callaghan, Mattila, Guetl, Petrović, & Jovanović (2016) studied virtual worlds in the context of science, technology and engineering. They found that most of the virtual labs available for science, technology, and engineering promote the introduction of basic concepts, but the labs are not sophisticated enough to handle more complex situations. Therefore, students still rely heavily on hands-on experiences after receiving the initial introduction in a virtual lab. They contend that newer advances of technology may help virtual labs become a place where more advanced concepts could be taught. They also point out that in order for this to take place, a restructure of the virtual environments is needed.

Nebel, Schneider, & Rey (2016) studied the impact of Minecraft - a virtual world created for everyday use and not originally intended for classroom use. They found that educators use this tool to teach a variety of topics, including spatial geometry, sustainable planting, language and literacy, digital storytelling, social skills, computer art applications and project management. They explain how educators are using this tool, and others like it, to create learning experiences for their students. They find the three most important aspects of using games like Minecraft as a learning tool to be 1) the ability to collaborate, share and modify content, 2) building in the world needs to be simplified for educators, 3) the games need to offer modifiable and easily programmed functions to enable easy creation and interaction within the worlds. Their study does

highlight how teachers are trying to leverage technology students are already using to create a learning space that is unique and motivating.

While the studies discussed above highlight the potential uses of virtual worlds, it can sometimes be difficult to teach in this environment. Catheryn Cheal (2009) conducted a study to determine how students felt about taking a class in Second Life. Second Life is one of the virtual world software packages that educators use to create virtual learning spaces. She found that students were successful in completing the course objectives of "exploring, communicating, and building - allowing students to gain skills and acquire conceptual understanding about virtual worlds " (Cheal, 2009, p.3). However, technical difficulties, course design, and students' expectations about the course, all contributed to an overall negative assessment by the students. Specifically, when asked if they would take another course in Second Life, 14 out of 15 responded, "no".

Her findings demonstrate the potential difficulty in implementing a virtual class and it also drives home the importance of professional development and the careful creation of activities that are well thought out, engaging, content aligned, and thoroughly vetted before implementation. Otherwise, even the most well-to-do learning experiences can fail. Virtual worlds are another technology that has potential to change the way students receive their educational experiences. However, research demonstrates that teachers need to plan carefully and expect some resistance from students if they do not perceive a value-added experience in addition to their traditional school work.

Collaboration in the "cloud". Another use for computers in the classroom is collaboration using cloud computing technologies. There are two collaboration tools

commonly referred to in the literature that are being used in the classroom. They are wikis (Augar, Raitman & Zhou, 2004; Leuf & Cunningham, 2001) and Google Apps (Sultan, 2010). These tools have different functionality and purpose but are essentially designed to allow people to work together on documents over the internet.

When using these tools, writing a paper with a partner can happen in real-time whether the partner is in the same room or across the country. As students make changes to their assignment, the other participants can see the changes being made immediately. The obvious benefit for writers is that they can compose their work with others, giving them the opportunity to peer-edit, share and gather ideas, and experience disparate writing styles.

The term "cloud computing" is also synonymous with collaboration. The "cloud" is a place where data is stored and accessed from anywhere. Google Docs and wikis are considered applications where your data actually lives in the cloud. The advantage of using the cloud is that you can access your documents or files from any internet connected computer in the world. It also gives a user the ability to share their documents with others and in many cases, give others permission to read or edit the documents. This trend of continuous connectivity and sharing of ideas is continuing to grow, especially in academic endeavors (Sultan, 2010).

Another reason public school teachers are beginning to leverage these tools are because students will encounter them when they enter higher-education (Barab, 2001). Many college courses, and inevitably the business world in which our students will work, will be using these tools to communicate and share ideas (Beldarrain, 2006).

In addition to wikis and Goggle Docs, students are also using tools such as FaceBook and Instagram. These tools are also considered cloud-based. Students are leveraging this type of technology to organize events, share their personal thoughts with an audience and ultimately, express themselves online. Prensky (2005) and Augar, Raitman, & Zhou (2004), have suggested that we must start teaching teachers to use the technology their students are already using.

The collaboration aspects of technology integration have some of the greatest potential to change the way we teach and learn. The tools mentioned above have the potential to enhance communication between all of the key players in a child's education; their teacher, their classmates, experts from around the world, and their parents. As cloud computing and other collaboration centered technologies continue to develop, their use in the classroom may play a more important role in teaching students how to gain information by collaborating with their classmates.

The flipped classroom. The flipped classroom reverses the traditional teaching strategy of presenting content in the classroom and then having students complete homework to further their understanding. The concept is students will come to class prepared to discuss content or clarify any misconceptions they may have. Proponents of this strategy believe that this type of learning will free up instructional time in the classroom – giving teachers more one-on-one time to help their students solve specific problems or to clarify any misunderstandings that may arise during the lessons taking place at the students' home. The time spent in the classroom is supposed to be spent furthering the students' understanding of topics being examined while giving them the opportunity to work collaboratively with their peers (Tucker, 2012). Others believe that

the flipped classroom "is simply a high-tech version of an antiquated instructional method: the lecture" (Ash, p. s6, 2012).

McDonald and Smith (2013) describe the benefits of the flipped classroom as having the potential to increase access to and provide greater efficiencies for individualized delivery of instruction, while providing a student-centered approach (giving students the opportunity to learn content on their own). The teacher's role in this setting is to provide students with quality learning experiences. Ideally, the classroom time gained because of the work being done at home gives the teacher more time to work individually with students and help the class work through common misconceptions that may arise during the learning process.

Flipping the classroom requires good classroom management and technical skills. In order for the flipped classroom to be effective, teachers have to create videos or find quality videos on the Internet and then create interactive lessons for students to complete at home. Technical problems are one issue students and teachers deal with when flipping the classroom. Other problems arise when students do not take advantage of the videos and lessons and come to class unprepared. Instead of being ready to participate in class, students are not in a position to learn because they have not covered the content adequately at home (Herreid & Schiller, 2013). Another challenge for using the flipped classroom is ensuring that all of the students in a flipped classroom have the technology at home to complete the assigned homework.

While flipping the classroom sounds like a promising way to use technology to further a student's educational opportunities, the literature reviewed above demonstrates the many caveats involved when flipping the classroom. And just like most new

technology initiatives, teachers are put in a position to decide whether or not they are going to try to use a completely different method for teaching, without ever receiving formal instruction on how to transform their classroom.

However, unlike a lot of technology opportunities, teachers who want to learn how to flip their classroom have a lot of resources at their disposal. Flipped classrooms have become very popular because of websites like Kahn Academy which offers flipped courses that are completely online and free to anyone with an interest in learning about one of the many topics covered on their site. As teachers experiment with using computers in the classroom, there is a good chance that many are aware of the concept of flipping the classroom. Again, it is just one of many ways computers are currently being used. Some would argue that it is old teaching practices being revamped to fit the modern classroom. That will be for teachers to decide. That criticism would be very difficult to apply to the next topic in this review, augmented reality. This section will demonstrate some of the most advanced uses of technology in the classroom to date.

Augmented reality in education. Augmented reality (AR) is a combination of physical reality and a virtual reality. When using augmented reality, the person using the AR device will see virtual objects superimposed into their environment. In an educational setting, augmented reality can provide a unique experience for students trying to learn new material. In some instances this learning experience seems to provide students with a level of excitement that cannot be attained in a traditional learning setting. Wojciechowski & Cellary (2013) studied high school students using the ARIES system to complete an experimental chemistry lesson. In this situation, the AR environment gave students the opportunity to complete experiments that may normally have to have been

completed by the teacher because of the safety concerns of students mixing chemicals and using burners to heat beakers, etc.

They found that students using the ARIES augmented reality environment reported an increase in perceived enjoyment, which had a comparable effect on the learners' attitude towards their intention to use the system to learn. Specifically, they found perceived usefulness and enjoyment had a comparable effect on the students' attitude toward using augmented reality environments. When comparing usefulness and enjoyment, perceived enjoyment played a significant role in determining the actual intention to use the system. They also studied the impact of the interface style of the AR system and found that it had a significant impact on the ease of use of the system. However, the interface style and perceived ease of use had a weak influence on the students' enjoyment. In contrast, interface style and perceived ease of use had a significantly stronger influence on perceived usefulness.

Kamarainen, Metcalf, Grotzer, Browne, Mazzuca, Tutwiler & Dede (2013) studied how AR could be used to help middle school students improve their understanding and interpretation of water quality measurements. The researchers studied students while they participated in a field trip to a local pond. Students used mobile wireless devices and FresshAir AR software to navigate the pond while observing virtual media and information overlaid over the pond. Students then collected water quality measurements at several virtual AR hotspots. The researchers found that student understanding of the topic was improved after the activity. Also, the teachers reported greater interaction amongst the students and that the interaction would be best described as student-directed as opposed to teacher-directed. Finally, teachers reported that students

had a deeper understanding of water quality measurements after this lesson as compared to students that didn't receive the AR experience and that the students had a better opportunity to participate in activities that resemble scientific practice.

Kaufmann and Schmalstieg (2003), examined augmented reality in a 3-d geometry course and found that students' learning was enhanced by being able to manipulate and actually see 3-d models of what they were learning about in class. The researchers expressed a need for further research to validate the effectiveness of augmented reality in the classroom, but their initial steps into this area of technology education are promising. Other common uses of augmented reality in schools are augmented reality books, or applications used in specific fields like astronomy or health.

Augmented books are created by the teacher using software on a tablet or other mobile device. These books allow students to use a tablet's camera to focus in on a particular image or graphic in a book. (Lee, 2012) This image or graphic acts as a trigger, which tells the augmented reality software to display a teacher generated 3-d digital representation of the concept being presented or it could also present the students with a youTube video for them to watch. Both methods create a unique experience for the students. Reading is no longer just a text and paper event for students. If teachers are using augmented reality, the books have the potential to come alive for the students. This technology is catching on and teachers are beginning to experiment with its potential in the classroom. Is it going to be an effective way to teach? That is a difficult question to answer. To begin to answer the question about the effectiveness of technology, the next section of this dissertation will discuss the current research on the overall effectiveness of technology in the classroom.

As described above, augmented reality has the potential to add another layer to learning. As reported in the literature, students are able to perform experiments that they would normally not have the chance to complete. Additionally, AR gives teachers the ability to create digital content that may help some students better understand what they are reading. These documented successful uses of AR demonstrate its potential for use in the educational setting.

Effectiveness of Technology Integration - 1:1 Computing

As stated above, many teachers engage in technology integration. Yet, there is data suggesting that the effectiveness of that integration is sometimes limited or at a very low level. Nevertheless, Keengwe, Schnellert, and Mills (2012) conducted a study that indicated that a 1:1 laptop computing program increased student engagement and learning, motivation, and ability to work individually. Secondly, their data suggests that a 1:1 laptop initiative increased the use of the computer at home, and finally, the 1:1 program improved traditional, at-risk, and high-achieving students learning experiences.

Bebel and Kay (2010) report that students' research skills and collaboration efforts increased as students participated in a 1:1 laptop initiative. According to their findings, the majority of students were using the Internet as their primary resource for research. Their report suggests that students use the Internet with great frequency in order to answer questions they have while in school. Their study also suggests that increased use of technology improved the number of projects and multi-media demonstrations created by students. Along with this increased creation of multi-media projects, teachers reported students relying on online teaching tools in order to learn new material. Finally, their report suggests that students had a greater freedom to explore topics of interest to

themselves and had a greater freedom to explore their individual learning styles (Bebel & Kay, 2010).

Islam & Grönlund (2016) did a review of the literature surrounding the topic of 1:1 computing. Their study looked at literature from all countries and included literature about all 1:1 initiatives regardless of the device. They found several positives and negatives concerning 1:1 initiatives. The positive outcomes they describe are enhanced student academic engagement and motivation and in increase in quality of work, independent learning, computer skills and collaboration. Teachers benefit from more engaging and flexible teaching, collaboration and professional development. Ultimately, they find that classroom interactions improve due to increased teacher-student interaction, increased parent participation, and reducing disciplinary problems.

Their study also showed that there were some reports of negative impacts to the classroom as well. The main problems associated with 1:1 computing are technical and logistical problems and resistance from teachers to adopt 1:1. Their study also points out that there is limited evidence that 1:1 computing raises academic gains when using student GPA as the measurement for success. Other areas for concern were that technology may provoke distractions, in some instances cause psychological and physical strains, and an over-dependency on technology (Islam and Grönlund, 2016).

While these studies highlight the effectiveness of 1:1 laptop initiatives, the authors noted that the teachers changed their approach to teaching once they got the laptops in the classroom and that a student-centered approach was adopted. The students used the computers for research and other academic endeavors, but it was a combination

of teaching strategy and access to the technology that made the technology integration effective.

Overall, there are very few studies that attempt to link increased academic achievement, in terms of increased test scores, to the use of computers in the classroom (Lei & Zhao, 2007; Ringstaff & Kelley, 2002). More often, studies about computers in the classroom show that teachers who use computers have students that exhibit academically desired behaviors, such as increased time on task, enthusiasm for learning and the desire to learn more. Proponents of computers in the classroom would argue that it is not the computer itself that is making students have academic success but it is the academically desirable behaviors that computers seem to harness that help students meet their highest potential (Ringstaff & Kelley, 2002).

Self-Directed Learning

In the previous section, the effectiveness of computers in the classroom was discussed. In summary, it appears that students are more engaged and exhibit desirable learning behaviors when computers are properly integrated into the curriculum. It is this purposeful integration of the technology into the curriculum that has the potential to provide students with a powerful learning experience. The literature also highlights that computers will do little to increase student learning if proper integration has not taken place.

As reported above, some studies suggest that using computers in the classroom can increase academically desired behaviors in students. Another learning behavior that most educators would like to pass along to their students is the ability to be self-directed learners once they have left the formal education setting. The following section of the

literature review will discuss the topic of self-directed learning and how computers have the potential to foster that quality in today's students.

Butcher & Sumner (2011) define a self-directed learner as "a nonexpert population of thinkers who must locate relevant information sources, evaluate the applicability and accuracy of digital resources for learning, and determine how and when to use these resources to complete educational tasks (p.1)". Computers give students the platform they need to improve their self-directed learning. Butcher & Sumner (2011) discuss how students utilize their metacognitive processes and prior knowledge in order to make sense of content they are learning. However, in many cases, the student's metacognitive processes and prior knowledge are lacking and that is where computers may help students develop the skills needed to become more self-directed.

Butcher & Sumner (2011) gives an example of how students use computers to develop an essay that demonstrate a student's understanding of a particular subject. The teacher then provides students with opportunities to do research and test their ideas in different settings, making changes/improving their essay as their understanding of the subject matter becomes more refined. If their initial mental model was not working, students had the opportunity to manipulate the model in hopes of discovering how the phenomenon truly works. As students move through their misunderstandings, the computer could be the tool to help the students develop a mental and possibly physical model of their thinking. It was the experimenting and changing of the essay that allowed students to build knowledge as they worked on their projects.

After surveying 761 college undergraduates, Rashid & Asghar (2016) found a direct relationship between technology usage and student engagement and self-directed

learning. Interestingly, even though engagement and self-directed learning increased with technology use, they were not able to find a direct positive relationship between academic performance and technology use.

Lee, Tsai, Chalt & Koh (2014) studied 500 secondary students and found students that engaged in self-directed learning and collaboration activities in a nontechnology context, were also more likely to engage in self-directed learning and collaboration activities in a technology-supported context. They argue that teachers may benefit from developing a student's learning processes, in terms of self-directed learning and collaborative learning, before asking students to engage in technology supported activities that require those processes in order to be successful.

The computer itself does not hold the key to self-directed learning (Cuban, 2001; Oppenheimer, 2003). Teachers providing quality instruction, specifically teaching students how to improve their metacognitive processes and information gathering/analyzing skills, will help students make sense of the world around them (Butcher & Sumner, 2011). This type of learning is what students need to become good self-directed learners. Computers simply provide students with the tools and information they need to not only analyze their initial thinking, but to give them a safe, controlled environment to gather new information, make sense of the information, try new strategies, and then move forward and improve/change their learning based on newly gained information they gathered for themselves. In order for students to have this rich experience, it is important that teachers provide quality instruction to give them the opportunity to take advantage of these new tools. Without quality instruction, very little

benefit is gained. The next section of this literature review addresses pedagogies using technology integration in the classroom.

Effect of Pedagogy and Content Knowledge on Computer Integration

Every teacher has his/her own style of teaching and beliefs about of how teachers teach and students learn. The beliefs that teachers have about teaching and learning, and the method by which teachers deliver instruction, is known as pedagogy. There are several articles that discuss the relationship between quality pedagogical practice and effective use of technology in the classroom. A discussion about Technological Pedagogical Content framework as well as descriptions of different pedagogies that lend themselves to integrating technology in the classroom will follow.

Pedagogy can be described as the method by which teachers teach their students. One of the more popular pedagogies in modern education, in particular when discussing technology integration, is constructivism. Constructivists believe that new knowledge is attained when a learner engages in authentic learning activities that allow them to build knowledge based on what they already know and understand (Papert, 1980; Papert, 1994; Girvan & Savage, 2010). It is through the problem solving/knowledge building process that students begin to gain a deeper understanding of the subject matter at hand. As discussed earlier in this literature review, computers in the classroom can lend themselves to this type of learning but a teacher's pedagogy could be one of the main factors that influence how computers are used.

In addition to a strong pedagogical practice, it is important for teachers to have a solid understanding of the subject matter they are teaching. Ball (2000) explains that content knowledge gives the teacher "listening flexibly to others and hearing what they

are saying or where they might be heading. Knowing content is also crucial to being inventive in creating worthwhile opportunities for learning that take learners' experiences, interests, and needs into account" (p.242). Teachers use this content knowledge to examine their teaching practices. They make adjustments based on what they know about the subject at hand. For example, a skilled mathematician would have a better understanding of why a student is confused based on how the student is responding to questions. A teacher without proper content knowledge would have a much more difficult time understanding the source of a student's confusion. Conversely, a content expert would be more aware of the common misconceptions in their field and they would be able to adjust their lesson to address their student's misconceptions.

Even when teachers have a strong pedagogy and content knowledge, they can sometimes struggle to be effective technology integrators. Koehler, Mishra and Yahya (2007) describe a Technological Pedagogical Content Knowledge (TPCK) framework. This framework explains how teachers need more than a strong content knowledge, technical expertise and pedagogical knowledge to be successful integrators of technology. Teachers must possess knowledge in all three areas - but it is a deep understanding of the complex interrelations between those three areas that help teachers grow as technology integrators. Their study suggests that teachers can improve their TPCK knowledge by participating in activities or events that force them to think about the complex interactions, such as lesson design or curriculum writing and that true technology integration is developed over time as teachers interact with the different complexities involved in a technology rich lesson.

The main goal of most classroom teachers is to teach their students the content they will need to successfully learn the subject being taught. As mentioned above, a strong pedagogy, technical expertise, and time to develop those skills is essential for teachers to be able to use computers to help their students learn. Additionally, teachers want to help students become better overall citizens. Up until recently, this type of training was provided through a comprehensive social studies curriculum. With the addition of technology in the classroom, there is another area of citizenship that teachers must be aware of and foster in our children.

Digital Citizenship

It has been a long-standing goal of educators to help students become productive members of society. The Internet has added an additional layer of citizenship that is new to everyone. More and more people, especially young people, are moving their social interactions online to places like Facebook and Instagram. As people move to these new platforms, they are engaging less in traditional civic responsibilities (Bennett, 2008). Teaching our students to be productive citizens, while considering this ever changing social landscape, presents a challenge for educators.

Bennett (2008) suggests that most of the public schools in America are doing very little to include activities that are interesting or engaging for today's youth. Furthermore, he explains that the students are commonly subjected to a curriculum that is void of topics that would enhance civic engagement. Bennett (2008) states, "Not only have civics offerings been in decline, notably the United States, but, where offered, the curriculum is often stripped of independent opportunities for young people to embrace and communicate about politics on their own terms" (p.7). He suggests that educators need to

develop curriculum that will demonstrate to young people the value of traditional civic engagement (Bennett, 2008).

Winn (2012) describes how schools can use social networking sites to teach students to be responsible digital citizens. He admits that there are valid reasons why school districts block or discourage social networking use during school hours, but as the tools available to educators mature, they are giving schools the tighter control they need to provide a safe social networking environment. Winn (2012) describes how teachers use their tightly controlled social networking environment to extend the classroom beyond regular school hours and give them a platform to model appropriate social networking behavior to students. The benefit of creating your own environment is that it limits the participants to teachers, students and administrators and it allows the school to emphasize accountability for anything posted on their school site.

The dangers of the internet have been well documented. Television, newspapers, magazines and other media outlets have published stories about employers firing employees for inappropriate behavior, students getting harassed and bullied, and most unfortunately, students even committing suicide partially because of the torment they received on the Internet. All of the great opportunities that computers provide must be carefully implemented. Teachers have to be aware of the dangers on the Internet and take an active role in making sure their students are safe when participating in online activities. Teaching digital citizenship is another challenge educators face in this new and ever-changing world of computers and the Internet.

Digital Natives vs. Digital Immigrants

There appears to be a divide between students who grew up with technology their entire lives and their teachers who did not have computers during their formative years. This divide sometimes creates a barrier for learning and exploration of new technologies. The problem arises when students familiar with technology want to use technology their teachers do not understand.

Prensky (2005) urges educators to take a more student-centered approach to technology adoption. He makes the argument that today's students are digital natives. They have grown up using technology to play games, explore the Internet and learn from digital media. He describes people that grew up without those technologies readily available to them as digital immigrants. He argues that digital natives come into our classrooms with a variety of skills that many of our digital immigrants do not possess. Prensky (2005), argues that teachers need to start listening to their students. He states,

> As educators, we must take our cues from our students' 21st century innovations and behaviors, abandoning, in many cases, our own predigital instincts and comfort zones. Teachers must practice putting engagement before content when teaching. They need to laugh at their own digital immigrant accents, pay attention to how their students learn, and value and honor what their students know (p. 10).

While this disconnect between older and younger users of technology may cause problems with some students, we need to be careful not to put all of our students into the category of being computer savvy just because they grew up during the time of personal computing. Bennet, Maton and Kervin (2008) found that many of our students do have technical skills that are greater than our teachers. However, there is also a large portion of

these students that are not the best of the best when dealing with computers and technology.

Not all of the research points to the generation gap as an explanation for digital native vs. digital immigrants. Helsper & Eynon (2010) suggest there are other variables that help to determine whether someone is a digital immigrant or a digital native. They point to measurable factors, such as internet use, education level and experience as playing a significant role in whether a person is considered an immigrant or a native. They state,

> Indeed, in all cases immersion in a digital environment (i.e. the breadth of activities that people carry out online) tends to be the most important variable in predicting if someone is a digital native in the way they interact with the technology (515).

Whether one holds the assertions of Prensky (2005) as factual or one thinks that experience and interest play a larger role in whether someone is a digital native or not, it is important for teachers to realize the differences between themselves and all of their students. But these studies also point out that teachers need to continually improve their computer skills so they have the ability to teach and lead students in the technology arena, even if they are not technological experts.

Barriers to Technology Integration

Studies have shown that one of the major factors impacting the integration of technology is a teacher's comfort level with technology itself. Hammonds, Matherson, Wilson, and Wright (2013) suggest that teachers begin to work with technologies that will make their lives as teachers easier and not necessarily try to integrate it into their

curriculum right away. Hammonds et al. (2013) suggest teachers use tools that can be used in their teaching profession but not necessarily in their lessons. For example, they suggest using DropBox, an online document storage and sharing website, to get familiar with cloud computing and file management. It is their belief that once teachers begin to see the value in their own lives, they will be more apt to begin integrating similar technologies into their curriculum and their technology efficacy will begin to flourish.

Some of the challenges teachers face are more difficult to overcome, such as a lack of working equipment in the classroom, sporadic or incomplete professional development, and high costs of network infrastructures and computer equipment (Hammonds, et al., 2013). Additional barriers include, but are not limited to, difficulty developing a teacher's vision about how technology could be used in the classroom, changing a teacher's beliefs about the usefulness and difficulty in implementing technology, a lack of time to prepare and or practice using technology, and a lack of professional development offered to teachers specifically around how to use technology in the curriculum they are delivering (Kopcha, 2012).

Other researchers suggest that barriers can be overcome by engaging in quality professional development. Several authors have found that professional development, specifically, mentoring or in-class professional development is an effective way to help teachers integrate technology (Zhao & Bryant, 2006; Lowther, Inan, Strahl, & Ross, 2008). They also noted that professional development that did not consist of in-class follow-ups were ineffective. However, it should be noted that providing in-class, one-on-one mentoring is expensive and difficult to maintain. This is because of the already high

demand on school resources, continually evolving technology, and lack of scalability (Kopcha, 2012).

Ertmer, Ottenbreit-Leftwich, Sadik, Sendurur & Sendurur (2012). Ertmer et al. (2012) also suggest that there are several barriers to technology integration in the classroom, both internal and external. To come to this conclusion, the researchers conducted a case study of twelve teachers that were award-winning technology integrators at their school. Notably, their research concluded that teachers felt the strongest barriers preventing other teachers from using technology were their attitudes and beliefs toward technology and their current levels of knowledge and skills. Etmer et al. also suggest changing professional development practices to focus on strategies for facilitating changes in teachers' attitudes and beliefs

Summary

The literature demonstrates that there are two main schools of thought when it comes to technology integration in the classroom. There are researchers who believe the use of technology in the classroom can reform the way we teach and learn, but others have found that schools have been oversold on the promise that technology can improve the education system.

In reference to the former group, there are teachers using the cutting edge technologies available to educators. The level to which these tools are being used effectively varies depending on how the teacher and students interact with those technologies. But research does show that when implemented properly, students and teachers seem to benefit from technology integration.

The latter school of thought has argued teaching practices have changed very little as a result of the introduction of the computers in the classroom. There are many reasons for this sporadic implementation of quality technology integration. A lack of funds, leadership and vision about the best way to use technology are a few reasons cited in the literature as to why computers fail to meet the expectation of improving education. Other barriers referenced in the literature are the lack of quality staff development afforded to teachers and the difficulty of learning new technologies and new teaching techniques simultaneously.

Research is clear that technology alone will do little to change the way we teach and learn. For computers to change the way they teach and learn, teachers need to have a solid understanding of the technologies available to them, a sufficient knowledge of their content area and a pedagogy that allows the teacher and students to use the technology to improve the learning environment, not just rehash traditional teaching techniques using a different medium.

The number of research articles supporting both sides of the argument suggests that the effectiveness of computers in the classroom is up for debate. The two main research questions for this study are:

1. How do teachers perceive their ability to effectively integrate technology into their curriculum?
2. How do students rate the effectiveness of technology integration they receive?

The literature review uncovered many possibilities that technology affords teachers and students in the classroom. It also highlighted some of the difficulties and challenges of successful technology integration. Many of the areas of study that were

discussed in the review would benefit from further study. Understanding how teachers perceive their use of technology to improve instruction and whether students perceive that instruction as beneficial are key components to improving the way technology is being integrated into today's classrooms. The following chapter of this dissertation, chapter three – Research Methodology - will provide the reader with a detailed description of the research methodology that was used, and why that method has been chosen to study how teachers and students perceive the effectiveness of computers in the classroom.

Chapter 3 - Methodology

There are two general methods for conducting research - qualitative methods and quantitative methods. The major difference between qualitative and quantitative research is their focus. Qualitative studies help researchers answer questions dealing with the "why" and "how" of the problem being explored. The researcher conducts a qualitative study by collecting and analyzing data looking for patterns and similarities in the data set. Sources of data include surveys, interviews, field observations and the review of documents and artifacts, to name a few. A deep understanding is gained by systematically collecting and analyzing data that will help the researcher create a clear understanding of the phenomenon being studied (Merriam, 2009). There are numerous qualitative research designs (e.g., phenomenology, ethnography, grounded theory, and narrative inquiry). Each design has its own strengths and purpose. It is important for the readers of this dissertation to understand the rationale for why the research design was chosen. Later in this chapter, the researcher will summarize the characteristics of each research design and provide an explanation as to why a particular design was either chosen or rejected for this study.

In comparison, quantitative research helps researchers determine relationships between independent and dependent variables. This type of research can help researchers predict when events will happen in the future and understand to what degree changing one variable will have as an impact on another (Merriam, 2009). In a quantitative study, researchers begin by identifying the variables and forming hypothesis to be tested. After the research questions and hypotheses have been decided upon, a representative sample is taken from a larger population (probability sampling) and a quantitative research design

is put in place to test the hypotheses of the study. Data is analyzed after it has been collected, not during the data collection process, which is often the case in qualitative studies. Another feature of a quantitative study is that when completed, the researchers should be able to repeat their study with similar results and be able to generalize their findings to a larger population.

For this study, a mixed methods approach was chosen. A mixed methods study combines both qualitative and quantitative methods into a single study (Creswell & Plano Clark, 2007). This approach provided the means to gain a better understanding of the experience of a classroom teacher and the experience their students have when using technology in a teaching/learning environment. The focus of the study was the qualitative portion, which included personal interviews with teachers and their students, classroom observations, and a review of documents and artifacts collected during this study. The quantitative portion of the study involved a survey that was given to all of the teachers participating in this study. The goal of the survey was to begin gathering data that when analyzed would help the researcher identify how teachers are using technology in their classrooms. A second goal of this collection and review of data was to identify how teachers perceive their effectiveness when trying to integrate technology into their curriculum.

The data was collected sequentially, starting with the survey data. After reviewing the survey data for patterns and trends that indicate how teachers use technology in their classroom, the qualitative portion of the study began. This portion included classroom observations, personal interviews, and the review of documents and artifacts collected during and after classroom visits. As this data was collected, the researcher began to

analyze it using techniques commonly associated with grounded theory: open and axial coding. This process will be described later in this chapter.

Ultimately, the researcher used both the qualitative and quantitative findings to gain a better understanding of the experience of classroom teachers and students using technology to improve teaching and learning experiences..

Research Design

Determining the best research design is an important part of any study. Therefore, it was important to choose a design that, when implemented, would provide the information needed to answer the research questions:

1. How do teachers perceive their ability to effectively integrate technology into their curriculum?
2. How do students describe their experience using technology to learn?

The research design outlined in this chapter would be best described as a mixed methods design. The combining of quantitative methods and qualitative methods is what constitutes a mixed methods study. Creswell, Plano Clark, Guttmann & Hanson (2003) discuss the power of mixed methods research. They contend that mixed method research helps to even out the weaknesses of the qualitative and quantitative research methods. The authors state, “the use of multiple methods can neutralize or cancel out some of the disadvantages of certain methods” (p. 211). To that point, this researcher decided to conduct a mixed methods study focusing primarily on qualitative research and using a quantitative component to screen potential participants and later compare the findings presented in the qualitative data. The specific mixed method design being used is called the sequential explanatory design (Creswell & Plano Clark, 2007).

Creswell (2014) states, “The intent of the explanatory sequential design is to begin with a quantitative strand and then conduct a second qualitative strand to explain the quantitative results” (p. 38). In this particular study, the quantitative data alone would have done little to provide the evidence needed to answer the research questions.

The qualitative portion of this research was what Chenail, Duffy, St. George, & Wulff (2009) describe as a generic brand of qualitative research. They explain that the approach contains all of the key aspects of good research. The reason this part is classified as basic or generic is because the study lacks the special features found in the other types of studies that were reviewed. For example, culture is considered essential to the ethnography and without it, a study cannot be considered ethnographic. Therefore, one could describe the qualitative portion of this study as a basic or generic qualitative research design utilizing grounded theory open and axial coding to help analyze and interpret the data. Below is a detailed description of the interaction, timing, and priority of the study; how the two methods were mixed; and a summary of the reasons for choosing this particular design.

Although the focus of this study is a basic qualitative study, a self-reporting survey was administered and analyzed quantitatively to aid the researcher in answering the research questions and selecting a sample. In this design, the researcher began by first collecting and analyzing quantitative data. In this case, the online survey was administered. After the survey data was analyzed, the qualitative portion of the study was conducted. It was the subsequent qualitative study that helped the researcher gain a better understanding of the quantitative data (Creswell & Plano Clark, 2007). For example, in this study, the researcher conducted interviews and observations with teachers and

students participating in those teachers' classes to gain a deeper understanding of how teachers use technology and perceive their ability to integrate technology in the classroom. In addition, the researcher was able to document how the student's describe the effectiveness of the instruction they receive.

Therefore, after the survey results were analyzed for patterns and trends in the data teachers and students were selected to participate in the qualitative portion of the study. The qualitative portion of the study consisted of reviewing documents (lesson plans, classroom artifacts, student work that is being displayed, test data, etc), classroom observations and one-on-one interviews. After the qualitative portion of the study was completed, both sets of data were integrated for the results portion of the study. Having both qualitative and quantitative data allowed this researcher to gain a better understanding of the true reality of technology integration happening in the classroom. The combination of this data was also used to help triangulate and validate the findings of the data.

Several other mixed method designs were considered but ultimately rejected for use in this study. They are 1.) convergent parallel design, 2) the exploratory sequential design, 3) the embedded design, 4) the transformative design, 5) and the multiphase design (Creswell & Plano Clark, 2007).

The first design reviewed was the Convergent Parallel Design. According to Creswell & Plano Clark (2007), the convergent parallel design is chosen when the researcher wants to compare both qualitative and quantitative studies in an effort to validate or expand the quantitative results with qualitative data.

In the Convergent Parallel Design, qualitative and quantitative data are collected simultaneously. During the analysis phase, qualitative data is analyzed first followed by the quantitative data analysis. The two sets of data are combined either in the interpretation or the results portion of the study. In many cases, the quantitative data is used to help triangulate and validate the findings of the data collected in the qualitative portion of a study. Creswell & Plano Clark (2007), suggest using this design when a) the researcher has limited time to complete the study; b) the researcher thinks that studying the problem both quantitatively and qualitatively will help them better understand the problem; c) the researcher is skilled in both quantitative and qualitative methods; d) and finally, this design should be used for a sole researcher who can collect limited amounts of data (Creswell & Plano Clark, 2007). Although many of these criteria were met for this study, it was ultimately decided that collecting quantitative data first would help the researcher gain a better understanding of the extent to which teachers are using computers in their classroom, so the convergent parallel design was ruled out.

The next design to be reviewed was the exploratory sequential design. This type of study is used when the researcher begins with the qualitative phase of the study. After analyzing the qualitative data, the researcher conducts a quantitative study to test or generalize the findings of the qualitative portion of the study. The point of this research is not to generalize to a larger population; therefore, it was rejected as an appropriate choice for this study.

After reviewing the exploratory sequential design, this researcher studied the embedded design. Using the embedded design, the researcher would conduct a traditional quantitative study and then add a qualitative strand or vice versa. Creswell & Plano Clark

(2007) state, “the researcher may add a qualitative strand within a quantitative design, such as an experiment, or add a quantitative strand within a qualitative design, such as a case study” (p.72). A full quantitative study was unnecessary to answer the research question of this topic so the embedded design was ruled out as an option for this study.

The transformative design was the next to be reviewed. This mixed-methods design can change depending on the theoretical perspective of the researcher. According to Crewsell & Plano Clark (2007), “all decisions (interaction, priority, timing, and mixing) are made within the context of the transformative framework” (p. 72). The theoretical perspective of the researcher is what drives this type of research. This study did not challenge social injustices, which is typically why a transformative design is used, therefore, it was also ruled out as a design option.

The final design that was reviewed is the multiphase design. According to Creswell & Plano Clark (2007), the multiphase purpose of this design is to provide an “overarching methodological framework to a multiyear project” (p. 100) that requires several phases to complete. Some of the reasons to choose this type of research are 1.) the researcher cannot complete long-term objectives of the study in a single mixed methods study, 2.) the researcher has experience with large scale projects, 3.) the researcher has sufficient resources and funding to implement a long-term project, 4.) the researcher is part of a team, 5.) the researcher is conducting a study where new questions arise during various stages of the project. Because this research does not require a long-term study and this researcher will not be working with a team, the multiphase design was ruled out as an option.

While deciding which research method to choose, the researcher reviewed Merriam's (2009), description of five types of qualitative research approaches. The five approaches Merriam (2009) describes are: basic, phenomenology, ethnography, grounded theory, and narrative analysis. After reviewing Merriam (2009), several other articles were reviewed in order to gain a better understanding of varying qualitative approaches. A brief description of each design will follow along with an explanation of why the researcher did or did not choose each particular design.

Phenomenology is one of the research approaches reviewed. The purpose of phenomenology is to get to the essence of the phenomenon under investigation. In this type of study, the researcher typically uses an in-depth interview as the main method of gathering data. Caelli (2000) explains, "they seek to explore the reality of phenomena in human experience, to allow the person's experience to speak so that it may be understood" (p. 370). Because the researcher did not plan to study a human experience that was affective, emotional, or intense, phenomenology was ruled out as a design option.

The next approach studied was ethnography. The main goal of ethnography is to understand the culture of a group. Fetterman (1998) describes ethnography as "the art and science of describing a group or culture. The description may be of a small tribal group in an exotic land or a classroom in middle-class suburbia" (p. 1). One unique aspect of ethnography is how the data is gathered. Fetterman (1998) describes the data collection process when he states, "Fieldwork is the most characteristic element of any ethnographic research design. This approach shapes the design of all ethnographic work. Classical ethnography requires from 6 months to 2 years or more in the field" (p. 8). Data is

collected through formal and informal interviews and observations. Analysis of documents and other cultural artifacts is incorporated into the data collection process. Researchers also take copious field notes, which are used as data to explore the culture being studied. This study did not focus on a specific culture, so ethnography was ruled out as a possibility.

Narrative inquiry is a qualitative research method that focuses on examining stories in order to make sense of the world around us. Merriam (2009) explains, "The key to this type of qualitative research is the use of stories as data, and more specifically, first-person accounts of experiences told in story form having a beginning, middle, and end" (p. 32). The text from these stories is examined using hermeneutics, which is the interpretive study of written texts. Because the researcher planned to use a semi-structured interview approach that did not allow the participants to tell comprehensive stories, narrative analysis was not chosen as a research method.

The next research method that was studied was grounded theory. Grounded theory's theoretical foundation is Pragmatism and Symbolic Interactionism (Corbin & Strauss, 1990, p. 5). Corbin and Strauss (1990) state that a researcher does not need to subscribe to these two philosophies in order to use the method, however, they point out that two principles, change and determinism, are drawn from those perspectives and are built into grounded theory research. When discussing change, Corbin and Strauss (1990) state, "Since phenomena are not conceived of as static but as continually changing in response to evolving conditions, an important component of the method is to build change, through process, into the method" (p.5). The second philosophy that is built into grounded theory relates to the issue of determinism. Corbin and Strauss (1990) explain,

"Strict determinism is rejected, as is nondeterminism. Actors are seen as having, though not always utilizing, the means of controlling their destinies by their responses to conditions" (p.5). It is the goal of grounded theory to identify the relevant conditions at play while also determining how the participants respond to the changing conditions around them.

In a grounded theory study, the aim of the researcher is to develop a theory that is "grounded" or based on data (Corbin &Strauss, 1990, p. 9). The data used to build the theory is typically obtained by conducting interviews, observations and examination of other relevant documents. Data is analyzed using open, axial, and selective coding. "In grounded theory, the analysis begins as soon as the first bit of data is collected" (Corbin & Strauss, 1990, p. 6). This simultaneous data collection and analysis continues until the researcher is no longer gaining new information from their sample. For this research project, the researcher used grounded theory's open and axial coding techniques to analyze data collected during personal interviews (Strauss & Corbin, 1998). However, it is important to note that the researcher did not attempt to build theory; rather, the researcher utilized the data analysis techniques commonly used in this approach.

Sampling

For this study, a non-probability sample was used. This type of sample is commonly used in qualitative studies (Merriam, 2009). A non-probability sample was appropriate for this study because the researcher was not trying to make generalizations across a population. Instead, the purpose of this study is to gain a deeper understanding of the topic under investigation. Marshall (1996), describes a key aspect of the sample by

saying, “The researcher actively selects the most productive sample to answer the research questions” (p. 523).

In order to determine the appropriate sample, the researcher used a purposeful sampling strategy (Marshall, 1996). The researcher used the following criteria to select the sample: (a) The teacher sub-sample consisted of teachers who self-identified as teachers who actively use technology in their classroom; (b) the teachers were actively teaching in grades 6-8 and using technology as a tool to improve the teaching and learning environment; (c) the teachers volunteered for the study; (d) students participating in the study were students of the teachers participating in the study; (e) any student that participated volunteered and obtained parental consent before being allowed to participate in the study; (f) students were currently enrolled in middle school grades 6-8. The sampling criteria were put into place to ensure the researcher was able to study teachers and students from similar classroom situations who are using technology to teach and learn in the classroom setting. The researcher feels that all of those criteria were met when selecting the sample and that the identified respondents provided “a rich supply of data” (Glaser, 1978) for this study.

To pick the sample, the researcher sent a 50 question survey to every teacher in the district who met the criteria for teacher participants listed above. After collecting the survey data, the researcher began by looking for patterns and trends in the data to identify classroom teachers who use technology in their classroom on a consistent basis. In the survey the teachers were also asked to volunteer for the second portion of the study. After using the survey data to identify the teachers actively using technology, the researcher selected eight volunteers for the qualitative portion of the study. To do this, the researcher

employed a strategy suggested by Patton (2002) called purposeful random sampling. The researcher imported all of the teachers who volunteered to participate in the qualitative portion of the study into an Excel spreadsheet. Then using the random number function in Excel, a number was assigned to each participant. The researcher then ordered the participants by the random number from lowest to highest and selected the first eight teachers from the ordered list. It is important to note that this strategy does not allow the researcher to generalize the findings across a population, instead, it is used to add credibility to the study. Patton states, "The purpose of a small random sample is credibility, not representativeness" (p.241). Data collection began after all eight classroom teachers were chosen.

This researcher's goal was to observe the classroom interaction between teachers and students, review artifacts and documents created in this environment, interview the eight teachers that were selected and interview two students from each teacher's classroom. The teachers were instructed to select two students from their class that they felt were proficient in technology and would have the most to say about using technology in the classroom. Fortunately, the researcher was able to reach these goals. The researcher was able to interview the desired number of participants. The researcher examined the data as soon as it was collected and data was collected until all of the interviews and observations were completed. Ideally, the researcher would have liked to conduct theoretical sampling, wherein additional interviews and observations would be conducted until data saturation is met (Marshall, 1996). Data saturation is accomplished when interviewees are no longer providing new information. However, time restrictions and

classroom availability did not allow this type of sampling to be conducted. The selected samples of teacher and students will be described in detail in the findings chapter.

Data Collection

Quantitative data collection - self-reporting survey. For this particular study, the Loti Digital Age survey, originally developed by Moersch in 1994, was administered prior to the interviews and classroom observations. The questionnaire consists of 50 questions. The questions address the three factors considered to be indicators of technology integration in the classroom: (1) classroom teachers' Level of Technology Implementation (LoTi), (2) Personal Computer Use (PCU), and (3) Current Instructional Practices (CIP). All of the questions used a Likert-scale consisting of seven valid responses. Those responses range from nonuse of technology to refinement of technology integration.

The LoTi level describes to what level technology is being used in the classroom. On the low end, technology is used to display information and provide additional resources for the teacher to disseminate information to the class. On the higher levels of LoTi, instructional emphasis is on student-directed learning and exploring real-world problems. The teacher CIP level evaluates the teachers' instructional practices. Lower levels of CIP are indicative of a subject-matter approach to learning. Students are focusing mainly on lectures and other media that is designed to help the students understand what is being presented. The higher levels of CIP describe a learner-based approach where student questions are the main motivator of inquiry. Student self-directed learning is also a feature of higher levels of CIP. PCU describe the levels of personal computer use. Specifically, PCU focuses on the fluency with digital tools. Teachers with

lower levels of PCU would have little fluency when using digital tools for student learning. On the other end, teachers with a high PCU would have extremely high fluency and have the ability to learn new technologies. Also, high PCU teachers use digital tools in a more sophisticated way as opposed to simply using technology to display information in various formats. See appendix I for a detailed description of each level.

To determine the reliability of the survey, this researcher reviewed a study by Hull (2011). Hull used Cronbach's Alpha to determine the reliability of the survey. Cronbach's alphas for the 40 LoTi level items was .74. Cronbach's alpha for the 5 PCU items was .81. Finally, Cronbach's alpha for the 5 CIP items was .73.

The survey was administered online by the researcher of this project. Teachers were invited to participate in the survey via an email invitation. The data was collected online and when extracted, any identifying information about the participants was removed. To remove identifying data, each teacher's survey was coded so that the teacher's name did not appear on the survey results. The corresponding codes are stored in a password protected computer file. After reviewing the data, the researcher began to identify how teachers were using technology in their classroom.

Because this study was a mixed methods study, after the conclusion of the qualitative portion of the study, the quantitative data was again compared to interview and observation data. This was done in an effort to find similarities and differences between the survey results and the data gained during interviews, observations, and artifact collection and review. Thus, a triangulation of survey, interview, observation, and artifact data was possible.

Qualitative data collection.

Interviews. In the qualitative portion of the study, the researcher is the primary source for data collection. One tool commonly used to gather the data is a personal interview. There are several varieties of interviews that are used. They range from structured, where the wording of the order in which they are asked is predetermined before the interview, to unstructured, which features open-ended questions and much more flexibility about their content (Merriam, 2009). The following section of this dissertation describes the interview type used for this study.

After considering the range of interview approaches available, a semi-structured interview format was chosen for this study. This format allowed the researcher to ask open-ended questions and several directed questions. It was important for the researcher to have the flexibility to add, change or leave out questions based on the participants' response. The researcher believes that a combination of open-ended and directed questions gave both teacher and student interviewees the best opportunity to share their experiences in their classroom and, at the same time, made sure that all participants were asked the same core questions to allow for a comparison of interviews.

Before conducting the interviews, the researcher developed an initial set of questions for the teachers and students. The researcher discussed the pros and cons of various questions with a research advisor before making a final decision on questions for the interviews. Before conducting all of the interviews, one initial interview each of a teacher and a student, was completed to inform the researcher about the effectiveness of the questions in terms of their ability to help answer the research questions for this study. After examining the data, the researcher decided to slightly reword one of the questions

to help the interviewee better understand what they were being asked. This technique was used to ensure that the questions used in all of the interviews prompted the interviewees to provide enough relevant data to answer the research question of this study. A list of the final version of the interview protocol is provided in appendix A of this dissertation.

At least one question would be regarded as open-ended. This question was used in an effort to identify unique viewpoints of the classroom teacher and student experience. One example of an open-ended question used was, “Explain what it feels like when you use computers for teaching and learning in your classroom?” The other questions were more structured, in the hope that they would direct the respondents to provide information that would help the researcher answer the research questions for this study.

The interview times and locations were agreed upon before the interviews were conducted. None of the respondents requested a copy of the interview questions before the interviews took place. Before conducting the interviews, each respondent signed an Informed Consent for Participation in Research Activities form. This was done to make sure that they were aware they were participating in a study and to inform them of what they would be expected to do if they decided to participate. This form was given to each teacher and student during an initial visit with the class. This visit also gave the researcher an opportunity to explain to the participants that they could stop the interview at any time and, if they choose, did not have to answer any questions. For students participating in the interview, direct parental consent as well as students’ assent was required.

During each interview, the conversations were recorded using a digital recorder. The researcher assured both teachers and students that their names would not appear in

the written report and that coded identities would be used any time their comments were referenced specifically. The original recordings and the coded data is being stored in a password protected computer file until the conclusion of this study. All of the interviews took place during the regular school day.

As soon as data was collected, the researcher began to transcribe the interviews. Before transcribing the data the researcher created a simple set of transcription rules that McLellan, MacQueen, & Neidig (2003) recommended, that are "limited in number, simple, and easy to learn" (p. 65). A complete list of the transcription rules is provided in appendix B of this dissertation.

After the transcription rules were finalized, the interviews were transcribed word for word and the researcher began to analyze the data. The examination of the data was completed based on guidelines described by Corbin & Strauss (1990), which indicated that data analysis should begin immediately after collection. The data analysis techniques used for this project will be described in detail later in this chapter.

Observations. In addition to personal interviews with students and teachers, eight classroom observations were conducted. The lessons that were observed were chosen by the teacher. Both teacher and student interactions were observed. Merriam (2009) points out several benefits of conducting observations in addition to interviews. They are: (1) outsiders may notice things that have become routine to the participants, things that may help the researcher understand the topic under study; (2) observations can help to triangulate emerging findings; (3) observations can help provide some context to the study or provide specific incidents, or behaviors that can be used as reference points for

future interviews; and; (4) researcher may witness something that participants would not feel comfortable saying in an interview.

As suggested by Emerson, Fretz, & Shaw (2011), field notes were used to capture the data during the observation. The researcher took notes in a field note journal and then audio recorded his complete thoughts on a digital audio recording device immediately following the observation. This was done to ensure that what was included in the observation report was accurate and reliable. All notes include the time, place, purpose of the observation and a brief discussion of any emerging questions or explanations.

Documents and artifacts. Document and artifacts were also collected during classroom observations. Photographs were taken at each location to document the physical surroundings of the classroom. This observer looked for evidence in terms of artifacts and documents that helped answer the research questions of this study. For example, lesson plans and assessment data were reviewed for evidence that technology integration was being purposefully employed to address lesson objectives. All of this information was recorded in detail to provide the database for analysis.

Data Analysis

Analysis of the quantitative and qualitative data occurred sequentially, beginning with the analysis of the quantitative data (survey results). The analysis techniques used for both designs are listed below.

Quantitative data analysis. After the data was collected from the self-reporting survey, the researcher used the reports provided by the LoTi survey tool to determine the teacher's level of computer use in the classroom. The reports provided a LoTi, CIP, and PCU score for each teacher.

Upon completion of the qualitative portion of the study, the quantitative data was again compared to the observation and interview data in an effort to find similarities between the data sets. This data served to strengthen the claims made during the interview process. As similarities were found between the interview data, classroom artifacts, observations and the quantitative survey measures, the data set made it possible for this researcher to triangulate the findings of the study. These findings will be discussed in the next chapter of this dissertation.

Qualitative data analysis – interviews, artifact review and observation field notes. After the data was transcribed, the researcher immediately began analysis of the data. The decision to immediately start reviewing the data is based on authentic grounded theory guidelines (Corbin & Strauss, 1990). The researcher used grounded theory open and axial coding techniques to analyze data collected through personal interviews (Strauss & Corbin, 1998). It is important to note that the researcher was not attempting to build theory but did utilize the microanalysis techniques commonly used in grounded theory.

Strauss & Corbin (1998) explain that "microanalysis" helps researchers look at the data from an analytic standpoint. Through the process of open and axial coding, researchers achieve "analytic distance" from the data. During the process, researchers begin to "conceptualize and classify events, acts, and outcomes. The categories that emerge, along with their relationships, are the foundations for developing theory" (Strauss & Corbin, p. 66). Corbin & Strauss (1990) describe categories as the grouping of concepts found in data that "are higher in level and more abstract than the concepts they represent" (p. 7). They also explain that the grouping of like concepts in and of itself does

not constitute a category. Corbin & Strauss (1990) state, "a more abstract concept must be developed in terms of its properties and dimensions of the phenomenon it represents, conditions that give rise to it, the action/interaction by which it is expressed, and the consequences it produces" (p. 7). That being said, if the researcher is unable to define the properties and dimensions (to be explained below) of a group of concepts, those grouped concepts cannot be considered a category.

The researcher chose grounded theory's open and axial coding techniques because they are the most appropriate based on the research questions and the purpose of this study. Although the researcher was not planning on building theory during this study, it was hoped that having a better understanding of the teachers' and students' experiences would help to identify aspects of classroom technology integration that could be improved. Therefore, it was a goal of this research to look for patterns in teaching and learning experiences using technology, both positive and negative, and how those categories are related to one another and to teacher beliefs. Looking for patterns in data and identifying how categories relate to one another are both goals of the data analysis techniques used in grounded theory data analysis techniques (Corbin & Strauss, 1990). The categories, and its subsequent subcategories, properties and dimensions that emerged during the data analysis portion of this study will be described in detail in the following chapter.

As this research documents the positive and negative experiences of the teachers and students, the information gained has the potential to encourage administrators to make changes to their staff development programs and help teachers change their teaching pedagogy to better suit the needs of their students. These changes could lead to

an improved teaching experience for the teachers, and more importantly, a richer learning experience for the students. Therefore, it is important to understand the coding process that was used to develop the categories that help explain the teachers' and students experience in a learning situation where technology is being used.

Coding process. Strauss & Corbin (1998) describe coding as the analysis of data that "generate initial categories (with their properties and dimensions) and to discover the relationships among concepts" (p. 57). The first step in the coding process is called open coding. Open coding can be defined as the "analytic process through which concepts are identified and their properties and dimensions are discovered in the data" (Strauss & Corbin, 1998, p. 101). Properties are conceptual aspects of the category and the dimensions define the range of that aspect. Properties and their dimensions explain what is happening within a category. The following paragraph will describe the steps of the open coding process.

To begin open coding, the researcher went through the process of naming or labeling ideas by doing a microanalysis of interview and observation data. The researcher examined each interview and observation line-by-line - adding codes (words or phrases) to the margin of the document to statements in the text that had the potential to help the researcher understand and explain the teachers' and students' experiences. "The purpose behind naming phenomena is to enable researchers to group similar events, happenings, and objects under a common heading or classification" (Strauss & Corbin, 1998, p. 103). As suggested by Strauss & Corbin (1990), to help the researcher deepen his understanding of the concepts being identified, the researcher wrote theoretical memos during the labeling process. These theoretical memos allowed the researcher to ask

questions of himself about the concepts being presented, think about the original interpretation, and flush out other possible meanings or concepts presented in the data that were not apparent upon the initial examination of the text (Strauss & Corbin, 1990).

During open coding the goal of the researcher is conceptualizing. The process of open coding is used to open up the text for understanding. A concept is defined as a labeled phenomenon. Strauss & Corbin (1998) defined open coding as "the analytic process through which concepts are identified and their properties and dimensions are discovered in the data" (p. 101). Strauss & Corbin (1998) explain, "Eventually, the analyst realizes that certain concepts can be grouped under a more abstract higher order concept, based on its ability to explain what is going on" (p. 113).

As Strauss & Corbin (1998) suggest, during this coding process, the researcher of this project began grouping concepts into more "abstract explanatory terms", called categories. The categories that emerged helped the researcher better understand and explain the phenomenon under study. As mentioned earlier, to give further meaning to each concept, properties and dimensions of a category were developed. The property of a category is simply a characteristic of a category. For example, if the category under study is drug use, one property could be the frequency at which a person uses drugs. The dimension of a property describes the variance of that particular property. For example, the dimension of the frequency of drug use could range from social drug users (a person that uses drugs very infrequently) to a habitual user (a person that uses drugs on a daily basis).

The codes used by the researcher consist of words and phrases that describe the ideas being presented in the interviews and observations. The actual codes used were

either taken directly from the interview data (in vivo codes) or they are conceptual terms used to describe the phenomenon that was taking place. The codes were added to the margins of the original interview transcripts using Microsoft Word. When a phrase or sentence was identified as having the potential to inform the development of a concept, the statement or word was highlighted and a code was added to the margin of the transcript.

While performing open coding, the researcher went through the process of axial coding. Axial coding is defined by Strauss & Corbin (1998) as the "process of relating categories to their subcategories, termed axial because coding occurs around the axis of a category; linking categories at the level of properties and dimensions" (p. 123). Subcategories are categories but as Strauss & Corbin (1998) state, "subcategories answer questions about the phenomenon such as when, where, why, who, how, and with what consequences, thus giving the concept greater explanatory power" (p. 125).

Following a thorough in-depth process of moving back and forth between open and axial coding, categories were developed. Axial coding resulted in the development of subcategories for each of the categories as well as properties and dimensions that aided in relating the subcategories back to the categories. The development of these categories was documented in a code book, see appendix K, and the categories will be fully explained in the following chapter. The identified categories provide insight into the primary factors that influenced the implementation of technology used by the teachers interviewed for this research and as perceived by the students.

A constant comparison method of data analysis was used to develop the categories. Constant comparison can be described as comparing incidents to one another

while looking for similarities and differences. Corbin and Strauss (1990) describe the benefits of the constant comparison method.

> Making comparisons assists the researcher in guarding against bias, for he or she is then challenging concepts with fresh data. Such comparisons also help to achieve greater precision (the grouping of like and only like phenomena) and consistency (always grouping like with like) (p. 9).

In another effort to reduce the effect of researcher bias, the researcher also used a suggestion made by Corbin and Strauss (1990) to not work alone. Originally, this researcher wanted a second researcher to code the interviews. Unfortunately, the researcher was unable to find another doctoral student with a similar interest in the topic under study. Instead, the researcher recruited a colleague familiar with grounded theory coding to help finalize the categories. This colleague is not a researcher by trade but has earned an Ed. S. in Education and worked in the education field for nineteen years. The colleague coded the interviews separately from the researcher. The colleague and researcher met on several occasions to discuss the interviews and categories, subcategories, properties and dimensions that emerged. They compared notes from each incident, looking for patterns in the data that would help explain the phenomenon under study. After working back and forth, constantly comparing one data set to the others, the researcher was able to define the categories, subcategories, properties and dimensions of the phenomenon under study. After coming to an agreement on the categories, and how they were defined in terms of their subcategories, properties and dimensions, the researcher is confident the categories are accurate. To improve the strength of the

categories, the researcher used the various forms of data collected during the study to corroborate the findings.

Research Permission and Ethical Considerations

Ethical issues were addressed during this study. Before the study began, the University of Missouri – St. Louis Institutional Review Board (IRB) granted permission for the study to take place. All of the necessary forms were filled out on IRB.net. The forms contained a description of the study and its significance, methods and procedures, participants, and research status. The project required a full review because one group of participants of the study were children.

Before the study began, an informed consent form was developed. Both student and teachers were required to volunteer for the study. Students were required to assent to the study. In addition to volunteering, students needed to obtain parental permission to participate in the study. Potential participants were informed of the study and its purpose via an invitation letter. The letter explained the purpose of the study and provided detailed information to the participants about the process they would go through if they decided to take part in the study. The consent and assent forms stated that the participants are guaranteed rights, agree to participate in the study, and acknowledge that their rights will be protected. Participants were instructed that they can withdraw from the study or not answer any questions if they so choose. The informed consent and assent forms are included in appendices C, D, E, F and G.

The identity of each participant was protected by taking off identifies from teacher surveys and numerically coding each questionnaire and interview and by keeping the responses confidential. Any time a participant is mentioned in the findings, a coded

name is used. All of the data collected, including survey data, classroom observation data, artifact data and interview data is stored in a safe in the researcher's home. All of the data will be destroyed after a year has passed. All participants were told that this study will be shared with professionals but their identity will be kept confidential.

Researcher Perspective

As a researcher, it was important to identify any biases that may have influenced this research. The researcher has worked in the technology department for the school district under study for 16 years. Being this close to the environment has forced this researcher to have preconceived notions about what is happening in the classrooms. Some of these biases include:

- preconceived notions about what should be happening in the classroom based on knowledge of the literature surrounding educational uses of technology in the classroom
- an expectation that technology is being used correctly because of my contributions to the department as a trainer and department leader
- an expectation that the technology equipment works properly based on my contributions to the department as a technician and department leader

Based on the biases above, it was this researcher's belief that technology is being used frequently in classrooms but there is very little higher-level use of technology happening in the district under study. It was the goal of this researcher to enlighten others of this situation with the hope of prompting significant changes in how teachers are trained to use technology for instruction.

For the purposes of this dissertation, higher-level use of technology use is associated with inquiry based learning and the constructivist learning theory. In these situations, learning would be very student-centered and self-directed. Students would be using technology to solve real-world problems. Teachers would guide the students through their inquiry and suggest possible strategies or technical tools, but students would ultimately be searching for answers on their own.

In contrast, in lower level uses of technology, teachers assume the prominent role of the disseminator of information by using technology to produce multi-media slide shows in hopes of enhancing lectures. In many cases, students may not actively use technology as part of the lesson. When students do use technology, most of the products produced by the students look very similar and there is very little student input into the project other than adding personalized styling to the end product.

The researcher was involved in collecting and analyzing all data, including the self-reporting survey, interviews, artifacts and classroom observations. Because the researcher was instrumental to the data collection and analysis process, it was important to put in place measures to help control for any bias that inevitably exists based on the researcher's close relationship to the district under study. Because of my role in the technology department, some of those potential biases would be an expectation that the technology is working correctly and that teachers have been properly trained to use the technology available to them. Also, because this researcher is responsible for some of the technology training the teachers have received, this researcher could have potentially overlooked criticism about the technology training they have received or looked favorably on how they are using technology in their classroom. Based on these biases the

researcher expected to hear that teachers were receiving the technology training they need to be successful technology integrators and that the technology they are using works well.

To control for these potential bias, the researcher took several steps. The first was to review the initial list of interview questions with my research advisor and dissertation committee and made changes based on their feedback. These questions were used in every interview but the research design allowed for follow-up questions based on the interviewees' responses. For example, follow-up questions were asked if students or teachers discussed topics that further helped to explain a category that was emerging. Additionally, the researcher took steps to help gain trust and confidence from the participants. Before beginning interviews, the participants were advised that the researcher wanted to know how they felt about how technology was being used in the classroom. The researcher wanted them to know that he valued their opinion and that their answers would be kept confidential and would not negatively impact them in any way.

The third step taken was to work with a partner during the data analysis portion of the study. This partner has worked for the district for 19 years and is an administrator. This person is not a researcher by trade, but is familiar with the coding process used in grounded theory. The partner did not collect any of the data and was provided with transcripts of the interviews. The partner was provided with the transcripts as soon as they were completed. After receiving the transcripts, she coded the interviews by herself. After the interviews were coded by both my partner and myself, we met face-to-face on several occasions to compare code books and discuss our findings. It was through the process of comparing code books and debating the merits of each concept being

presented, that the categories emerged. It could be argued that my partner would have some of the same biases and beliefs about technology integration in the classroom because of her employment with the school district, but her role as an administrator and her classroom experiences as a teacher give her a unique perspective about technology use in the classroom. It was the hope of this researcher that working together with someone in a different capacity in the district, with differing views on technology integration, would help to negate the above stated biases. Because we were able to come to a consensus on the categories, this researcher assumes the categories are viable.

It would have been ideal to work with a research partner or partners with different backgrounds and experience throughout this study. However, because of the time commitments required for this study, the researcher was unable to find other researchers willing and able to participate. In addition to the steps listed above, the entire proposal for this project was reviewed by my dissertation advisor and dissertation committee and changes were made to the design based on suggestions from the group.

My experiences working with teachers who are developing websites for instruction have given me a great deal of insight into how teachers currently use technology in their classroom. The researcher also had much experience developing an online curriculum guide. Through this work, it became apparent that a study needed to be conducted to give administrators and teachers a better understanding about what they can do to improve the use of technology in the classroom. At this point, there appears to be a disconnect between what is expected by curriculum coordinators and the actual experience that teachers and students have when using technology to teach and learn.

Chapter 4 – Findings

The following chapter describes the findings of this study. The purpose of this study was to examine middle school teachers' perceptions of their effectiveness integrating technology in the classroom and students' experiences when using technology to learn. Data was collected using a survey, personal interviews, classroom observations, and artifact collection.

As mentioned in the previous chapter, a mixed methods study was conducted. The focus of the study was the qualitative data (interviews, observations and artifact and document analysis). A survey was also given to help identify interview participants for the study. It is important to remember that the data collection and analysis techniques used for the qualitative portion of this study would typically be associated with grounded theory studies; however, the goal of this study was not to build theory. Instead, this researcher intended to document and report on how middle school teachers perceive their ability to effectively integrate technology into their curriculum and how students report their experiences using the technology to learn.

This chapter will begin by describing the participants of the study. After a description of the participants, the results of the survey will be reviewed. After the survey data is discussed, personal interviews will be described and analyzed. It is during the interview findings that the categories, subcategories, properties and dimensions of the phenomenon under study will be defined and related to one another. By defining the categories, the researcher is able to document the phenomenon under study.

After categories that were developed during the data analysis process were reviewed, artifacts and classroom observations that took place during the study will be

discussed. Through these discussions, the researcher will be able to corroborate and strengthen findings of the survey and interview data. It is through the comparison of these various data sets that the researcher was able to triangulate his findings.

Participants

A total of 309 middle school teachers, and 124 students, were invited to participate in this study. 46 teachers total volunteered. All 46 teachers participated in the survey. In the survey the teachers were also asked to volunteer for the second portion of the study. 24 teachers volunteered for the interview portion of the study. To pick the eight teachers for the interview, the researcher began by looking for patterns and trends in survey data to identify teachers who use technology in their classroom on a consistent basis. After using the survey data to identify the teachers actively using technology, the researcher selected eight volunteers for the qualitative portion of the study. 16 students also participated in personal interviews. The majority of the students who participated were observed in a classroom setting and did not participate in the personal interviews.

In order to keep the teachers' identity confidential, the researcher will only provide the teachers' experience, education level, curriculum area and gender. If more detailed information were provided, some of the teachers would be easily identified because of their teaching position and other demographic data. For example, the gifted teacher who participated in the interview portion of this study is one of five teachers in the district that teaches middle school gifted children. It would not be difficult to ascertain this teacher's identity if their full demographic information were tied directly to the participant.

Teachers. A total of forty six middle school teachers participated in the survey portion of the study. 37 of the participants identified themselves as female, seven as male and two did not identify their gender. Of the 46 teachers surveyed, five teachers reported teaching less than five years, 20 reported teaching between five to nine years, 15 reported teaching ten to 20 years and five reported teaching more than 20 years. Seven teachers reported having a bachelor's degree, 35 had a master's degree, two had an educational specialist's degree and one had a doctoral degree. Two teachers did not indicate their education level (see table 1).

Table 1

All Teachers – Teaching experience and education level

Teaching Experience	Bachelor's Degree	Master's Degree	Educational Specialist	Doctoral
<5 years	3	2	0	0
5-9 years	2	15	2	1
10-20 years	2	13	0	0
>20 years	0	4	0	0

Eight of the 46 teachers who took the survey also participated in the interview portion of the study. Six of the teachers interviewed were female, two were male. Of the eight teachers who participated in the interviews, two teachers reported teaching between five to nine years, four reported teaching ten to 20 years and two reported teaching more than 20 years. None of the teachers who participated taught less than five years. Eight teachers reported having a master's degree, and one had an additional educational specialist's degree. Three of the teachers taught communications arts, one taught business education, one taught Spanish, one taught gifted education classes, one taught science, and one taught mathematics.

Students. All of the students ranged in age from eleven to 13 years and were in grades six to eight. 124 students were observed in the classroom setting. Of those 124 students, 16 participated in personal interviews. To select the 16 students, teachers who were selected to participate in the interviews were instructed to select two students from their class that they felt were proficient in technology and would have the most to say about using technology in the classroom. Nine of the students who were interviewed were male and seven were female. The following sections will discuss survey results, personal interviews, observations, and documents and artifact data.

Quantitative Results

The Loti Digital Age Survey for Teachers (see appendix H) was used to begin the process of gaining a better understanding of how students and teachers are using technology in the classroom. The following section will describe the results of the survey. The Loti survey was created by Moersch in 1996. Since his initial research, Moersch has updated his survey tool several times. The researcher requested and was granted permission to use the 2013 version of the survey for the purposes of this study. The permission form associated with this request can be found in appendix H of this dissertation.

The survey measured three variables: (1) classroom teachers' Level of Teaching Innovation (LoTi), (2) Personal Computer Use (PCU), and (3) Current Instructional Practices (CIP). The survey was administered to teachers online. After the survey data was captured, the researcher calculated the teachers LoTi level, PCU level, and CIP level. Tables 3, 5, and 7 summarize the number of teachers that fell within each level of the

LoTi, PCU, and CIP frameworks, respectively. A complete description of the various levels is included in appendix I of this dissertation.

LoTi (Levels of Teaching Innovation).

Table 2
LoTi level descriptions

LoTi Level	**Description**
Level 0 – Non-use	Instructional focus may vary; digital tools and resources are not used during the instructional day
Level 1 – Awareness	Instructional focus emphasizes information dissemination; teachers use digital tools and resources for classroom management tasks or instructional presentations
Level 2 – Exploration	Instructional focus emphasizes content understanding; students use digital tools and resources for classroom management tasks or instructional purposes
Level 3 – Infusion	Instructional focus emphasizes engaged higher order learning; students use digital tools and resources to solve teacher-directed problems related to the content under investigation
Level 4a - Integration	Instructional focus emphasized student-directed exploration of real-world issues; students use digital tools and resources to answer self-generated questions that dictate the content, process, and product. Level 4a teachers experience classroom management or climate issues that restrict full-scale integration
Level 4b - Integration (Routine)	Instructional focus emphasizes student-directed exploration of real-world issues; students use digital tools and resources to answer self-generated questions that dictate the content, process and product Level 4b teachers facilitate full-scale inquiry-based teaching regularly with minimal implementation issues.
Level 5 - Expansion	Instructional focus emphasizes global student collaboration to solve world issues; students use digital tools and resources for authentic problem-solving opportunities beyond the classroom.
Level 6 - Refinement	Instructional focus is entirely learner-based; students experience seamless integration of digital tools and resources for their self-directed problem and issues resolution.

The Loti level results will be discussed first, followed by the CIP, and PCU levels assigned to each teacher. The data associated with the teacher LoTi level indicated to some extent how teachers and, consequently, students are using technology in the classroom and how often it was being used. 43 of the 46 teachers who participated in the survey were assigned a LoTi level 3 or lower (see Appendix I for detailed level descriptions). Only three participants had a LoTi level of 4a and 4b. Interestingly, 25 of the participants had a LoTi level 2 – Exploration. According to descriptors provided by the survey tool, a LoTi level 2 describes a teacher who is focusing on content understanding and students' use of digital tools to showcase content understanding.

Table 3
Number of teachers identified by their LoTi Level

Loti Level	Percent of Participants	Number of Participants
Level 0 – Non-use	9 %	4
Level 1 – Awareness	20 %	9
Level 2 – Exploration	54 %	25
Level 3 – Infusion	11 %	5
Level 4a - Integration	4 %	2
Level 4b - Integration (Routine)	2 %	1
Level 5 - Expansion	0 %	0
Level 6 - Refinement	0 %	0

This type of learning is what is generally described by Cuban (2001). He believes that the learning experience provided by lower level implementations of technology could be accomplished without the use of a costly computer workstation and that the schools are being oversold on the usefulness of technology for improving the learning environment. It appeared from this data that the majority of the teachers were not using computers to teach students to perform higher-level tasks or to do something that could not be accomplished without the use of the computer. Instead, they were generally aware

they were using technology in class to display information to the class and give students a platform to demonstrate content knowledge.

Three teachers were listed at a LoTi level 4. Teachers with this LoTi level are focusing on student-directed exploration and solving real-life problems. If a teacher has a LoTi level of 4a, students in their classroom are solving problems that are posed by the teacher. If a teacher is rated as LoTi level 4b, the focus of the lessons is on student generated problems instead of problems posed by the teacher. Two teachers scored a LoTi level 4a and one teacher was labeled 4b. It was after reviewing the results of this portion of the survey that the researcher started to understand that most of the technology being used in these particular middle school classrooms would be considered low-level usage.

CIP (Current Instructional Practices).

Table 4
CIP level descriptions

CIP Level	Description
CIP Intensity Level 0	No formal classroom setting.
CIP Intensity Level 1	Instructional practices align exclusively with a subject-matter based approach to teaching and learning; teaching strategies lean toward lectures and/or teacher-led presentations
CIP Intensity Level 2	Instructional practices still consistent with a subject-matter based approach to teaching and learning; emphasis on didactic instruction and teacher-generated questions.
CIP Intensity Level 3	Instructional practices align somewhat with a subject-matter based approach to teaching and learning with limited options given to students for their final products.
CIP Intensity Level 4	Instructional practices align with a subject-matter based approach to teaching and learning, but students are given expanded options with the content, process, and/or products.
CIP Intensity Level 5	Instructional practices lean toward a learner-based approach; teaching strategies and assessments used for learning are diversified and driven by student questions.
CIP Intensity Level 6	Instructional practices consistent with a learner based approach; student inquiry and self-directed problem solving influence the content and context of instruction.
CIP Intensity Level 7	Instructional practices align exclusively with learner-based approach; students to teaching and learning; students establish personal goals and monitor their own pace and progress with purposeful learning space.

Current instructional practices (CIP) was the second factor examined. Similarly to LoTi, the CIP levels range from intensity level 1 to intensity level 7. Each level describes how technology is being used in the classroom. Specifically, the CIP intensity is looking at two areas of the classroom. They are instructional focus and the type of products produced by teachers and students when using computers in the classroom. Detailed descriptions of each CIP level are available in appendix I of this dissertation.

Table 5

Number of teachers identified by their CIP Level

CIP Level	Percent of Participants	Number of Participants
CIP Intensity Level 0	2 %	1
CIP Intensity Level 1	2 %	1
CIP Intensity Level 2	7 %	3
CIP Intensity Level 3	33 %	15
CIP Intensity Level 4	28 %	13
CIP Intensity Level 5	20 %	9
CIP Intensity Level 6	9 %	4
CIP Intensity Level 7	0 %	0

As table 5 shows, of the 46 teachers who participated in the survey, the majority of teachers (28) had a CIP intensity level of 3 or 4. Teachers with the CIP range of 3 focus on a subject based approach to teaching and learning with very little student choice in products produced to show understanding of the subject matter. Teachers with a CIP level 4 are just beginning to give students some choice in the products they will produce in the classroom. There were 13 teachers who had a CIP level of 5 or 6. Teachers with these CIP levels are beginning to focus on a student-centered approach to education. The lessons are more diversified to meet each student's needs and learning is beginning to be driven by student generated questions. On the other end of the range, five teachers had a CIP level 2 or lower. A CIP level of 2 or lower is focused entirely on teacher-led instruction and students have very little say in the questions that are being addressed during class.

The results of this portion of the survey were not surprising based on what the researcher found when studying the LoTi results. It appeared that most teachers are focusing on subject-based learning and teacher-led activities, instead of giving students the opportunity to develop better critical thinking and problem solving skills. The survey data shows that the majority of the teachers are using technology to supplement their current teaching strategies. It does not appear that technology is shifting the teachers' pedagogy towards a more student-centered approach, which is one of the main selling points for educators pushing for more technology in the classroom.

PCU (Personal Computer Use).

Table 6
PCU level descriptions

PCU Level	**Description**
PCU Intensity Level 0	No inclination or skill level to use digital tools and resources for either personal or professional use.
PCU Intensity Level 1	Little fluency with using digital tools and resources for student learning; may have a general awareness of various digital tools and media but is not using them.
PCU Intensity Level 2	Little to moderate fluency with using digital tools and resources for student learning; does not feel comfortable using digital tools/resources beyond classroom management.
PCU Intensity Level 3	Moderate fluency with using digital tools and resources for student learning; may begin to become "regular" user of selected digital=age media and formats
PCU Intensity Level 4	This is a transition level. Teachers exhibit moderate to high fluency with using digital tools and resources for student learning; commonly uses a broader range of digital-age media and formats in support of curriculum
PCU Intensity Level 5	High fluency level with using digital tools and resources for student learning; commonly able to expand range of emerging digital-age media and formats in support of curriculum.
PCU Intensity Level 6	High to extremely high fluency level with using digital tools and resources for student learning; sophisticated in the use of most existing and emerging digital-age media or format.
PCU Intensity Level 7	Extremely high fluency level with using digital tools and resources for student learning; sophisticated in the use of any existing and emerging digital-age media or format.

Personal computer use (PCU) was the final factor measured by the survey. PCU measures teacher fluency level with digital tools and resources as well as how those tools are used in the workplace. Most of the teachers fell within the range of PCU level 3 and 5. Of the 46 participants, all but five participants fell into one of these three levels. 15 teachers had a PCU level of 3 which indicates moderate fluency with digital tools and resources who may become regular users of digital media and resources in the classroom. Twelve teachers had a PCU level of 4 which indicates a transition level between moderate and high fluency with digital tools and resources and they commonly use these tools for classroom instruction. 14 teachers had a PCU level of 5 which indicates a high fluency using digital tools and resources and the ability to expand their technical skills in order to help support the curriculum. Only one teacher had a PCU level of 6, which indicates a high fluency using digital tools and a sophisticated use of technical resources to help student learning in the classroom.

Table 7

Number of teachers identified by their PCU Level

PCU Level	Percent of Participants	Number of Participants
PCU Intensity Level 0	2 %	1
PCU Intensity Level 1	0 %	0
PCU Intensity Level 2	7 %	3
PCU Intensity Level 3	33 %	15
PCU Intensity Level 4	26 %	12
PCU Intensity Level 5	30 %	14
PCU Intensity Level 6	2 %	1
PCU Intensity Level 7	0 %	0

This data again indicates that most teachers do not use technology in a sophisticated manner in their teaching practices. However, the researcher did note that while a sophisticated use was not indicated for many teachers, the data seemed to indicate almost all of the teachers felt at least moderately fluent and comfortable using technology in the classroom. With only three teachers scoring at a PCU level 2 or lower, the majority of the teachers seemed to appear comfortable with technology in general and are willing to use it, despite what some may consider low-level uses of technology.

The survey results were used to give the researcher a general sense of how technology was being used in the classroom. Individual surveys were used to corroborate findings of the qualitative portion of the study. Additionally, the survey allowed participants the opportunity to volunteer for the qualitative portion of the study.

The qualitative portion of the study will be discussed next beginning with a report of interview findings. After personal interviews have been discussed, the researcher will discuss the data collected during classroom observations. Finally, artifacts and documents collected over the course of the study will be discussed.

Qualitative Results

The main source of data for this study was the personal interview. Grounded theory data analysis techniques were used to examine the interview data. Four categories emerged during this analysis and will be described below. Each category will be defined in terms of its subcategories; subcategories will be further demarcated in terms of their properties and dimensions. Throughout the chapter, the researcher will explain how each category stood alone and how they interacted with one another. It is through this thorough examination of the interview data that this researcher is able to explain a middle

school teacher's perception about their effectiveness integrating technology into the curriculum and how their students feel about the technology integration they receive.

In order to provide a clear picture as to what is happening in the classroom, this researcher collected and analyzed 16 student interviews and eight teacher interviews. After the data was collected, the researcher employed data analysis techniques commonly used in grounded theory studies. By using this process, the researcher was able to identify four main categories that help answer the research questions; they are "Shared Experience", "Educational Uses of Technology", "Technology Integration Readiness", and "Obstacles to Technology Integration". When the categories are fully described in terms of their subcategories, properties and dimensions, and the researcher describes how those categories relate and interact to one another, it is hoped to provide understanding and guidance to those interested in improving educational uses of technology in the classroom. Throughout this section, direct quotations from teacher and student interviews will be used to support the emergence of the categories being described (teachers are referenced by letters, A-H, students by numbers, 1-16). The first category to be described is the *shared experience.*

Table 8
Final categories and subcategories

Categories	Subcategories
1. Shared Experience	Motivation Engagement
2. Technology Integration Readiness	Interest in Technology Training
3. Educational Uses of Technology	Learning Environment Assessing Learning
4. Obstacles to Technology Integration	Distractions Access Comfort Level

Shared Experience. A *shared experience* was evident in all of the participant interviews. A *shared experience* refers to the phenomenon that teachers are trying to create a unique learning experience for all students using technology as the catalyst for change. This category is very important because this *shared experience* is what seems to determine to what degree the use of technology in the classroom is successful. The category *shared experience* is described by the subcategories, *motivation* and *engagement.*

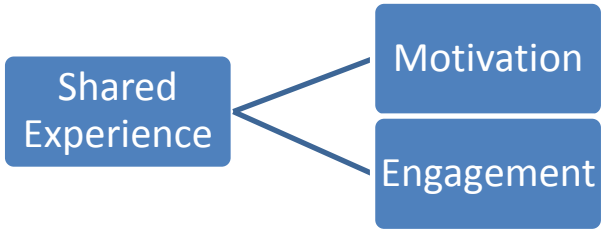

Figure 1. Mind map of the shared experience category.

When analyzing the shared experience, the researcher was trying to understand what teachers were trying to accomplish when using technology in the classroom. Answering this question was important in determine the teacher's perception about the effectiveness of technology integration in the classroom. The data seemed to indicate that most teachers believe technology is beneficial in the classroom. This benefit can best be described by the subcategories motivation and engagement. The data indicates teachers believe one of the main purposes of technology is to elicit a positive motivational response from students. It appears that some teachers believe using technology in a classroom setting alone will trigger this positive reaction.

However, that may not always be the case. In some cases, data indicated that teachers' beliefs about the best use of technology do not align exactly with student experiences. This phenomenon could potentially lead to undesirable experiences for some students and hinder some teachers from improving their technology integration abilities. Shared experience can be further defined by its subcategories, motivation and engagement. The data seemed to indicate that these subcategories were the most important to determining the success of the shared experience created by introducing technology to the classroom. The first subcategory of *shared experience* is *motivation.*

Motivation. Motivation was mentioned by most by teachers as one of the main reasons they used technology. Motivation ranged from no student motivation to complete student motivation. Most of the teachers believed that the use of technology motivated their students to learn. For example, Teacher D said the following when asked about how technology helps her students learn,

> I mean they're pretty excited. Like I notice in sixth grade with the whole sharing in Google – they're pretty excited with being able to communicate and not let the other group or groups in the room know what they're talking about. So they're finding ways that are exciting. When they post those projects on Edmodo in eighth grade they're pretty excited to be able to view other people's and be able to leave comments and communicate with each other (296-302).

In this example, the teacher seems to indicate that students are excited about the lesson, but there are indications that the teacher believes the act of leaving comments and posting material to a website is exciting to the children. It could be argued that when teachers believe their students are excited, they would consider them to be highly

motivated to learn and they would attribute technology as the reason for this *motivation*. In some cases, that belief holds true. For example, Student 12 had this to say about how he feels when using Google to search for information,

> what I was saying about how I go and just find new stuff, so then I get excited to find something else. Because there's times where I'll learn something on there and I'm like "Whoa, I never knew that." And I'll tell someone that and they're like "What? No it's not, "and we'll get in a huge debate about that, like "Look it up, and I'm right (laughter) (307-310).

In that situation, the student is excited about the vast amounts of information available to him and the ability to debate about the newly discovered information with his peers. This *motivation* seems to be tied to the student's personal interest to learn new information and share and discuss this newly acquired information with friends. However, other students are less *motivated* by using technology in this way. When discussing if they liked using technology, Student 14 said, "It depends on what we're doing. Like if it's boring then I would rather be doing stuff that's hands-on" (304-305). After mentioning being bored, he was asked what percentage of time he was bored when using technology at school, he stated, "75%" (319).

The latter comment could be an indication that the student desired interaction with peers over the simple use of technology. It is the activity that is important to this student. If a teacher believes that technology is motivating their students just because they are using technology in their lessons, one could argue this belief could hinder their ability to look for other ways to improve technology use. In order for teachers to continue to improve their technology integration skills, you can presume they will need to expand

their teaching repertoire using computers. You could also argue that they will need to continue to experiment with new and exciting teaching strategies in order to keep students interested.

If teachers begin to believe that simply using technology in the classroom is enough to increase *motivation,* they may become complacent and think they are getting the most out of their tools, when they could be doing more. *The second subcategory of* shared experience *is* engagement.

Engagement. *Engagement* was also mentioned by most of the teachers and students as one of the positive responses elicited by the use of technology in the classroom. *Engagement* ranges from *no increased engagement* to *complete engagement* because technology is being used. Many of the teachers mentioned seeing an increase in the amount of work students participated in when using technology to learn as compared to lessons that do not incorporate technology. Teacher B stated,

> Whether it's collaborating with me, collaborating with another student. I know the kids from before so I -know that they used to kind of just sit there. I've always used technology but the collaboration part has created a whole new element (587-590).

Teacher A agrees, "I think it makes the curriculum more relatable to the kids and that raises engagement, which always helps the teaching" (158-159). The data shows that teachers tend to think their students would be more engaged when using technology to learn.

According to Student 3, this is not always the case. Student 3 said, "Well, I prefer technology outside the school because it's more fun. You can do what you want to do

instead of just doing stuff that you learn with" (243-245). Student 1 talked about playing games outside of school. "And outside of school I mainly use my home computer and my phone to play games" (49-51). It appears that students are using technology outside of school for activities related to fun. The students rarely mentioned having fun using technology in school. This is not to say that some students do not have some enjoyment when using a computer at school.

For example, Student 1 said this when talking about learning to code on a computer, "Well the teachers obviously really didn't know how to code that much so they had videos on how to do it, and we used this application, I don't… I forgot what it was called, but it was really fun" (309-312). The belief that students are engaged in schools when computers are being used may be based on the fact that teachers see their students using electronic devices outside of the classroom. But teachers should be cautious to assume that same level of engagement is attainable in the schooling situation. In fact, you could argue that the students' personal interest is what is driving their prevalent use outside of the classroom.

All of the technology related activities discussed in the interviews were almost entirely dependent on the teachers' personal beliefs about using technology to enhance the students' learning experience. In general, they believe that when technology is introduced into the classroom, the students are more motivated and engaged in learning.

In some instances, teachers report that the *shared experience* created using technology will help elicit these positive classroom behaviors. This belief seems to stem from the fact that teachers view their students as heavy technology users outside of school. The idea that because students enjoy using technology outside of school, that they

will also enjoy it in school, may not be accurate. In some aspect they are correct. All of the students reported heavy use of computers outside of school. However, it appears students are using technology outside of school to address personal interests and entertainment. It is not computers alone that seems to be driving their *motivation* and *engagement,* it is the type of activities in which they are engaged. Therefore, teachers need to be cautious when assuming that students' *motivation* and *engagement* will increase with the increased use of technology related lessons.

The teachers' belief that technology is creating a positive *shared experience* for their students could impact the educational experience students receive. If teachers believe they are using technology appropriately, they have little incentive to change the way they are using technology in the classroom. Interestingly, all of the teachers seemed comfortable with how they were using technology in the classroom and did not seem to be aware of the disconnect between some of their students' perceptions about how technology is being used. The second category that emerged was *technology integration readiness.*

Technology Integration Readiness. *Technology integration readiness* refers to a teacher's ability to effectively integrate technology in their classroom. This category was mentioned by most of the teachers who were interviewed. This readiness is impacted by several factors and is best described by its subcategories, *interest in technology* and *training.*

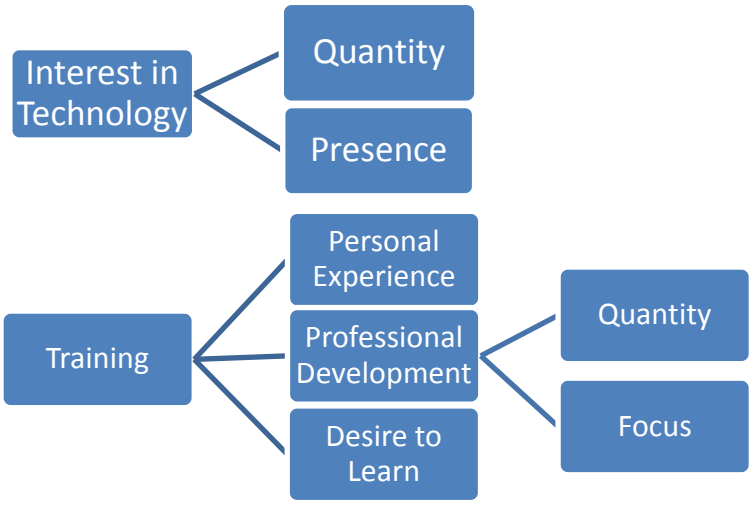

Figure 2. Mind map of the technology integration readiness category.

Interest in technology. Almost all of the teachers mentioned being interested in technology. This *interest in technology* was evident throughout the teacher interviews. It could be argued that some *interest in technology* is important for a teacher who wants to use technology successfully in the classroom. The teachers expressed their interest when explaining how they use technology in the classroom and on a day to day basis. This subcategory can be described by its properties, *quantity* and *presence*. The first property of *interest in technology* is *quantity*.

Quantity refers to the number of technology tools and software teachers use on a day-to-day basis. *Quantity* ranges from *no technology usage* to *frequent technology usage*. Every teacher stated that they used a cell phone to communicate and access the internet. They used this tool for a variety of purposes. Teacher B said this about her iPhone use, "So my day starts with using my phone, my iPhone. And I check my mail; I sometimes check Facebook and some other social networking things and do some reading" (33-35). Other teachers talked about how they used their phone to organize their daily lives. Teacher D said,

> Oh yes, I have a cellphone which is great because I have a 13-, almost 14-year-old daughter. So it's good to be able to text and know if she needs a ride or something's changed. And certainly my husband uses the calendar and shares the calendar with us, so we use it in those kind of ways (27-30).

In addition to cell phone usage, teachers talked about using other types of devices on a day-to-day basis. For example, Teacher G said, "Oh! Okay, well we have four or five computers at home. We have a desktop; we have two laptops; we have a Chrome Book, two iPads…" (18-20). The data shows that most teachers not only use technology on a day to day basis, they tend to use multiple devices to organize and make their lives easier, both inside and outside of school. In addition to *quantity*, *interest in technology* can be described by a second property, *presence*.

Presence is the second property of *interest in technology. Presence* refers to the amount of technology usage during instruction and class activities. *Presence* ranges from *sparse use of technology* to *pervasive use of technology*. A *pervasive* use of technology is when students are using technology the majority of the time they are in class. *Pervasive* use of technology was only discussed by one of the teachers. Teacher B talked about how her class uses a computer every day, all day. The nature of the course she teaches, business education, lends itself to this *pervasive* use of technology in the classroom. She had this to say about her day-to-day routine,

> When I get to school I use a desktop computer almost immediately to open up my Google Slide which has my structure for the day for my sixth, seventh and eighth. And I primarily use, detail-wise, Chrome, the Chrome browser and I have all my pages loaded in, and it just makes things go more efficiently as far as starting up

> the day. Throughout the day I am using everything from Net Support to the desktop computer and primarily Google Drive and Google Classroom to teach. And I do use a laptop some when I need to be portable – during the day I have to go to other places in the building and so that gives me the portability to be able to continue planning lessons (35-39).

This *pervasive* use of technology is contrasted by the sparse use of technology. The *presence* for most of the teachers interviewed was somewhere in between *sparse* and *pervasive* use of technology. Most teachers' use of technology consisted of organizing and posting class materials online. The students used the computer for online assessments, research and document preparation (Google Docs), but much of the class still operated without the use of computers. Student 9 described his typical use of technology, "We use Google Docs for papers, to write. And we use Google Slides for presentations. And for this experiment that I had to write for a final report, I used Google Sheets to make a graph and data table" (12-15). Most of the students described similar experiences. Student 5 said this, "So we also use Google Docs and stuff to write papers and Google Slides for like slideshows to present to the class" (292-293).

The *presence* of technology varied slightly between classes, but the students and teachers described similar experiences when describing how technology was being used in the classroom. The technology use described by the teachers and students seems to indicate a moderate *presence* of technology by most of the teachers with the exception of the business education teacher. It appears every teacher was trying to integrate technology into their lessons continuously throughout the year. This is evident by the number of times students mentioned accessing course materials throughout the semester.

This seems to be an indicator that teachers have sincere *interest* in using technology to improve schooling.

Because of this apparent *interest in technology*, and the increasing number of the technology tools available to teachers, it is important to supply ample professional development to teachers if they are expected to use these tools to increase academic achievement. Teachers not only need this training to stay abreast of the tools available to them, but also to develop an understanding of how those tools can improve their instructional practice and ultimately their students' understanding of the subject matter being presented. The second subcategory of *technology integration readiness* is *training*.

Training. The second subcategory of technology integration readiness is *training*. Training describes the formal and informal activities that teachers participate in that allow them to learn how to use technology in their classroom. *Training* appears to impact both technical and pedagogical aspects of teaching. *Training* is best described by its properties, *personal experience*, *professional development*, and *interest*. The first property of *training* is *personal experience*.

Personal experience was mentioned by almost all of the teachers. *Personal experiences* are experiences that are not part of an official professional development activity, yet the experience itself became the learning platform for a particular piece of technology. A teacher's *personal experience* ranges from *few personal experiences* to *many personal experiences*. In some cases, teachers mentioned using technology as a crucial part of their everyday life. At least one teacher mentioned using technology to navigate day-to-day life when traveling abroad. Teacher C mentioned using Google Translate to help him communicate when he was overseas. "Google Translate I used

more of course when I was overseas but it still comes in handy sometimes" (62-64). Google translate is web-based software that allows you to record your voice in your native language. That recording is then translated to a different language. This translation can be played back audibly so that anyone within listening distance of the device can hear the translation. In this case, the *personal experience* with technology was crucial for the teacher to be able to communicate in his day-to-day life. Perhaps, this necessity to communicate prompted this teacher to learn how to use new technology tools. Another teacher talked about her previous job experience as one of the ways she learned how to troubleshoot technical issues. Teacher B said,

> I have a background purposely of troubleshooting, and so that… I think if I were to say maybe professional development-wise, if I were to go back to that other question, I think everybody should have to go through a basic troubleshooting-type course that would just allow them to not interrupt the teaching based on - I don't have any internet access right this second (383-387).

It appears that her *personal experience* troubleshooting technical issues, makes her feel confident using technology to teach. She values it enough to mention that her colleagues would benefit from similar experiences in their life. These *personal experiences* varied among all the teachers but it looks as if that they played a role in helping teachers grow as technology users. The second property of *training* is *professional development*.

Professional development refers to training provided by the school district that employs the teacher. This type of training focuses on both technological and pedagogical practices using technology in the classroom. *Professional development* is best described

by its dimensions, *quantity* and *focus*. The first dimension of *professional development* is *quantity*.

Quantity ranges from *no development* to *ample development*. Most of the teachers noted that there were few opportunities for professional development in relation to technology integration strategies. The opportunities that were mentioned could be described as large workshops. According to the teachers, the workshops are held during the summer months and there is little opportunity for continued learning. Teacher D said this about the workshops,

> And the only other thing I would say is so many of the workshops that the district does, while they're great I feel like we get inundated with stuff but then we don't have a lot of time to try it out. So that would be I guess one change, is to build workshops where you actually have time to play with the technology or learning, because you walk away with your notes and having seen it but you really wish you had time to try things and build things (94-101).

She also talked about how teachers have formed their own cadres to continue their learning.

> I've gone to some workshops but what's been most beneficial for me is our middle school cadre tries to put together a couple workshops that we want, and we find somebody within the district that could present to us (65-68).

The data seems to indicate that teachers feel they need additional technology training. Some teachers have ideas about how to use technology to increase the *quantity* of training. Teacher B said this,

> I would like to see a regular time allotted for Google Hangout. So people would maybe put their list of things they wanted to learn about but just didn't have the time to out there and then those people – kind of like a Google Hangout but an on-conference version of the Google Hangout. And then you would join with one person who potentially could give a little more information (223-229).

The data seems to show that teachers do have some training about how to use technology, but the *quantity* of learning experiences could be increased. The second dimension of *professional development* is *focus*.

The dimension *focus* ranges from *technical only* to *technical and pedagogical training*. Most of the teachers described the *focus* of their training as *technical only*. This type of training concentrated on how to use technology tools or software and did little to address how to use technology to help students better understand the subject matter being presented. Teacher H said this about the training,

> I've been to a lot of summer PDs over the different types of like learning how to use the SMART notebook; when Senteos were big we had a lot of PDs with those. Most recently the Google Classroom – we had some PD in the mornings, or I went I think once. That's really about it (102-106).

It appears teachers appreciate this type of training. Teacher C said this about his experiences:

> Well, I had a really good one, it's my first year in {District Name} and I came back to the States in July or in June. And I guess it was in July there was a Google camp for educators here at {District Name}. And it was the whole district. It's a big district, as you know, and yeah, there were about four breakout

> sessions, two of which were really valuable – one on ways to use YouTube, one on ways to use Google Classroom; and I guess a third one which was just a variety of extensions that are available in Google Chrome. And yeah, it was great. Sometimes you go to a professional development, don't learn much. But this one, I walked away with several useful apps and techniques to use (191-201).

All of the training activities mentioned by the teachers had little to do with improving pedagogy as it relates to introducing technology into the content the teachers teach; however, it was obvious that they thought the training was worthwhile. It would be difficult to argue that this type of training is not improving the teacher's ability to understand the technology available to them and to give them the basics on how to use that technology. However; the training teachers receive does little to help them better explain the subject matter they are responsible for teaching. The data seems to indicate that it is still up to the teacher, for the most part, to determine the best way to integrate those tools into the curriculum they teach. The final property of *training* is *desire to learn*.

Desire to learn ranges from *no desire* to an *intense desire to learn* for training. Most of the teachers expressed some *desire* to continue to receive training. Teacher A realizes that the district she works for expects technology integration to happen in the classroom, but said this about the *desire to learn* more about technology integration,

> I think I would like to see all-school training then as a follow-up after that, district level - because I know they're… Maybe administration is trying to be sensitive to everybody's maybe at a different level. But if the expectation is that we need to be

> doing this, then we all do need to be trained and at some point it can't be an option (107-112).

Teacher H concurs, "I would increase the tech integration. It is a part of our evaluation model and I think that I would love to expand my horizons with that" (169-171). These teachers are directly expressing their desire for more training. This seemed to be the case for most teachers. However, it did not always hold true. At least one teacher was displeased with the training she has received and had little *desire* to receive further instruction. Teacher G said the following,

> Well we spend a lot of professional development time spinning our wheels, reinventing the wheel, doing a lot of things to justify other people's, to justify people's jobs instead of doing cool, new things that are good for kids or that are exciting, or that are really relevant (200-204).

These negative views about professional development were not common, but do highlight the range of this property. With the exception of teacher G, all of the teachers talked favorably about the trainings' value and appeared to want more training. This *desire to learn* is a clear indicator that the teachers want to learn more about how technology can help them improve instruction.

Interestingly, the *shared experience* that the students and teachers go through on a day to day basis seems to be directly impacted by the *technology integration readiness* of the teachers. How teachers prepare for using technology in the classroom and their own personal experiences with the classroom seemed to be very important to the development of a teacher's technical integration skills. It would be interesting to further investigate to

what extent providing additional opportunities for teachers would reduce the disconnect between teacher beliefs and student perceptions when using computers in the classroom.

Educational Uses of Technology. This category describes uses of technology that are intended to improve the schooling experience in some way. Educational uses of technology can best be described in terms of its subcategories, *learning environment and assessing learning*. The uses of technology defined below describe how students and teachers feel about their current reality when using technology in the classroom. The first subcategory of *educational uses of technology* is *learning environment.*

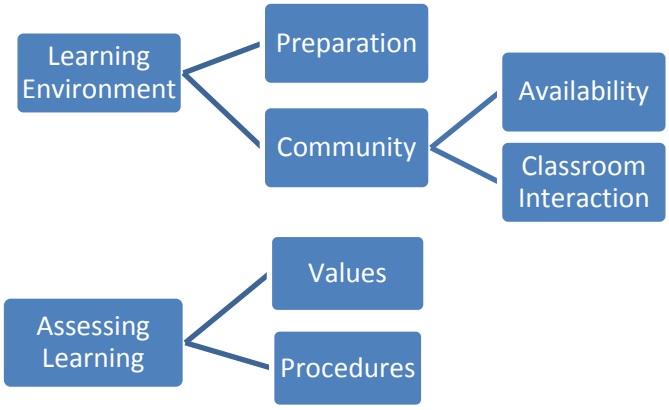

Figure 3. Mind map of the educational uses of technology category.

Learning environment. *Learning environment* describes how technology is used in a classroom setting to improve the students' and teachers' learning experience. It can be best described in terms of its properties: *preparation* and *community*.

The first property of the subcategory *learning environment* is *preparation.* The dimensions of this property range from *no preparation* to *all preparation using technology*. Most of the teachers that were interviewed mentioned using technology to prepare materials or plan a particular lesson or unit. This *preparation* took many forms including grading from home, storing curriculum online, creating lessons online,

answering students questions via email, creating videos for a flipped classroom, organizing class content, storing student work, analyzing student achievement data, and collaborating with peers. For example, some of the participants referred to using technology to grade exclusively from home. Teacher G said, "I do all of my grading at home online" (33). Teacher C stated how technology helped him provide feedback to students, "it just reaches out to the students, especially if it's something where they really need quick feedback. Like I graded those papers last night so that's less than a 24-hour turnaround time" (306-308). Perhaps the efficient grading and quick turn-around times help both the teacher and student be better prepared for future learning experiences. Teachers can use the information gained during the grading process to prepare materials that will address the needs of their students. Similarly, the quick feedback gives students time to process the feedback and develop new skills or pertinent questions to pose to the teacher during class. The data seems to indicate that technology provides the platform needed to improve *preparation*.

Another example of *preparation* mentioned by almost all of the teachers and students was using the technology infrastructure to store, organize, and share class materials. Students and teachers mentioned preparing their class materials online. Teacher A mentioned the following,

> This year I started using the Google Classroom so I have all of my classes set up in Google Classroom. I can send them in assignments and receive assignments that way which works out great. Each classroom has a separate passcode to get in so they can specifically see either their homework or their assignment (28-32).

Teacher B stated she prepared her entire curriculum online,

> Okay, so the technology that I use primarily is really my Google. Google has taken over my life, so I use Google Docs. The kids can access my curriculum which is in a Google Doc. I use Google Slides to break that down on a kind of daily basis into folders (78-81).

Student 16 concurs:

> I like it because of Google Classroom. Google Classroom is a great way for teachers to upload things and you just click on that. You can share things with the teacher, so if you have like a worksheet that's late you can share it with her and she'll get it really fast – it just pops up in her email or Google Drive. And you can share things super-easily, and you can access things easily. And it's really, really fast (335-341).

In terms of *preparation,* technology appears to be beneficial to both the teacher teaching and the students' learning experience. However, some educators would see using computers simply for the sake of preparation is a misuse of expensive technology. They may argue that unless technology is transforming the learning experience, the cost is not justifiable. It would be difficult to argue that the technology usage described above dramatically changed the learning experience for the students. However, the teachers seem confident in their ability to integrate technology. Apparently they are comfortable with this current type of use. Perhaps the teachers are unaware of other uses of technology that would improve learning and they believe what they are doing is satisfactory. The second property of *learning environment* is *community*.

Community refers to how technology impacts students' and teachers' personal interactions with one another in a *learning environment.* The technology itself doesn't create the *community,* but it seems to have a role in how students and teachers maintain relationships with one another. *Community* can be described in terms of its dimensions, *availability,* and *changing classroom interaction.*

Almost all of the students and teachers mentioned *availability* as one of the main functions of technology in the classroom. *Availability* ranges from *no additional availability* to *always available*. Almost all participants made mention of increased access to course materials. Teacher D stated:

> I mean I post the entire trimester syllabus on my website so they can access it, plus I have documents and things that they might need to access on there. But also when they come in I either freeze an AB calendar up there with deadlines for them or the syllabus to help remind them, because honestly these students' organization is one of their struggles as bright as they are – and so just ways to keep them focused (47-54).

Students also seem to appreciate the extended *availability* of class materials. Student 8 had this to say,

> We use Google Classroom, too. So our teacher posts the things that we need, the resources, and then we open the Google Classroom and we open those links. And then we can see what the teacher wants us to do, or if there's any assignment we can get it without having actual paper (84-88).

And when asked if that was helpful, Student 8 said this,

> It works good. Like on our school website, there's the teachers' pages and so you can get to the homework that we have for today. So if you were to lose it or something you could still find it, so you would be able to do it (92-95).

Other students talked about using email and other technologies to increase their ability to ask their teacher or peers questions before or after regular school day hours. Teacher B discussed how technology has helped her organize and communicate with her students.

> It helps my teaching by really, oh gosh, from a communications standpoint when you have the numbers. You're seeing hundreds of kids – it just, it allows me to create videos for example, like a tutorial. It allows me to organize. It allows me to communicate beyond school with the kids who have questions. I get a lot of emails after school with clarification-type questions that probably wouldn't happen otherwise. And I never saw that before Google Drive stuff. So gosh… It helps me make really careful decisions about what technology I'm using and why am I using it (326-335).

In addition, Student 12 talked about how he uses technology to communicate with his peers outside of the normal school day.

> Yeah, because and like people will send you their stories so you can read about that and then you can comment back on them. And with Google Classroom you can leave comments on there so I like that a lot – with the teachers you can comment back and forth a lot, which is really helpful because you can't see them at night when you need to work on homework (443-448).

In either case, both students and teachers mention this type of technology use as being helpful and convenient. Because of this increased *availability*, the learning *community*, which typically begins and ends with the ringing of school bells, can now extend beyond regular school hours, potentially increasing the *community* engagement among students. The technology seems to be necessary to provide students and teachers with this ability to work with their classroom community from home. Some might say, without the technology, the work students do at home would be completed in isolation and without the benefits of sharing ideas and strategies with their peers and teachers. *Increased availability* is a primary benefit of using technology to enhance learning. The second dimension of the property *community* is *changing classroom interaction*.

Changing classroom interaction refers to how classroom interaction at school changes when technology is being used. *Changing classroom interaction* ranges from *no change* to *classroom interaction*, to a *complete change* to *classroom interaction*. Technology seems to have the potential to change how typical *classroom interaction* takes place. Most of the teachers reported little change to *classroom interaction*. When Teacher D was asked how she was using technology in her classroom, she said, "In sixth grade they're doing Mystery Disease, a group project, problem solving; and they are using it, Google particularly, to share information with each other and put a slideshow together or some of them are using Prezi" (13-17). In this example, the students were using the computer to share information with each other and publish their presentation materials online. This type of activity appeared to be engaging to the students, but it could be argued that the technology was not the catalyst for this excitement. The activity itself seemed to be the main motivation for the students. Therefore the technology did not

appear to have a significant *change* on the *learning environment*. However, at least one teacher mentioned using technology to completely change the way students interacted in the classroom. For example, Teacher A, a foreign language teacher, describes how her students used the internet to communicate with students in Mexico. Teacher A describes this activity below.

> I've used VoiceThread; I've used, I can't even think of the name but I worked with a classroom in Mexico and I recorded my kids and they recorded theirs, and then we sent them to each other and we gave each other feedback in the language. And that worked really well. Each kid was paired with a specific kid from that class in Mexico. So they were learning English like we were learning Spanish and it was, I kind of forgot the name of the program off the top of my head but that was great because it was a project like 'All About Me.' And they were learning things similar as my -kids were learning it, that level but in Spanish. So that was cool (80-97).

This type of activity is unique and unattainable without the use of technology or a significant number of Spanish speaking students in the school. It shows there is potential for using technology to bridge the gap between different cultures, allowing students to learn about other cultures from those who live it. This is the one example that was found in the data that showed how technology can change *classroom interaction,* but you must note that this experience is only available to students who have teachers with the skills and classrooms equipped for this type of activity. As mentioned earlier, most of the other *classroom interaction* that took place was less profound. In most cases, the students' interactions with peers and teachers were no different than if technology was absent in

the classroom. Without the teacher's understanding of the technology and the willingness to organize this activity, the students would not be able to have this unique and powerful practice.

Some have argued that technology has the potential to change the *learning environment*. However, the current reality is that most teachers are not using technology to transform the *learning environment* into a place that cannot exist without the use of computers and technology. Instead, this researcher believes that most teachers use technology in ways consistent with their personal experience and formal training they have received. Unfortunately for students, their *shared experience* seems to be directly impacted by the skills of the integrator leading the instruction. This interaction between categories and subcategories is important to consider as further studies may be required to determine if and how these relationships impact one another. The second subcategory of *educational uses of technology,* is *assessing learning.*

Assessing learning. The second subcategory of *educational uses of technology* is *assessing learning*. The data indicated that many of the technology experiences that students and teachers participate in are specifically designed to capture and assess what a student knows about a particular subject. It could be said that administering tests and collecting test data were a significant part of the students' and teachers' lives. Interestingly, most of the interview data that indicated assessments were a big part of the education experience came mainly from student interviews. Teachers mentioned testing in passing during interviews and the researcher was able to observe test data and teachers using testing data in the classroom, but students spoke specifically about testing software and test preparation throughout their interviews. The type of assessments given varied

from class to class, but it was apparent that technology was being used in one way or another to capture and analyze academic data. Assessing learning can best be described by its properties; *procedures* and *value*. The first property of *assessing learning* is *procedures*.

The property *procedures* is best described by its dimension *variety*. *Variety*, ranged from *traditional* to *progressive*. Almost all of the students and some of the teachers mentioned using computers for assessing learning. Assessments came in a *variety* of forms, including quizzes, unit-based projects, informal and formal exams. Some of these assessments would be considered more *traditional*, meaning the teacher is not using technology to administer assessments or capture the data associated with those assessments. Conversely, there are many teachers being more *progressive* about using technology for assessing learning. For example, student 7 mentioned using a device called Sentios for quick assessments. He says, "a few of my teachers use [Sentio] to help us with our tests" (263-264). Sentios are small devices that allows students to enter answers to multiple choice questions electronically. Teachers can see the students' answers immediately and quickly determine if the students correctly answered the question being posed to them. In addition to using Sentios, students mentioned using other software for test reviews. For example, Student 6 mentioned using Kahoot for quizzes. "Generally we use a website called Kahoot which they create like a little quiz or something to review for like a test that's coming up or something like that" (14-16). Additionally, students mentioned using computers to take formal exams, such as district benchmark exams. Student 13 said "today we're doing it, like testing with each eighth grade English class" (233-234). In fact, Student 7 seemed to be aware that the

computerized exams and software on the computers are preparing them for a more formal test. “You can actually have programs on there which can work a lot better with the schools, since I know schools want to use programs to help with MAP testing and things of that sort” (367-369). Teacher A described using technology tools to make capturing data easier. “I've used Socrates.com to create mini quizzes online and some of these, you know, are supposed to make it easier to tally the results, so if you're looking to create a format of everyone's results together” (139-142). The examples above would be considered on the *progressive* end of *variety* dimension because technology is being used to administer the test, capture the students’ responses and provide the teacher with tools to score and analyze the data quickly.

In comparison, the *traditional* side of *variety* may not use technology for administering assessments, scoring assessments, or analyzing the data. For example, some teachers may give a paper pencil test and then enter the scores into a standard grade book. In many cases, the *variety* falls somewhere in between traditional and progressive. For example, Student 7 described doing a paper and pen exam and then entering the scores online.

> Well we do the tests on paper first and then we just input them online. And it helps us, it helps the teacher put it in a different format, see it all together in one thing on digital, already made for them (268-271).

The student realizes the benefit of entering test data into an organized and useable format for the teacher, but the process of entering test scores into a system after completing a paper and pencil test is a good example of how *traditional and progressive* methods of capturing and organizing data can be combined. Student 14 described a similar situation.

> In math we enter our grades… So they have the answers… So we do our homework and then they have random questions on the board. So it'll be like questions 1, 7, 9 and 10 or something like that, and then you go back and then you check them. But it's like you only check those four questions and then say you've got two right out of the four. Then you would go to the computer; you would enter your name, what assignment it was and then you would click whether you completed the assignment or not, and then you would put the score that you got on the four. And then they enter your grade based off of that (183-192).

Capturing academic data using a database provides teachers with an organized way to analyze learning and constitutes one way teachers leverage technology in the classroom. Additionally, the assessment data appears to be very helpful to the teachers. The second property of *assessing learning* is *value*.

Value can be described by its dimension *helpfulness*. *Helpfulness* ranges from *not helpful* to *very helpful*. The numerous examples above highlighted how teachers and students are using technology for assessment purposes. It could be argued that the number of times assessments were mentioned by students and teachers indicates they value the data they get from the exams and find it *very helpful*. The fact that teachers are able to track data over long periods of time and see academic increases or deficiencies in their student's learning or the curriculum itself is also a clear indicator of the *value* put on these assessments. One example of this type of data use that was mentioned during the interviews was mentioned by Teacher H. She used this data to determine whether her "flipped classroom" strategy was helping her students.

> We started flipping after winter break I guess it was two years ago, and so I saw a definite increase in their scores from the previous year's assessment grades to these. They can just understand it better in my opinion (472-475).

It is not difficult to see that the teacher finds this information helpful. She can see that the technology strategies used in her classroom are successful, or at least she attributes her students' success to the flipped classroom environment.

In addition, teachers *value* the storage and ease of use of electronic academic data and find it *very helpful*. For example, Teacher E describes how he used stored academic data to share students' work with other teachers. This was done to give the students' new teachers some background of the student's writing ability.

> It also helps with giving the teachers that my students will have next year a head's up: "Look, here are his or her writing samples from last year." I can just share them via Google Classroom or Google Drive and they don't have to scratch their heads and start from ground zero to try to figure out "Where am I going to, what direction am I going to go in to help this student write?" (264-270).

The data shows that teachers are using technology to collect and analyze testing data, and in some instances, they are implementing technology in a way that is helping to improve their teaching strategies. They were also using technology to share academic data with their colleagues. These two specific uses are examples that demonstrate teachers not only *value* how computers are being used for capturing, storing, and using academic data, but are finding using computers to assess learning *very helpful*.

Obstacles to Technology Integration. As mentioned in the previous sections, in some cases, the *shared experience*, specifically, the *learning environment* and a student

and teacher's *beliefs about technology* can contribute to the obstacles a teacher and student face when using technology. This is especially true if the environment or teacher's beliefs conflict with a student's beliefs and/or their preferred learning environment. The category *Obstacles to Technology Integration* discusses phenomenon directly associated with a less effective learning situation due to the use of technology. *Obstacles to Technology Integration* can best be described in terms of its subcategories, *Distraction*, *Access to Technology Resources*, and *Comfort Level*.

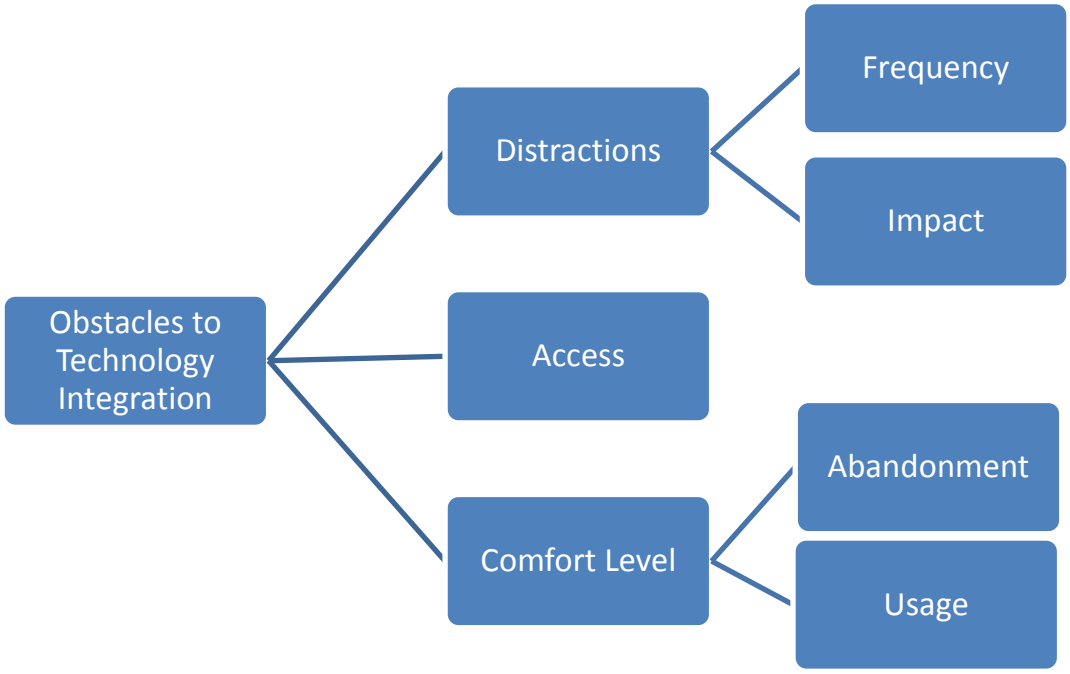

Figure 4. Mind map of the obstacles to technology integration category.

Distractions. Several students and teachers mentioned the subcategory *distractions* as one of the main obstacles to using technology in the classroom. For the purposes of this study, this researcher focused on *distractions* that are a result of the use of technology in the classroom, not other common distractions found in the classroom setting. *Distractions* are best described by the properties, *impact* and *frequency*.

Impact ranges from *little impact* to *extreme impact*. Most of the instances mentioned by students seemed to be minor and cause little distraction. For example, Student 10 said the following when asked if technology is a hindrance.

> Well some people sort of seem distracted with their phones and personal devices especially during classes that they seem, that are boring. So they'll get distracted on their phone and sometimes the teacher can't always see it. So while they're like doing something on their phone they can't pay attention to the lesson and therefore they can't learn (469-474).

Several teachers also mention this type of behavior. Teacher C described a similar situation, "I'm good at noticing if they're looking down at their crotch. I mean it's usually pretty obvious to me if they're distracted" (409-411).

However, in some instances, the *impact* is more pervasive. For example, Student 14 said,

> If I'm like looking something up on my phone, it's usually distracting; because the teacher's basically giving a free pass to do whatever you want on your phone. And on computers I know that kids will always play a game and then whenever the teacher gets close they'll X out of the browser and go back to whatever they were supposed to be working on. So it's really distracting to kids. And then if you're doing that then other people will probably be watching what you're doing. So it's just really distracting nowadays with all the technology in schools (401-409).

In this situation, the student described how a single distracted student can cause other students to also become distracted also. The *impact* in this case is more extreme

because a single incident can cause several students in the class to become *distracted*. The second property of *distraction* is *frequency*.

Frequency refers to the number of times a distraction takes place in the learning environment. The number of times a teacher addressed a distraction may not have been explicitly stated by any of the teachers, but most of them mentioned implementing processes and procedures to curb the amount of distractions taking place. For example when talking about using technology in the classroom, Teacher A said,

> But you know, I embraced it and I accepted it and you just had to have boundaries when and where it's appropriate. It needs to go off as soon as they come into the classroom. So it makes you check your classroom expectations, make sure you're clear with them. And some kids have tablets, too, so that can be a hindrance. I've tried different things before, like having a shoe pocket where they put their phones when they come in – that didn't work. So now I just, I give them a warning and then I just am consistent with I take their phone, it goes to the office and they can't, they get it at the end of the day. And that's like taking their heart out, you know? But it is challenging (209-220).

Teacher H described how she has to monitor student behavior to help her avoid the distractions.

> Yeah, just the distraction piece, it does. You constantly have to be on a watchful eye for them texting or Snap Chatting or getting on Instagram. I mean the minute that they have a down second they're on their phone trying to do something with it. So it can be hard. Also I had Ac lab today and so the kids all have their Chrome Books out and everything and you just have to be vigilant about going

> around and making sure they're on the right tab and not on YouTube watching some pilot. And you know, it's like "Nope, put it away," and he's like "Oh, I'm on Infinite Campus!" and switches over to that. I'm like "Nope, let's close out the YouTube window." So just very easy to get off task and distracted (324-335).

The fact that teachers have developed strategies and appear to monitor student behavior to help minimize distractions is an indicator that student distractions were prevalent. The instances of distractions were happening frequently enough that teachers have changed classroom procedures to make sure distractions do not become a prevalent issue when using technology. The distractions that students and teachers face on a day-to-day basis are just one of the obstacles to integrating technology in the classroom. The second subcategory of *obstacles to technology integration* is *access*.

Access. The second subcategory of *obstacles to technology Integration* is *access*. *Access* ranges from *no access to technology* to *ample access to technology*. When at school, students reported similar *access* to technology. The technology students used in the classroom was provided by the school district. However, when students talked about being at home, they began reporting varying levels of access in terms of technology. Some students discussed several computing resources at their disposal. Student 4 said this, "I have a phone. I have an iPad and we do have multiple laptops and computers in our house because that's the industry my dad's in" (87-89). However, every student's situation is unique and in some instances a powerful computing device was not available to the students when they left school. For example, student 10 talks about using an iPod to write papers.

Interviewee: Well I don't really have a computer at home so mostly I do all my like writing on my iPod, which is not very good but…

Interviewer: You do, you write on the iPod?

Interviewee: Yeah, like if I have an assignment due I type it on my iPod. (63-69)

The two scenarios presented above are vastly different and demonstrate how unequal access to technology at home can disturb the intended benefit of the technology-based learning activity.

Comfort Level. The final subcategory of *obstacles to technology integration* is *comfort le*vel. It is best described by its properties, *abandonment* and *usage*. The first property of *comfort level* is *abandonment*. *Abandonment* ranges from *quickly abandoning technology lessons* to *continuing to use and refine*. The *abandonment* reported by teachers influenced how they were using technology in the classroom. For example, most teachers reported being eager to try new techniques to integrate technology, but there was a high rate of discontinued use of the project/activity after a short time. Some teachers abandoned technologies because they got old or out of date. Teacher G said this about how quickly technology trends come and go.

> A couple of summers ago I did Moodle technology and that was taught by BB, and that was incredible and of course now we don't use Moodle. So I feel like, not that it was a waste necessarily but…
>
> Interviewer: "Did you invest time in Moodle?"

> Interviewee: A lot, a lot of time in Moodle. So I haven't been investing as much time in learning new technologies super thoroughly like in the past couple years because I feel like everything moves so fast and you know, I could be spending my time just learning something in a kind of half-baked way if that's the word (150-163).

Other teachers abandoned teaching technology-rich methods that appeared to be helping their students because they simply did not see the value of using these activities on a day-to-day basis. Teacher E said this about using flipped classroom.

> So it turned into well, if the majority of class doesn't know what's going on we can't proceed the way we want to. So we'd end up showing the video during regular class hours or during lunch, and so we thought well, we might as well just teach the mini lesson to everybody because we know everybody's here. I think Flipped Classroom could work but I think right now the way I'm seeing it with students in seventh grade, it might work better for kids who are absent and need to catch up. Maybe they're not so sick that they can't focus on something and maybe I could put it, or give them the key to the private YouTube page to go look at it if they were out and missed the mini lesson in person. But as far as making it an assignment it just kind of didn't work for us (190-201).

The second property of comfort level is *usage*.

Usage describes how teachers use computers in the classroom. *Usage* ranges from *routine* to *advanced* uses of technology. Most teachers reported routine technology use. Routine usage of technology is when technology is used to replace outdated teaching materials, but traditional teaching techniques are still being used. An example of routine

use is when teachers use an interactive whiteboard as opposed to a chalkboard without changing their method of teaching. For example, teacher E describes how they use technology on a day-to-day basis. “Right now we're in an informational text unit so we're doing a lot of research. We're doing a lot of drafting using the computers, either laptops, Chrome Books or the desktops that are in the computer lab” (32-35). The teacher describes using technology for the purpose of composing papers and doing research. This type of activity could be accomplished without a computer, but it would be very challenging. However, very few teachers described what could be considered *advanced*. Advanced use of technology is when technology is being used to accomplish something that could not be accomplished without the use of the technology. In this situation, students are responsible for making choices about which tools to use to accomplish class goals. They are also participating in activities that could not be accomplished without it.

The potential for advanced *usage* is apparent, but at this point, the majority of the teachers described using technology in a *routine* manner. The usage a teacher describes is an indicator as to how comfortable a teacher is when using technology in the classroom. A teacher that is more comfortable using technology is more likely to use technology to enhance the learning situation. Thus, it is apparent that a teacher’s *comfort level* can contribute to one of the *obstacles to technology integration* that educators face. This is especially true if they are unsure of how to successfully integrate technology in the curriculum, are unable to troubleshoot basic technical difficulties, or if they are unfamiliar with the technology tools available to them.

The categories described above were developed over several months during many hours of examination of interview data. As the data was analyzed, it became clear that the

shared experience is the category that seemed to have the most direct impact on how technology was being used in the classroom. Specifically, it was evident that teachers believed that the technology was beneficial to their classroom, however, as noted by some of the students' responses, the technology did not engage all of the students. In some cases, students seemed to be motivated by personal experiences and interests rather than schoolwork or learning.

The technology integration readiness of the teachers, and their educational uses of technology, played a role in the experience the students had with technology as part of their learning environment. Generally speaking, teachers who were more prepared, had more experience, and had a better understanding of how to use technology in the educational setting, were more successful integrating computers and other electronic resources into the curriculum. Their personal interest in technology, along with formal training, are what seemed to determine if technology was being used at an advanced level in the classroom. Finally, it became apparent that obstacles to technology integration could have a negative impact on the other three categories. This portion of the study has raised several questions that would benefit from further investigation.

In order to triangulate the analysis of the interview data with another data source, this researcher conducted eight classroom observations in addition to the personal interviews. The results of those observations and how they corroborate the findings above, will be described below.

Classroom Observations

The eight classroom observations took place during normal school hours during the months of December 2015 – February 2016. Observations were approximately fifty

minutes in length. The researcher was able to observe how eight different teachers, responsible for teaching various curricular areas, were using technology in their classroom. To record the observation data, the researcher jotted handwritten notes in a notebook and used a digital camera to photograph and document the observations. Notes or pictures were taken when the observer noticed something of interest that could potentially be used to answer the research question or further the understanding of the categories that were developing. In addition to taking notes and pictures, the researcher recorded his initial thoughts about the observation on a digital recording device immediately following each observation.

After collecting the data, the researcher went through the process of writing detailed field notes about each observation. These notes were written as soon as possible after the data was collected. Each field note contained a description of the activity that was observed, a reflection from the researcher, and any emerging questions/analysis that developed as a result of the observation. The notes were taken in this way to help the researcher document and recall the experience of the observation at a later date and improve the accuracy of recall. Previously the categories of *shared experience, educational uses of technology, technology integration readiness,* and *obstacles to technology integration* were discussed during the analysis of student and teacher interviews. The following will describe how specific observations helped the researcher gain a better understanding of the categories described in the personal interview section of this dissertation.

Shared Experience. A *shared experience* refers to the phenomenon that students and teachers experience similar benefits and limitations when technology is used in a

learning situation. It seemed that teachers were responsible for whether technology was being used and ultimately how it was being used in the classroom. One observation in particular demonstrated the range of the shared experience students and teacher take part in when using technology in the classroom.

Evidence of shared experience – Teacher D. The observation took place December 11, 2015 at 11:40am. The classroom was arranged with several desks pushed together in small groups. The desks were arranged in groups of two to four. As the students entered the room, they took their seat and quickly focused on a brain teaser problem that was on the whiteboard. They seemed very interested in trying to solve this problem. It appeared the students were excited to find the answer and worked independently at their desk until their teacher requested they move on to the lesson of the day. After the students finished their brain teaser problem, they were given a hypothetical situation. They were told that they were researchers working with a community that has been stricken with E.coli. The students were provided with information about the situation and considered several problems that were happening because of the communicable disease. As researchers, they were asked to use their research skills to develop practical and creative solutions to help solve the given problems. The students worked in groups and utilized technology throughout the lesson. Their end goal was to create a group presentation and present their findings to the other groups. It was during this lesson that the observer noticed that the technology may not have been what was motivating the students to engage in the lesson.

The shared experience appeared to be driven by the teacher's beliefs about technology and its role in motivating and engaging students. As this researcher observed

the class, it became clear why teachers believe that technology is motivating and engaging to students. The students were certainly engaged in the activity, but they were also engaged when solving the brain teaser problem, which was void of technology use. The researcher believes that this first-hand example demonstrates how students' personal interests are most likely driving their motivation and engagement in the classroom. The absence of technology did not stop the students from being engaged, so it would be hard to argue that the presence of the technology would be the reason for their excitement. To that point, teachers may have to consider carefully when it is the best time to use technology and not to count on technology to be the reason for students to be *motivated* and *engaged* in the classroom.

Evidence of shared experience – Teacher A. This observation took place on December 8, 2015 at 8:40am. As soon as attendance was completed, all of the students retrieved a Chromebook from a laptop cart located in the back of the room. During the introduction of the lesson, the teacher talked about how they were going to use technology to improve their fluency when speaking Spanish. Teacher A explained that recording yourself speaking Spanish and listening to the recording was a good strategy to improve fluency. Students were encouraged to think about how the technology was going to help them become fluent when speaking Spanish. Before the lesson began, students took five minutes to generate a personal goal for the lesson. After the goals were written, the students were told to select an excerpt from their textbook to record. The students were asked to record themselves using the website, www.vocaroo.com. Then they were directed to listen to their recorded voice and evaluate whether they reached their goal.

From a distance, the activity looked like it was going well. The students seemed to be engaged and on task. However, after the activity began and the researcher was able to get a closer look at what the students were doing, it became obvious, that while the students were in a shared experience, it was not *motivating* and *engaging* for everyone. Some students seemed to be frustrated by the technical problems they experienced during the lesson. For a number of reasons, but mainly because the teacher was not prepared to deal with technical difficulties, the students had varying levels of success completing the academic goals of this activity.

The experience for the students in Teacher A's class was vastly different from Teacher C's class. The entire positive experience of the first group seemed to rely on their personal interest and the *technology integration readiness* of the classroom teacher. The students who were in the class with the best technically and pedagogically prepared teacher, also seemed to have the best classroom experience. The next section of this dissertation will focus on the events that happened during classroom observations that support the second category mentioned above, *technology integration readiness.*

Technology Integration Readiness. One of the main categories that was discovered was the teacher's *technology integration readiness*. *Technology integration readiness* refers to a teacher's ability to effectively integrate technology into their classroom. *Technology integration readiness* seemed to play a role in the student and teacher *shared experience*. It became apparent that the teacher's *training* played a role in their technology integration readiness. The following observation helped support this subcategory of *technology integration readiness*.

Evidence of technology integration readiness – Teacher E. During the observations the researcher was able to view how teachers were using technology in their classroom. The researcher assumes they are using technology with which they are familiar because of training or past personal experience. The following description is of an observation that helped the researcher confirm the subcategory of *technology integration readiness, training*.

Teacher E's observation took place on December 11, 2015 at 8:40am. This classroom was configured with groups of desks arranged around the room. As the students entered the room, the only technology being used was a radio, which was being used to play classical music. The students immediately took their seats and within a few minutes, the class was ready to start.

For this class, the students were participating in a Writer's Café. The teacher brought bagels and juice to share with the students. More importantly, this was an opportunity for students to share the feature article they had been working on during class. To create their article, technology was used throughout. One requirement of their feature article was for students to interview an expert and use some of that interview data to support their article. All of the students used the Internet and some students used email to collect data. After gathering all of their information, the students used Google docs to author and save their writing. All of the technology work took place prior to this observation. However, the researcher was able to observe final products that were presented during the Writer's Café.

The lesson was fairly straight forward. The teacher made several copies of each student's featured article and placed them on a large table in the front of the room. The

teacher directed several students at a time to visit the table and pick an article to read. Those students then worked as a group. After they reviewed an article, the students provided feedback on the piece. For each article, the students gave one praise statement and one polish statement. The praise statement was supposed to encourage their peer about some aspect of the author's writing. The polish statement was to give advice on how the piece could be improved or polished. After providing feedback, the students would return the piece they reviewed to the table in the front. The students selected another document and repeated the process described above. This entire portion of the lesson was void of technology use. All of the statements were recorded using a pencil and paper and shared verbally with the group.

It was obvious that the students used technology to publish their piece and that the teacher used a printer/copier to print each student's work. But other than that, the lesson itself was very traditional. However, this illustrates that teachers are using technology with which they are familiar and comfortable. All of the teachers mentioned learning how to use Google docs software when receiving training.

This observation provided legitimacy to the argument that teachers will use technology on which they have been trained but their teaching strategies tend to remain traditional. The next example demonstrates another important subcategory of *technology integration readiness*, *interest in technology*.

Evidence of technology integration readiness – Teacher B. Teacher B's observation was a good example of the subcategory *interest in technology*. The observation started at 2:40pm. Each student sat at a desk that contained a desktop computer. The teacher and students consider this type of room a business lab. Most, if not

all of the classes held in this room are geared towards introducing students to concepts impacting technology in relationship to business.

As the students arrived to the classroom, they immediately sat down and looked to the SmartBoard for directions on their warm-up activity. The students started working on their warm-up almost immediately. They seemed very familiar and comfortable working independently on this task. The researcher thought this because there were very few questions to the teacher and the students all appeared to be working on the same assignment, which made the researcher assume they were on task and engaged. The students visited a website called code.org. At this time, most students were working independently. However, several students were working with their neighbor to solve the problems. The teacher walked around the room reviewing students' work, and if needed, offered suggestions for improvement. The students worked independently for about ten minutes before the teacher began the lesson for the day.

The lesson was a combination of independent and group work. The lesson was centered on a program called Scratch. Scratch was created by Massachusetts Institute of Technology to provide a platform for students to learn how to code computers. The students were presented with five problems that needed to be solved. Each student was assigned one of the five problems. Students worked independently for three minutes trying to debug a broken computer program. After the three minutes concluded, all of the students who worked on the same problem gathered to share their solutions. The students refined their work and incorporated the best ideas from each student's solution. Then a representative from each group presented the group's final work. After all of the groups shared, students were encouraged to solve the remaining four problems independently.

This lesson was interesting because it provided students with a real life computer bug and they were able to fix the bug in a variety of ways. Each strategy they choose had merit and the activity promoted idea sharing and a deep understanding of the problem trying to be solved. It appeared this lesson was falling in line with more of the higher-level activities promoted by Papert (1980) and others.

This teacher, in particular, was very open about her interest in technology during her interviews. She spoke openly about her prior experiences as a technology specialist and how that experience helped her to use technology in the classroom. When reflecting on this particular observation, the researcher noted that it was void of the technical issues witnessed in other observations and the students seemed very comfortable working both independently and as a group. The researcher believes that this is a solid example of how a teacher's interest in technology, prior experience, and formal training, play a role in how teachers are using technology in their classroom.

Educational Uses of Technology. This category describes uses of technology that are intended to improve the schooling experience in some way. All of the observations were examples of using technology in the *learning environment*. The following description of Teacher G's observation is a good example of how teachers are using technology for preparing for lessons.

Evidence of educational uses of technology – Teacher G. The observation of teacher G's class took place on February 4, 2016 at 9:05am. As the students entered the room, there was a practice problem being displayed on the smartBoard. This problem was displayed from the teachers Google drive folder. After working on the practice problem for several minutes, the students were instructed to take out their homework notebook.

This is where they keep their assignment from the previous night. The teacher quickly walked around the room and checked the students' work and asked them if they had any questions about the assignment or what they were learning in class. At this point of the lesson, neither the teacher nor students were using technology tools, except for the smartBoard, which was displaying a practice problem that the teacher created earlier.

After the quick homework review, the teacher began the lesson. A geometric figure was being displayed using a document camera. The teacher gave the students some information about the figure and told the students to solve the unknown parts. For several minutes the students worked independently at their desk, using a whiteboard and dry erase marker, to try and solve the problem. As the lesson concluded, the teacher moved to an activity she had prepared for the smartBoard. At this point, the students were broken into three groups, based on where they were seated in the class. Each group had the opportunity to send a representative to the smartBoard to solve one piece of the large problem. After the representative reached the correct answer, they were given the opportunity to throw a soft sponge ball at a target being displayed on the smartBoard. Each ring of the target had a different value with the highest value in the middle of the target. The smartboard captured where the ball hit the target and the appropriate points were given. Each student was earning points for their team. This process went on until the entire complex problem was solved and all of the representatives had a chance to throw the sponge ball at the target being displayed on the smartBoard.

The teacher's *preparation* for both parts of the lesson seemed apparent, even though the researcher noted that the technology was not being used at a high level. This particular lesson provided an example of teacher-made materials being used to further the

understanding of concepts related to the subject they teach. This example along with the numerous mentions of *preparation* in the interviews, helped to strengthen the category described above. The final observation that will be used to highlight the *educational uses of technology* will be described below. This particular observation highlighted the *community* building that technology sometimes has on the *learning environment*.

Evidence of educational uses of technology – Teacher D. The other aspect of the learning environment that seems to be directly impacted by technology in the classroom is the *community*. One aspect of community was creating opportunities for students to collaborate with one another on school work both inside and outside of the regularly scheduled school day. The best example of this phenomenon took place during Teacher D's observation. During this observation, the students were trying to solve a hypothetical problem related to an E.coli outbreak. The students were using Google Docs for several aspects of this lesson. The students were preparing slides and working on the same problem together. For example, the researcher observed two students working together on one slide, from two different computers. One student was adding text to the slide, while the other was collecting and adding the data to support the text by the first student. This collaboration effort was fairly impressive to the researcher. It appeared they planned this approach in advance and both students appeared to be comfortable completing the task they were assigned. The researcher can only assume that the students would be able to transfer this same community approach to solving a problem when outside the walls of the classroom. The students demonstrated that they have the skills to delegate tasks and follow through to completion. This class of gifted students appeared to be highly

motivated and it seemed apparent that they were using the computers to improve their classroom *community*.

The second subcategory of educational uses of technology, *assessing learning*, was evident during Teacher F's observation. The following will describe the class observation and how this experience helped the researcher better understand the role technology plays in the assessment of learning.

Evidence of educational uses of technology – Teacher F. The observation with Teacher F took place on January 15, 2016 at 1:45pm. As the students entered the room, the teacher handed them a test that they had completed during their previous class meeting. As the students received their test, the first thing they seemed to notice was the score they received. After all of the students received their test, the teacher began reviewing it with the students. The students and teacher spent the first twenty five minutes of the class reviewing the exam.

After the students finished reviewing the exam, they were given time to work independently on their science fair projects. The students spent the remaining class time, about 15 minutes, using laptops to create various Google documents, such as graphs and other data.

Due to the amount of instructional time spent reviewing the test data, the researcher assumed the teacher thought this test was of great importance. In this particular situation, it was clear that the test data was collected using a *traditional* procedure, a paper and pencil test. But then as the researcher observed the room, he noticed test data hanging on the wall behind the teacher's desk. The data was in electronic form and obviously being stored in a database. It appeared that this teacher

used various forms of assessment *procedures* to capture the data, but in the end, the data was entered manually into district's assessment reporting system. The researcher believes that if teachers are spending time entering data into an assessment warehouse developed by the school district, the teachers must find the data *helpful*.

All of the educational uses of technology highlighted in the observations were also prevalent in the interview data presented earlier in this chapter. The next section of this dissertation will help the researcher define and corroborate the category, *obstacles to technology integration.*

Obstacles to Technology Integration. The category *obstacles to technology integration* discusses phenomenon directly associated with a less effective learning situation due to the use of technology. Three observations highlighted the most frequently discussed obstacles and they will be discussed below.

Evidence of obstacles to technology integration – Teacher H. The following observation took place on January 26, 2016 at 1:45pm. The activity was a continuation of a lesson that started the previous time the class met called Book Talk Bingo. As soon as the students entered the room, the first thing the teacher did was ask them to pick up a ChromeBook and log in. The students seem to be familiar with this exercise because they needed very little instruction to get started. After all of the students arrived and retrieved their ChromeBook, the teacher started the activity by asking for a volunteer for the book talk. After a volunteer was selected, the first round of Book Talk Bingo began. This activity continued until two students had presented their books to the class. This portion of the class went smoothly with very few *distractions*.

It was during the second half of the class, when the students were working independently that the observer noticed a couple of students gathered around one computer. As the researcher approached to investigate, he noticed one of the students quickly closing the browser. This was the first time the researcher noticed that the students seemed to be noticeably distracted. The researcher confirmed this by moving away from the students and observing from afar. The students resumed the distraction. At that time, the researcher was able to capture a photograph of the distraction taking place, which will be discussed in the documents and artifacts section of this dissertation. This particular distraction started to move from a *minor* distraction to a more *pervasive* distraction because this single incident was negatively impacting the learning of more than one student. It would seem since this is the only incident discovered during observations, that this type of distraction is *infrequent*. In combination with the evidence from the personal interviews, this observation seems to provide a clear example of how *distractions* can become an *obstacle to technology integration*.

Evidence of obstacles to technology integration – Teacher A. The observation that took place with teacher A, which was described earlier in the *shared experience* portion of the classroom observation section, is also a good example of how *access* to technology can be an *obstacle to technology integration*. The goal of this lesson was for students to increase their fluency when speaking Spanish. During this lesson, the students used a website called vocoroo.com to record themselves speaking in Spanish. This lesson required several pieces of technology in order for it to be possible. As the researcher observed this lesson, it became apparent that technology being used in class might not be available to all students when they leave this particular classroom. This was a good

example of how *access* to *technology* can make completing a lesson like this difficult. If students were asked to complete this type of lesson outside of the classroom, they may or may not be able to participate, depending on the type of computer access available to them. Teachers and administrators will need to consider *access* issues when planning curriculum around technology. In addition to making sure their students have the correct *access* to technology, a teachers' comfort level with technology can have an impact on how technology is being used in the classroom. The following observation highlights how a teacher's comfort level with technology impacts the classroom.

Evidence of obstacles to technology integration – Teacher G. The observation that took place with teacher G, which was described earlier in the *educational uses of technology* portion of the classroom observation section, is a good example of how *abandonment* of technology strategies can be an *obstacle to technology integration*. During personal interviews Teacher G stated she used a flipped classroom format. Upon observing her lesson, the researcher noticed that the lesson did not appear to be part of a flipped curriculum. When the researcher asked the teacher if this was considered a flipped lesson, she explained that some students were having problems keeping up with the homework in this particular chapter, which was forcing her to abandon the flipped classroom for this chapter. She said this group of students was not as successful as some of her past classes and that she was going to try to reinstate the flipped classroom in the near future. This is a strong example of the *abandonment* that teachers experience when trying to implement classroom strategies that have an important and involved technology component. In some cases it appears that the technology may introduce more problems than it solves. The final section of this chapter will discuss the document and artifact

review that took place and how that process helped the researcher corroborate the findings of this study.

Document and Artifact Review

The following section of this dissertation is a description of several documents and artifacts that were collected during visits to the schools. An explanation of why the artifact was chosen and how it helps to corroborate the categories developed during the personal interviews will be included.

Assessment Reporting System. The district participating in this study has invested in creating an assessment reporting system for teachers and administrators. The test data stored in this system would be best described as district benchmark and unit assessment data. The data is distributed to teachers using various pre-made reports. These reports were created with the input of various stakeholders in the district and tend to help school district staff track student growth over their academic career. The data is then used to make instructional and curriculum related decisions. At the classroom level, teachers are supplied with detailed reports that show how their students performed on various aspects of each assessment. A sample report from this system has been supplied in appendix J of this dissertation.

The existence of the reporting system indicates a strong *value* placed on storing assessment data and analyzing learning. Additionally, the system requires ongoing maintenance, which demonstrates an effort on part of the school district to improve the process for delivering assessment data to district staff. This appears to be another indicator of the value the district puts on technology used to store and manage assessment data.

It is difficult to assess whether teachers feel that this system is helpful from this artifact. However, one could argue that the continued support and development of this system indicates that at least some teachers find the data helpful. This system also shows signs of routine and progressive procedures for capturing academic data. For example, some tests are administered on paper and pencil, scored by hand, and entered into the assessment system, while other assessment data is gathered in a more *progressive* manner with assessments being taken online by the students and scored online by the teachers.

Professional development course guide. The professional development course guide shows all of the professional development opportunities for certified teachers. You can find a copy of the courses offered in the guide in appendix J of this dissertation. There were several courses designed for teachers to learn how to use various technologies. There were two Do it Yourself Video courses, three classes on Google Tools, one class on how to use YouTube in the classroom, one class on Chrome apps and extensions, and one class for websites for teachers.

All of the classes related to technology, with the exception of one, are geared specifically on how to use different hardware or software in the classroom. There was only one course that addressed enhancement of a specific curricular area. Only the DIY video class and the Websites for Teachers class were geared towards middle school teachers. The rest of the classes were developed for elementary school teachers.

This artifact gives further evidence to the types of professional development opportunities provided to teachers. Furthermore, the researcher believes that this lack of development opportunity also shows that teachers rely on teaching themselves how to provide higher level activities for their students. Their personal experience plays a role in

that development and appears that it may continue to be the primary source for teacher development in the near future.

Photo of sign. Earlier in this chapter, the researcher stated that teachers implemented rules and procedures to help alleviate the *distractions* technology pose in the classroom. During one observation, the researcher noticed and captured a photo of a sign that told students when they could or could not use their personal technology tools. This artifact shows one of the steps teachers are using to minimize the *distractions* that sometime cause *obstacles to integrating technology* in the classroom. It appears the instances of *distractions* were happening *frequently* enough that teachers have changed classroom procedures to ensure *distractions* do not become a prevalent issue when using technology.

Photo of posted assessment data. *Assessing learning* was one of the more prominent uses of *educational uses of technology*. This photo was taken during a classroom observation and can be viewed in appendix J of this dissertation. The photo depicts assessment data posted to the wall behind the teacher's desk. The data is highlighted and posted in a prominent place in the room. This artifact is another example of the value and advanced procedures this district is using to capture, analyze and distribute district assessment data.

Photo of Book Talk Bingo. This depicts a photo of a Book Talk Bingo card and can be located in appendix J of this dissertation. This is the card that was used by students during one of the classroom observations. During this lesson, the students were instructed to place a marker on their bingo card any time one of the student presenters mentioned the literary element listed on the card. The technology component of the lesson included

students using a computer, projector and Google slides to generate a multimedia presentation of their book talk. Some would argue that this is *routine usage* of technology. It seems that training and comfort level are two conditions that impact a teacher's use of technology.

Photo of classroom technology. This photo depicts various classroom technologies that were observed during Teacher B's classroom observation and can be found in appendix J of this dissertation. The photograph shows an instance of the access to technology that students and teachers have when they are at school. But as mentioned earlier, these tools are limited to use on the school's campus. For technology to be utilized to its fullest potential, it would be important for students to be able to have access to technology outside the classroom to complete assignments, participate in online discussions and share ideas about what they are learning. Some students have access to various machines and software to complete their projects while at home. In contrast, some students only have access to the technology captured in this photo. The disadvantage for these students is two-fold. First, they do not get to practice how to use technology except when given time by their teachers. Secondly, the students are put at a disadvantage when asked to do technology related assignments from home. Teachers and administrators must keep this access issue at the forefront of decisions concerning technology implementation in order not to disenfranchise students with limited resources at home.

The quantity of equipment in this photo also demonstrates an *interest* in using technology in the classroom. Every classroom had some level of technology and laptop carts were available on demand if a teacher scheduled them in advance. Evidence of

technology quantity ranges from sparse to pervasive. While some teachers enjoy a technology-rich classroom, others are bringing in equipment to ensure there are adequate devices for every student in their class. In either case, the interest in technology seems to be strong.

Chapter 5 - Discussion

The purpose of this study was to document how teachers and students perceive the effectiveness of technology integration happening in the classroom. The researcher, using techniques commonly associated with grounded theory data analysis was able to identify four main categories. They are 1.) shared experience, 2.) technology integration readiness, 3.) educational uses of technology, and 4.) obstacles to technology integration. These categories along with their subcategories, properties, and dimensions help to explain what is happening when technology is being used in a middle school classroom and help to answer the research questions being posed.

Triangulation of Data

In an effort to strengthen the results of this research and reduce the influence of bias on the results, the researcher made an effort and was able to triangulate the findings of this research. As the categories developed, the researcher was able to find evidence in multiple sets of data to corroborate the findings. Evidence sources included, interview data, observation reports, documents and artifacts, and survey data. Through the process of comparing and validating findings in multiple sources of data, the researcher is confident that the categories, subcategories, properties and dimensions discussed in the findings chapter accurately document how technology is currently being used in the classrooms under study.

What Was Learned – Student and Teacher Perceptions

Motivation and engagement. The data suggests that students and teachers have similar perceptions about the use of technology integration in the classroom. Some teachers seem to believe that simply using technology during lessons is motivating for

students. In some cases this actually holds true. For some students, it appears the simple act of learning is exciting and technology is simply the tool they use to engage in acquiring new information.

However, not all students felt technology itself was engaging at school. The data suggests that students enjoy using technology outside of school to participate in activities, mainly games and social media, which are of their personal interest. These differences in perception about what is motivating and engaging suggests that teachers would benefit from acknowledging these differences and taking them into consideration when planning instructional activities.

Value of technology. The data also indicates that teachers seem to value the technology they use in the classroom. Specifically, teachers view technology as helpful with their classroom instruction. In some cases, teachers have completely changed the way they deliver content because they believe that it is improving their student's ability to understand the content being presented.

In some instances, the teachers believe the delivery of content using technology has resulted in increased academic performance. One teacher pointed to increased scores on benchmark exams from year-to-year, while other teachers generally stated that they value the technology they use and that it helps their teaching. Other teachers described how they use technology to share student work with their colleagues so that their colleague has some knowledge of the students writing ability before they ever see the student in class. The examples given during interviews and observed during classroom visits highlight the perception that teachers value technology in their classroom, and in

some cases, they believe that their use of technology in the classroom is increasing student achievement.

Students also value the use of technology for learning. Specifically, they mention valuing access to materials and being connected to their peers and teacher outside of regular school hours. Even students that mentioned being bored with technology seemed to value what technology had to offer to the learning environment. It should be noted, the data indicates that students value participating in activities, such as games and social networking, more than they value the educational uses of technology. The researcher came to this conclusion after hearing almost every student mention playing a game or social networking with friends as their typical use for technology outside of school.

Community building. Teachers and students both believed that technology played an important role in building the classroom community. Students and teachers seemed to enjoy the expanded availability to each other. Students and teachers talked about Google Classroom as a means to communicate with peers and teachers both inside and outside of regular school hours.

The technology being used in the classroom is promoting communications and community building that would not be possible otherwise. The students have access to a content expert during all hours of the day. They can contact the teacher at any time during the day, but may not get an immediately response. This perception of extended access, that students and teachers possess, could potentially enhance the amount of time teachers and students spend collaborating with each other outside of the regular school hours. In addition, the perception of extended access could possibly give students more confidence in completing their assignments, knowing an expert is available.

Assessments. Teachers and students see the value of assessing learning using technology. The data showed that the students and teachers believe technology is useful for assessing student learning and it is often used for that purpose.

The frequency of testing was one indicator that teachers and students felt assessing learning was an important use of technology in the classroom. In addition, students mentioned that they saw the value of using computers to assess their learning. In some cases, students mentioned they thought it helped their teacher do their job and that it helped them prepare for future exams. Students also saw value in using technology for preparing for assessments.

The data demonstrates that both teachers and students perceive using technology for assessing learning as valuable and effective. It was interesting that students not only saw the value in the assessments themselves, even mentioning that they helped them prepare for tests, they also mentioned how it helped their teacher. The data indicates that using technology to assess learning may be one of the most mutually beneficial uses of technology for both teachers and students.

Distractions. Both students and teachers perceive technology as having the potential to distract students and teachers from learning. Almost all of the teachers mentioned distractions as one of the main hindrances caused by using technology in the classroom. Interestingly, students also felt that technology has the potential to cause distractions in the classroom. Some students acknowledged that technology can be distracting to the learning process. Other students pointed out that the distractions can in some instances cause students to get off task.

This perception has caused teachers to develop classroom management strategies to minimize the distractions caused by technology. In some cases, this requires teachers to request that no technology be used during lessons. To better control these distractions in the classroom, understanding the potential distractions that technology can introduce and developing strategies to improve a student's digital citizenship, seems to be an appropriate next step.

Fun, games and social media. Students mentioned they perceive using technology outside of school for fun activities. Activities that they mentioned as fun were playing games and participating in social media with their friends. The activities described by the students were mainly social in nature. Participating in games and sharing personal information with their peers via social media seemed to dominate their use of technology outside of school.

Interestingly, rarely did the students mention technology as being fun when in context of the school environment. This is interesting especially since teachers maintain they are using technology to excite and motivate students in class. If teachers believe the act of providing computers to students will make students enjoy and participate in schooling, they may be using technology in a way that is less than ideal. It seems that when trying to motivate students, the technology is secondary to the interesting activities that teachers provide. If the students are not motivated by the lesson's content, it appears technology alone will not improve their enthusiasm for learning.

Categories and Their Relationships

When trying to interpret how teachers and students perceive the effectiveness of technology integration in schools, the researcher started noting how the technology

integration readiness of the teacher, educational uses of technology, and obstacles to technology integration impacted the overall shared experience of the teachers and students. The interaction amongst categories and possible explanations for those interactions will be discussed next**.**

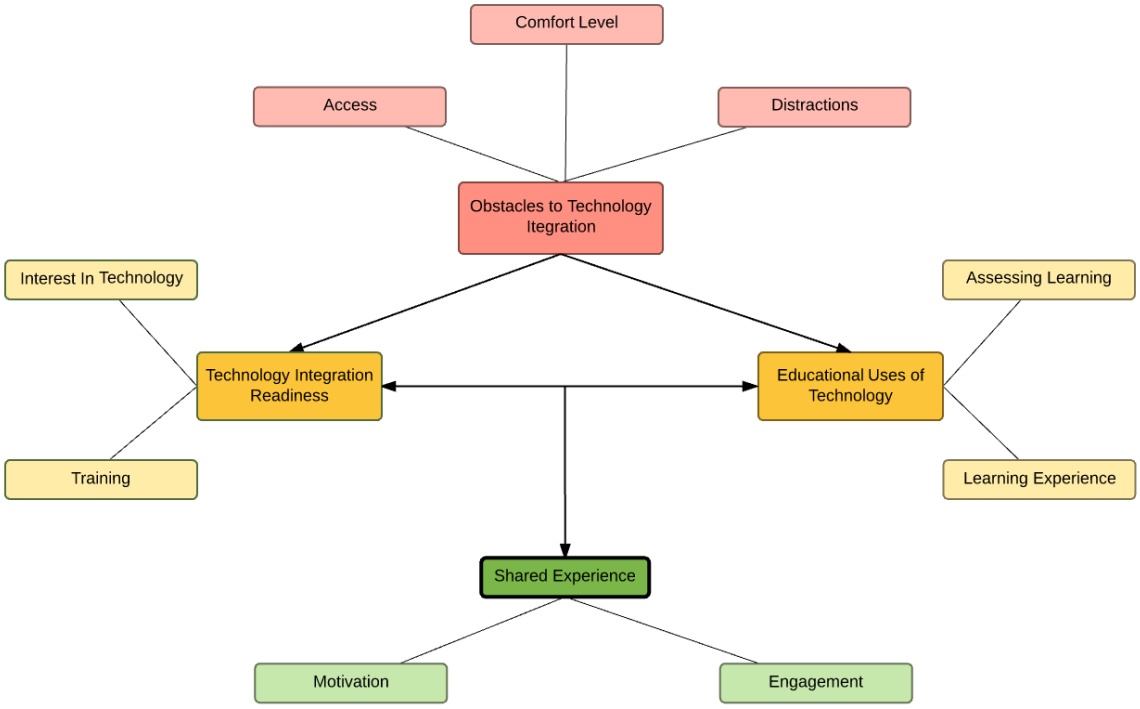

Figure 5. Mind map demonstrating categories and subcategory interactions.

Shared experience. The category *shared experience* was evident in all of the teacher and student interviews. The shared experience refers to the desire that teachers use technology in an attempt to create a shared environment where students are motivated and engaged in learning. Only one teacher mentioned that she was using technology in the classroom because she believed it would help her students improve academically. Therefore, the data indicates that the shared experience that most teachers were trying to attain was to motivate and engage their students with the use of technology. This is not surprising based on other research in the field. Keengwe, Schnellert, and Mills (2012)

conducted a study that indicated that a 1:1 laptop computing program increased student engagement and learning, motivation, and ability to work individually. Teachers familiar with this research, and teachers that note that students seem to use technology frequently when outside of school, may tend to think that teachers are creating a positive shared environment for their students when incorporating technology in their lessons.

However, after interviewing 16 students, it became clear that not all of the students were experiencing the same shared experience that their teachers were trying to provide. The technology alone was not motivating and engaging for all of the students. Some students reported not being motivated or engaged when using computers. One student even mentioned that he was bored most of the time when using technology at school. This feeling of boredom, even though computers were being used, was contrary to how teachers believe students would react to the technology in the classroom.

After examining the data, this researcher suggests that teachers believe technology is a motivating and engaging activity for students because students often use technology outside of the classroom. It appeared that students were using technology outside of school to engage in activities that peeked their personal interest. Specifically, students talked about using technology to play games and socialize with their friends on social media.

In order for the technology to have the intended result of creating increased motivation and engagement, it appears that it is important for teachers to use technology tools in tandem with well-planned and creative lessons that somehow connect with students on a personal level. This conclusion supports research conducted by Watson, Mong, and Harris (2011). They conducted a case study of high school sophomores

utilizing the video game, *Making History*, to learn about WWII and found that the classroom climate shifted from a traditional teacher-centered model to more student-centered model and that the students were much more active and engaged than in other lessons.

It was the game and activity that was engaging the students. It could be argued that if the activity were to simply use a Word processor to write a report about the history of WW2, then only students who were interested in writing would become motivated or engaged. One could argue that the students that would be excited about writing on a computer, would have been excited about the assignment if they were using paper and pen to complete the task. This assessment of the situation is similar to the findings of research conducted by Lee, Tsai, Chalt & Koh (2014).

Lee, Tsai, Chalt & Koh (2014) studied 500 secondary students and found students that engaged in self-directed learning and collaboration activities in a nontechnology context, were also more likely to engage in self-directed learning and collaboration activities in a technology-supported context. They argue that teachers may benefit from developing a student's learning processes, in terms of self-directed learning and collaborative learning, before asking students to engage in technology supported activities that require those processes in order to be successful. The researcher suggest that the students' ability to complete the task successfully was most important and the technology seemed to play a lesser role in the learning experience.

Teachers who were interviewed and observed had varying levels of success when implementing technology. Therefore, the researcher contends that their success or lack of success implementing technology had an impact on the shared experience. It appeared

that the next two categories, technology integration readiness and educational uses of technology, play a role in teachers' level of success when integrating technology, and therefore they have a direct impact on the shared experience that was created.

Technology integration readiness and educational uses of technology. The technology integration readiness of a teacher seemed to have an impact on how technology was being used in the classroom, and therefore the overall shared experience of the students. To this point, throughout the analysis of interviews, observation and artifact data, I hoped to hear teachers were using technology in ways that would be considered advanced. After considering what is described in the literature in terms of virtual worlds, augmented reality, games, and advanced uses of the Internet for community building, the researcher was surprised that only a few teachers indicated that they were using technology for anything other than preparation, assessing student learning, and sharing of classroom materials.

Most of the lessons observed and described by students in interviews could be described as low level uses of technology. In those situations, technology was essentially the medium for presenting data, sharing documents, and producing student work. The lessons themselves, while interesting, could have been completed with little to no technology and the goals of the lesson could have been met. It seems reasonable that some educators would ask themselves whether these low level uses of technology make purchasing expensive equipment worth the investment. These findings align with the views of Cuban (1986) and Oppenheimer (2003).

After interviewing and observing the teachers, a pattern in the data seemed to exist. It appeared teachers who were using technology at a high level were those with the

most interest and training in technology integration. The teachers who were satisfied with the amount of training they had already received, were those who were using technology at its most basic level.

In addition, teachers who had a lot of training but also sought out additional training, appeared to be the most comfortable using computers at a higher level. They were attempting to provide unique learning experiences that could not take place without the use of technology. These findings are consistent with the study conducted by Koehler, Mishra and Yahya (2007). They describe a Technological Pedagogical Content Knowledge (TPCK) framework. This framework explains how teachers need more than a strong content knowledge, technical expertise and pedagogical knowledge to be successful integrators of technology. Teachers must possess knowledge in all three areas - but it is a deep understanding of the complex interrelations between those three areas that help teachers grow as technology integrators. Their study suggests that teachers can improve their TPCK knowledge by participating in activities or events that force them to think about the complex interactions, such as lesson design or curriculum writing and that true technology integration is developed over time as teachers interact with the different complexities involved in a technology rich lesson.

When participating in higher level activities, the students seemed to be enthused and engaged during the entire lesson. They appeared to be on task and involved in solving the problems posed by the teacher. There were two lessons that the researcher observed, in particular, that demonstrated this connection. The lessons on communicable diseases and the software debugging described in chapter 4, were free from distractions and the integration took place in the context of student-led lessons. The students were in

charge of their own learning, solving problems that seemed interesting, while working with their peers to build a deeper understanding of the problems at hand. The teachers in both situations enthusiastically described their professional development, but more importantly in my opinion, their personal desire to self-educate.

In contrast, students in the classes where teachers were simply displaying information or using technology as a means to share documents, did not seem to be as engaged or excited about the lessons taking place. The researcher thought this because the technology was either rarely used by the students or it was used by students to create simple documents, such as, slide shows or word processing documents. The researcher considered both of those activities to be low level uses of technology that would not be motivating or engaging unless the student had a personal interest in writing or creating slide shows.

Professional Development. Because of this apparent connection between *technology integration readiness, educational uses of technology,* and the *shared experience* in the classroom, one could argue that supplying ample professional development to teachers is the main strategy that schools can use to increase academic achievement, or at the bare minimum, help teachers create a shared environment that is exciting and motivating for students. Since we know that students tend to use technology for social interaction and games when they are outside of school (Bennett, 2008), if teachers were receiving training that helped them engage their students in activities similar to what they are doing outside of school, more students may begin to find the technology integration happening in the classroom to be motivating and exciting.

However, after reviewing the data, it became clear that many teachers do not receive this type of training and have to take on the responsibility of learning how to best use the technology in the classroom on their own. This conclusion is very similar to what Oppenheimer (2003) suggests. Oppenheimer (2003) suggests that schools are underfunding basic educational needs of students and not focusing enough on teacher-child interaction. He argues that schools purchase technology for the classroom while teachers are given little if any staff development and the technology is never truly fully integrated into the curriculum. Although Oppenheimer (2003) sees some potential for technology in schools, he is mainly concerned with the over purchasing of equipment with little or no change to teacher-child interactions and teaching strategies.

Without professional development, many teachers are left to their own interests and abilities to provide a quality shared experience for the students. As the data indicated, teachers who create motivating and engaging activities using technology are relying on their own personal experiences to do so. Conversely, integrating technology can be challenging for teachers lacking quality personal experiences.

It seems that teachers may benefit from various levels of formal training on how to use technology in the classroom ranging from basic trouble-shooting classes, to advanced classes that help teachers develop lessons that utilize technology in ways similar to how students interact with technology when not in a schooling situation, mainly through games and social networks. Gee (2005) discusses how video games are motivating to children and adults alike. He states that “Good video games incorporate good learning principles, principles supported by current research in Cognitive Science” (p. 34). Gee discusses several learning principles that are involved in good games and his

research shows that the skills gained while playing video games could translate into the classroom. Because the research is showing that students not only participate in games outside of the classroom, providing teachers with training to recognize and discover relevant games, as well as creating lessons for those games, may be beneficial to the shared experience.

If the goal of technology is to create an environment that is motivating and exciting for students and possibly different than traditional school work, one could argue that unless educators start using technology in ways that are interesting to students, some students may continue being bored when learning with technology at school.

A lack of training on how to use technology to improve instruction and a student's understanding of a particular subject area is what Oppenheimer (2003) and others describe as a main obstacle impacting technology usage in schools. During the interviews, some teachers expressed frustration about the lack of opportunities, while others felt that they were receiving a sufficient amount. In either case, it seems that a formal strategy to help teachers become aware of the technical tools and strategies available to them, may help to improve student engagement and motivation, ultimately improving the shared experience that technology brings to the classroom.

The educational uses of technology mentioned by both teachers and students vary in complexity and rigor. However, it would be difficult to argue that the instructional strategies and the teachers' understanding of how to integrate technology in the classroom would not impact the teacher/student shared experience.

Additionally, it may benefit educators to explicitly state what is expected of teachers as it relates to technology integration. Formally defining what constitutes an

effective use of technology may benefit teachers and help direct how technology is being allocated and utilized in the classroom. Without this formalization of classroom expectations of technology integration, one could argue that teachers will continue to use technology at a basic level and not try to change their teaching strategies to best utilize the tools available to them, thus, furthering the perception from some students that using technology in school is boring.

The category, obstacles to technology, seems to directly impact both the technology integration readiness of the teachers and the educational uses of technology, which ultimately appears to have an impact on the overall shared experience of the teachers and students. The next section will describe some of the obstacles to technology integration and how those obstacles impact the technology integration readiness of the teachers and the educational uses of technology happening in the classroom.

Obstacles to technology integration. It appeared obstacles to the technology integration readiness of the teacher and the educational uses of technology in the classroom could have an impact on the shared experience of the students and teachers. Furthermore, it appeared that the manner in which teachers dealt with the obstacles, could make the difference between a positive or negative shared experience.

Obstacles to technology integration were apparent in all of the data. The category obstacles to technology integration describes phenomenon directly associated with a less effective learning situation due to the use of technology. There were several obstacles that were specifically mentioned by teachers and students. Those included, distractions caused by technology use, access to technology, and one of the obstacles that was most often mentioned, was the teachers' comfort level using technology.

All of the obstacles mentioned by the teachers in this study are similar to those described by Ertmer, Ottenbreit-Leftwich, Sadik, Sendurur & Sendurur (2012) and Kopcha (2012). Ertmer et al. suggest that there are several barriers to technology integration in the classroom, both internal and external. Notably, their research concluded that teachers believe "the strongest barriers preventing other teachers from using technology were their attitudes and beliefs toward technology, as well as their current levels of knowledge and skills" (p. 423). In addition to suggesting further research on this topic, the researcher suggests that schools realign their professional development to focus on strategies for facilitating changes in teachers' attitudes and beliefs.

An example of how obstacles to technology could interfere with the shared experience of the students became clear after interviewing and observing Teacher B. During her interview it was apparent that Teacher B was one of the teachers who was most prepared to integrate technology in the classrooms. She was familiar with new and upcoming technology trends, mentioned writing her own technology-infused curriculum, discussed attending multiple workshops on technology tools, and she considered herself a self-learner when it came to new technologies. In addition, she mentioned trying to teach her students how to fix their own technical problems instead of relying completely on the teacher.

During her observation, the students were using technology at a very high level. You could see the students using troubleshooting steps to solve routine problems that may have caused a distraction in other classrooms. It was obvious by the teacher and student interaction that the students were familiar with troubleshooting problems in her class. The researcher witnessed the teacher prompt one of her students to try to

troubleshoot the problem on their own using the steps they had previously practiced. She reminded the student to ask two friends before coming to her for assistance. After that quick reminder, the student was able to solve the problem without stopping the teacher from continuing the lesson.

During Teacher B's lesson, the researcher witnessed a very engaged group of students, using computers to solve problems that could not be completed without the use of technology tools. Students were put in a situation where they were expected to fix purposely broken software. Each student worked individually, and eventually as a group, to determine the most elegant and graceful solution to each problem. The integration looked almost flawless and the students appeared to be self-directed, on task and interested during the lesson. This high-level of technology integration was unusual compared to the other classroom observations. However, it did appear that the benefits of this self-directed learning task were similar to those of Butcher & Sumner (2011). Butcher & Sumner (2011) found that students utilize their metacognitive processes and prior knowledge in order to make sense of content when participating in a self-directed learning activity. In this case, however, instead of building knowledge by constructing an essay, computers were used to provide the platform for self-directed learning. This unique experience appeared to be successful in creating the positive shared environment, with increased motivation and engagement, that the teachers desire.

Not all teachers implemented technology in such a sophisticated way and most were unable to handle the obstacles to technology as gracefully as Teacher B, which could possibly lessen the positive shared experience the teachers are hoping to provide. For example, Teacher G, the one teacher that expressed little desire to take additional

training and did not value the training she had received, was one of the teachers who was using technology at its very basic level. This observation, that teachers are not receiving adequate training to support the integration of technology they have available to them, is supported by the research of Cuban (2001) and Oppenheimer (2003). Since their work, it seems very little has changed in this area. Teachers are still reporting receiving very little professional development and what they do receive is usually how to use specific software or tools, not how to integrate technology to improve their curriculum.

Not surprising, during Teacher G's lesson, the students seemed less than engaged. The students completed what the researcher described as a book report lesson. The students were playing Book Study Bingo. During this lesson, students watched a classmate give a report on a book. The technology use for this lesson consisted of using Google Slides to create a presentation and a projector to display said presentation. The students at their desk did not use any technology and were playing Bingo at their seats during the report. Students placed a marker on their Bingo card if the presenter mentioned one of the literary elements listed on the card.

The activity utilized some technology, but it was at a very basic level, and not all of the students were engaged with the technology at the same time. Students at their desk had a laptop in front of them, even though it did not appear that they needed the laptop as an audience. Because the laptops were at the students' desks, but not in use, some students were distracted by the technology. It was my conclusion that the distractions may have been more prevalent because the teacher did not have good classroom management of the equipment and the students were uninterested in the activity.

Students were using the technology at their desk inappropriately and this inappropriate use was causing other students to get distracted. The researcher assumed that if the teacher were better prepared to use and manage the technology in her class and the lesson was more engaging and motivating, the students around the distraction may not have been as distractible. Therefore, you could argue that if the teacher had been better prepared to integrate the technology, and had access to additional training on classroom management and curricular uses of technology, the students may have been more motivated and engaged.

The categories described above were developed over several months during many hours of examination of survey, interview and observation data, as well as a review of classroom documents and artifacts. As the data was analyzed, it became clear that the *shared experience* is the category that seemed to have the most direct impact on the classroom learning experience. Specifically, it was evident that teachers believed that the technology was beneficial to their classroom, however, as noted by some of the students' responses, the technology did not engage all of the students. In some cases, students seemed to be motivated by personal experiences and interests rather than schoolwork or learning.

The *technology integration readiness* of the teachers, and their *educational uses of technology*, played a role in the experience the students have with technology as part of their learning environment. Generally speaking, it appeared that teachers who were more prepared, had more experience, and had a better understanding of how to use technology in the educational setting, seemed to be more successful integrating computers and other electronic resources into the curriculum. Their personal interest in technology along with

some formal training are what seemed to determine if technology was being used at an advanced level in the classroom. Finally, it appears that obstacles to technology integration could have a negative impact on technology integration readiness and educational uses of technology, resulting in a less than desirable shared experience.

Conclusions and Limitations

This study provided documentation of how technology is being integrated into the curriculum at several middle schools in an upper-middle class suburban school district. The primary research questions for this study are:

1. How do teachers perceive their ability to effectively integrate technology into their curriculum?
2. How do students describe their experience using technology to learn?

The primary conclusion is that the teachers in this particular school district are using technology often and for many aspects of teaching. They receive some technology training, but are mostly responsible for developing curriculum specific teaching strategies using technology. Their expanded use of technology for organizing class materials, assessing learning, improving their access to students, and providing students with a way to extend their learning community outside of the classroom have had positive results. To this end, it appears teachers have a positive perception about how they are using technology in the classroom. Students report feeling more connected with their teacher and classmates and they appreciate the organization and availability of course materials online. Some students reported being bored with technology while others seem to be excited and motivated. However, this excitement and motivation may be due to the activity and a student's personal interest rather than the technology itself.

Finally, the results indicate that teachers could potentially benefit from further professional development in both technical and instructional aspects of technology integration in the classroom. Efforts should be made to study the effect of long-term in-class professional development and its impact on a teachers' ability to successfully transform their classroom into a student-centered, technology-oriented learning environment.

The limitations of this study can be assessed utilizing the four components of trustworthiness described by Letts et al. (2007). Credibility is the first component and is the process of providing a true and accurate description of the phenomenon (Letts et al., 2007). A specific concern related to credibility was the author's participation in conducting the interviews. The author provided some training and support to the teacher participants as part of his regular assigned duties for this school district. The focus of the study was to document how teachers and students perceive the effectiveness of technology integration in the classroom. Many of the questions the participants were asked could have been interpreted as directly related to some of the workshops the author has led in the past, and in which the participants may have attended. Because of this, the participants may not have been completely forthright in their responses to interview questions due to concern of hurting the researcher's feelings.

Transferability is the second component and refers to whether the findings can be transferred to other situations (Letts et al). The researcher attempted to provide detailed descriptions of the survey results, participants' interviews, observations and the document and artifact review. However, it would be difficult to transfer the results of this study to other situations because of the unique technology infrastructure of the district under

study. Without ample technology equipment and expertise and similar staff development models in place, there would be no way to transfer the results of this study to another environment.

Dependability refers to the consistency between the data and the findings, and it is exemplified by providing a clear description of the research methods. The researcher believes that he effectively addressed this category by providing extensive detail of the methods used for this study, including selection of methodology, sampling strategy, and data analysis procedures. This audit trail has been presented and provides the reader with extensive insight into the methods used in this study.

The final component described by Letts et al. is confirmability. This component assesses the extent to which the researcher is able to limit bias (Letts et al., 2007). As a researcher, it was important for me to identify any biases that could influence this research. To control for these potential bias, the researcher took several steps including reviewing the initial list of interview questions with my research advisor and dissertation committee and made changes based on their feedback. Additionally, the researcher took steps to gain trust and confidence from the participants. The third step taken was to work with a partner during the data analysis portion of the study. The researcher felt that working together with someone in a different capacity in the district, with differing views on technology integration, would help to negate the above stated biases. Because we were able to come to a consensus on the categories, this researcher assumes the categories are viable.

In addition to the steps listed above, the entire proposal for this project was reviewed by my dissertation advisor and dissertation committee and changes were made

to the design based on suggestions from the group. Finally, member checks of the findings were conducted throughout open coding and microanalysis of the data.

The purpose of this study was to gain insight into how teachers perceived their ability to integrate technology into the curriculum and how students describe the experience of the technology integration they received. The findings provided significant insight into what this experience was like and also served to provide information that can be used to develop future training and support for the teachers trying to improve their technology integration skills. Because this research focused on a specific district, the results of this study have limited application to other settings. The findings could serve to provide basic awareness of issues that might occur in other educational settings attempting to implement large scale technology efforts in the classroom.

Suggestions for Future Research

This research indicated some disconnect between the teachers' beliefs that technology was inherently motivating and engaging for students and how students actually felt when using technology at school. The researcher would suggest that educators would benefit from placing an emphasis on technology related activities rather than technological tools themselves. Research that identifies these activities and provides instructional guidance may help teachers plan and implement curriculum that would have a positive impact on the learning environment.

Also, teachers may benefit from additional models of training. Currently, the large workshop model is the prevalent method for providing instruction for teachers interested in using technology in their classroom. Additional studies may help to determine if teachers would benefit from an in-class instruction model that focuses on integration

techniques in the context of their own classroom and curriculum. A study that would document and evaluate various professional development models may help school districts plan appropriate training for their teachers, thus increasing the level at which technology is being integrated.

Additionally, this research describes students and teachers using technology in their day-to-day lives. It could be argued that this pervasive use of technology is certainly a cultural phenomenon. During interviews, teachers mentioned that their students would be using technology in the future. In some cases, it appeared teachers might be using technology because they think it is expected and without it, they were doing a disservice to their students. A study that focuses on whether teachers are simply conforming to cultural pressure to use technology in the classroom or whether they truly believe technology in the classroom will actually improve the learning experience would be valuable.

Finally, this research pointed out that the technology usage in schools seems to be linked to a desire to create a motivating and engaging shared experiences for students. For some teachers, they thought simply using technology in the classroom was sufficient to create this environment. This researcher speculates that in the past, this may have been true and that might be why this perception still exists. For example, at one time during this researcher's formal education, the only access to a computer was at school. During that time, the researcher found writing a paper with a word processor or finding information on the Internet to be more engaging and easier than writing on a typewriter.

As technology matured and became more prevalent, the technology use alone was no longer exciting, it simply became one of the tools that this researcher uses to learn. A

study that determines whether technology use in the classroom actually has a real effect on improving engagement and motivation or whether that initial gain is due to the novelty of using technology instead of traditional teaching methods, would help educators determine the most appropriate uses of technology in the classroom.

Implications for Practice

There are several implications for future practice that should be considered. They are, 1) make a concerted effort to give teachers the opportunity to become familiar with technology tools and their potential uses, 2) educators should work collaboratively to design classroom activities that will improve content instruction, 3) clearly define expectations for the teachers' use of technology, 4) develop strategies to utilize tools and activities students already use outside of class.

Becoming familiar with technology tools. Teachers are relying on their own personal experiences and infrequent professional development opportunities to become familiar with technology tools available to them. In order to ensure that all teachers are at least familiar with the tools currently being used in education, teachers should be given the opportunity to share their ideas with their peers. For large districts, like the one in this study, teachers who are effectively using technology in the classroom are a tremendous resource.

The data indicates that teachers are oftentimes left to discover potential uses of technology on their own. A formalized approach that validates quality uses of technology and provides a platform for teachers to share those ideas would be one way to increase the teachers' understanding of how they could use technology to improve instruction.

Collaborative curriculum design. The literature and data indicates that there are strong relationships between content knowledge, technology literacy, and understanding how to combine those two aspects of technology integration to create a quality learning experience. It would seem that if content experts worked closely with technology experts, the two could leverage the expertise of one another and create a curriculum that identifies the best approaches for using technology in a particular content area.

A well thought out curriculum that purposefully and explicitly explains how to use technology to teach specific concepts may encourage teachers to explore new technologies and expand teaching strategies. If teachers understand and trust that the lessons have been specifically designed to help them teach their content area, they may be willing to take more risks when trying to improve their technology integration skills.

Clearly define expectations. Many educators believe that unless technology is being used at a high level in the classroom, there are less expensive ways for teachers to present content and for students to demonstrate knowledge. However, when talking with students and teachers, it was clear that they valued the use of technology in the classroom. Most of the teachers thought that using Google Docs to write papers and using Google Classroom to share materials with their students were completely appropriate ways to utilize the technology available to them**.**

If the expectation is for teachers to use technology at a high level, there needs to be a commitment by administrators to clearly define expectations of technology use and provide appropriate professional development to move teachers closer to high level technology integration. This researcher would suggest a thorough examination of how technology is currently being used in order to determine if the benefits gained with that

type of usage suffice. If it is determined that lower level uses of technology like building community, assessing learning, and providing easy access to materials are quality uses of technology, then staff development efforts should focus on making sure all teachers have those basic technology skills. If it is decided that technology could be more beneficial if used at a higher level, it is imperative to improve the staff development opportunities to include higher level uses of technology.

Utilize tools students are already using. The data suggests that students utilize technology tools outside of school on a regular basis. It appears they are participating in games and social media with their peers. Their interactions are mainly social in nature and would not be considered academic uses of technology. However, as research indicates, games and other tools that students are currently using could potentially be used to create exciting and motivating learning experiences for students.

If teachers are able to utilize games and other social media platforms to teach real-life concepts, educators may see several benefits. In many cases, the time teachers spend teaching students to navigate the software will be reduced. Because students will be familiar with the technology itself, it is feasible that very little time will need to be spent on this aspect. Teachers would be able to quickly move into lesson objectives and how the technology is going to help the students learn, instead of taking preparation time to explain how to use software that is unfamiliar to the students.

Also, many of the technology tools that students are using outside of school are well designed, tested and work consistently without errors. The fact that the software is well vetted, tested, and many teachers are also familiar with the technology, may reduce

the technical difficulties and raise the teachers' comfort level when trying to use technology in the classroom.

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Appendix A – Interview Protocols

Teacher interview

1. How do you use technology on a day to day basis in all spheres of life (inside and outside of the classroom)?
2. Tell me about how you use technology in the classroom specifically?
3. Talk to me about the staff development you've received concerning technology integration?
4. If you could add to or change the professional development you have already received, what kind of changes would you make?
5. How does technology help your teaching
6. How does technology hinder your teaching?
7. How does technology help students learn?
8. How does technology hinder students learning?
9. What lets you know that technology is helping students learn?
10. What happens if a student does not like to use or is resistant to technology?
11. Is there anything else you'd like to share with me about the role of technology in your classroom?

Student Interview

1. Tell me about how you use technology when you're at school.
2. Tell me about how you use technology in all aspects of your day-to-day life both in and outside of school.
3. How do you use computers and other technologies to learn at school?
4. Tell me how you use technology to learn when you're not at school.
5. Tell me about how your teacher uses technology when he/she teaches.
6. Tell me how you feel when you are using technology at school.
7. Tell me how you feel when you are using technology outside of school.
8. If you could change the way technology was being used in schools, what would you do?
9. Is there anything else you'd like to share with me about how you use technology at school?

Appendix B - Transcription Rules

- Transcriptions should include the following information:
- All transcripts will be transcribed word for word.
- All transcripts will include line numbers, which will make it easier for the researcher to organize and reference specific aspects of the interview.
- The interviewees name will not be indicated on the transcript; instead, an alias should be used. The duration of the interview should be noted at the end of the document.
- The following symbols should be used to indicate specific aspects of the interview.

Symbols to be used in transcriptions

- ( ) - brackets indicates transcriber's observations and notes
- [word TIME] - if the interviewees statement is inaudible, it should be indicated in brackets. The time on the recording should also be recorded. If you think you may know what the word is, include the possible word
- NOTE – Any statement that may be used as a direct quote should be highlighted in yellow.

… indicates a pause in the interviewee's statement.

Appendix C – Informed Consent for Child Participation - Interviews

Department of Educator Preparation, Innovation, and Research

One University Blvd.
St. Louis, Missouri 63121-4499
Telephone: 314-516-4802

Informed Consent for Child Participation in Research Activities

MIDDLE SCHOOL STUDENT AND TEACHER PERCEPTIONS ABOUT THE EFFECTIVENESS OF TECHNOLOGY INTEGRATION IN THE CLASSROOM

Participant _____ HSC Approval Number _____

Principal Investigator __David Irby_____ PI's Phone Number ___314-882-7630_____

---

1. Your child is invited to participate in a research study conducted by David R. Irby, under the supervision of Carl Hoagland, PhD (Faculty advisor). The purpose of this research is to gain a better understanding of how teachers and students feel about the effectiveness of using computers in the classroom to teach and learn.

2. Your child's participation will involve an interview with the researcher.

   Interviews

   Interviews will take place during normal school hours. The interviews will take place in the child's classroom or designated area. The interview will be limited to questions concerning how your child feels about the technology integration taking place in their classroom and how they use technology in their day-to-day lives. Interviews will be limited to 40 minutes and students will be told they have the option of stopping the interviews at any time. The audio of the interviews will be recorded on a digital audio recorder and transcribed at a later date for data analysis. All of the interview data will be analyzed in an effort to gain a better understanding of how your child feels about the technology integration taking place in his/her school. If any portion of the interview is used in the research paper, an alias will be used in order to maintain your child's confidentiality. All interview data will be stored in a secure place and destroyed at the conclusion of the study.

   The interview will last approximately 40 minutes.

3. It is possible that your child might feel uncomfortable when answering some of the questions. Your child has the right to stop the interview at any time if they no longer wish to participate. Your child will not be penalized in any way for stopping the interview. Additionally, your child's loss of confidentiality is a risk. This could happen if someone familiar with a student's work or study habits read the final report and were able to ascertain who they are based on this information. To reduce the risk of loss of confidentiality, aliases will be used throughout the report and all data related to the study will be destroyed at the completion of the study.
4. There are no direct benefits for your child's participation in this study. However, your child's participation will contribute to the knowledge about how teachers and students use technology in the classroom and may help educators better use technology for teaching and learning.
5. Your child's participation is voluntary and you may choose not to let your child participate in this research study or to withdraw your consent for your child's participation at any time. Your child may choose not to answer any questions that he or she does not want to answer. You and your child will NOT be penalized in any way should you choose not to let your child participate or to withdraw your child.
6. We will do everything we can to protect your child's privacy. By agreeing to let your child participate, you understand and agree that your child's data may be shared with other researchers and educators in the form of presentations and/or publications. In all cases, your child's identity will not be revealed. In rare instances, a researcher's study must undergo an audit or program evaluation by an oversight agency (such as the Office for Human Research Protection). That agency would be required to maintain the confidentiality of your child's data.
7. If you have any questions or concerns regarding this study, or if any problems arise, you may call the Investigator, David Irby at 314-882-7630 or the Faculty Advisor, Carl Hoagland at 314-516-4802. You may also ask questions or state concerns regarding your child's rights as a research participant to the Office of Research Administration, at 516-5897.

I have read this consent form and have been given the opportunity to ask questions. I will also be given a copy of this consent form for my records. I consent to my child's participation in the research described above.

Parent's/Guardian's Signature	Date	Parent's/Guardian's Printed Name
Child's Printed Name		

Signature of Investigator or Designee Date Investigator/Designee Printed Name

Appendix D – Informed Consent for Child Participation – Observations and Document/Artifact Review

Department of Educator Preparation, Innovation, and Research

One University Blvd.
St. Louis, Missouri 63121-4499
Telephone: 314-516-4802

Informed Consent for Child Participation in Research Activities

MIDDLE SCHOOL STUDENT AND TEACHER PERCEPTIONS ABOUT THE EFFECTIVENESS OF TECHNOLOGY INTEGRATION IN THE CLASSROOM

Participant _____ HSC Approval Number _____

Principal Investigator ___David Irby__ PI's Phone Number _314-882-7630_____

1. Your child is invited to participate in a research study conducted by David R. Irby, under the supervision of Carl Hoagland, PhD (Faculty advisor). The purpose of this research is to gain a better understanding of how teachers and students feel about the effectiveness of using computers in the classroom to teach and learn.

2. Your child's participation will involve a classroom observation and a review of classroom documents and artifacts.

   Classroom Observation

   The classroom observation will take place during regular school hours. The researcher will be observing a lesson looking for student and teacher interaction with technology in the classroom. During the observation, the researcher will be recording notes about what is taking place. These notes will document what is happening in a technology rich classroom environment. The researcher may have a casual conversation with your child during the observation. These conversations would be limited to general questions and comments concerning the activities taking place in

the classroom. All classroom observation data will be stored in a secure place and destroyed at the conclusion of the study.

Document and Artifact Collection and Review

Documents in the classroom (student work, classroom/course grades, etc.) will be reviewed for any information that may be helpful in answering the research questions for this study. The documents will be photographed, labeled and emailed to the researcher for analysis at a later date. If any documents are used in the dissertation, student and teacher names will be redacted. All documents will be stored in a secure place and destroyed at the conclusion of the study. Sent emails will be deleted immediately after artifacts have been stored in a secure location.

Approximately 140 students may be involved in the observation portion of this research.

Your child would be observed in the classroom environment for approximately 50 minutes.

3. The risks to your child are very minimal. However, your child's loss of confidentiality is a risk. This could happen if someone familiar with a student's work or study habits read the final report and were able to ascertain who they are based on this information. To reduce the risk of loss of confidentiality, students names will be redacted on all documents included in the dissertation, aliases will be used throughout the report and all data related to the study will be destroyed at the completion of the study.
4. There are no direct benefits for your child's participation in this study. However, your child's participation will contribute to the knowledge about how teachers and students use technology in the classroom and may help educators better use technology for teaching and learning.
5. Your child's participation is voluntary and you may choose not to let your child participate in this research study or to withdraw your consent for your child's participation at any time. You and your child will NOT be penalized in any way should you choose not to let your child participate or to withdraw your child. To officially withdrawal your student from this study, please sign the form below and return it to the classroom teacher or principal investigator. If I do not receive a signed form, it is assumed that you do not object to your child's participation in the study described above.
6. We will do everything we can to protect your child's privacy. By agreeing to let your child participate, you understand and agree that your child's data may be shared with other researchers and educators in the form of presentations and/or publications. In all cases, your child's identity will not be revealed. In rare instances, a researcher's study must undergo an audit or program evaluation by an oversight agency (such as the Office for Human Research Protection). That agency would be required to maintain the confidentiality of your child's data.

7. If you have any questions or concerns regarding this study, or if any problems arise, you may call the Investigator, David Irby at 314-882-7630 or the Faculty Advisor, Carl Hoagland at 314-516-4802. You may also ask questions or state concerns regarding your child's rights as a research participant to the Office of Research Administration, at 516-5897.

   I have read this consent form and have been given the opportunity to ask questions. If I withdrawal my child from this study, I will also be given a copy of this consent form for my records. <u>By signing this form, I am indicating that I do not consent</u> to my child's participation in the research described above.

Parent's/Guardian's Signature	Date	Parent's/Guardian's Printed Name
Child's Printed Name		
Signature of Investigator or Designee	Date	Investigator/Designee Printed Name

Appendix E – Assent to Participate in Research Activities

Department of Educator Preparation, Innovation, and Research

One University Blvd.
St. Louis, Missouri 63121-4499
Telephone: 314-516-4802

Assent to Participate in Research Activities (Minors)
Middle School Student and Teacher Perceptions about the Effectiveness of Technology Integration in the Classroom

1. My name is David Irby.

2. I am asking you to take part in a research study because we are trying to learn more about how teachers are using technology to teach and how students feel about the instructions taking place when using technology in the classroom.

3. If you agree to be in this study you will be observed in your classroom during normal classroom hours. I will be observing how your teacher and the students in your class use technology to teach and learn. I will be recording all of the interactions I see and how your classroom looks using field notes. Field notes are detailed notes that I will record during or after the observation. These notes will detail what I see when observing your classroom. Specifically, I am interested in observing how you are using technology to learn. I will keep these notes in a secure place and they will be destroyed at the completion of the study.

   In addition to field notes, I will be collecting some artifacts during my observation. **Artifacts include student work, class/assignment grades, and other classroom documents.** Artifacts will be captured using a digital camera. All artifact photographs will be emailed and stored in a secure place. Once in a secure location, the photos will be removed from the camera and deleted from the sent email. I will store the artifacts in a secure location until the completion of the study. At that time, the photographs will be destroyed.

   You may also be asked to participate in a short interview that will take no more than 40 minutes. All of the interviews will be recorded using a digital audio recorder. The interviews will be transcribed and analyzed by the researcher. I will keep these transcriptions of our interview in a secure location until the completion of the study. After the completion of the study, the interview data will be destroyed. If you are selected to take part in an interview, your interview would take place at a time and location designated by your classroom teacher.

4. It is possible that you might feel uncomfortable when answering some of the interview questions. If you do, please feel free to stop me and we will stop that question and move on. We will stop the entire interview if at any time you feel as though you no longer wish to participate. There is no penalty or consequence for deciding to end the interview early.

   Additionally, loss of confidentiality is a risk. To reduce the risk of loss of confidentiality, all student names will be removed on all documents included in the dissertation, aliases will be used throughout the report and all data related to the study will be destroyed at the completion of the study.

5. You will not get any direct benefits from being in this study but you might enjoy it and your participation may influence the way computers are used in the future to teach and learn.

6. If you don't want to be in this study, you don't have to participate. Remember, being in this study is up to you, and no one will be upset if you don't want to participate or if you change your mind later and want to stop. If you change your mind, please tell me.

7. You can ask any questions that you have about the study. If you have a question later that you didn't think of now, you can call me at 314-882-7630.

8. Signing your name at the bottom means that you agree to be in this study. You will be given a copy of this form after you have signed it.

_____
_____

Participant's Signature Date Participant's Printed Name

_____ _____

Participant's Age Grade in School

Appendix F – Informed Consent for Participation – Teacher Survey

Department of Educator Preparation, Innovation, and Research

One University Blvd.
St. Louis, Missouri 63121-4499
Telephone: 314-516-4802

Informed Consent for Participation in Research Activities
MIDDLE SCHOOL STUDENT AND TEACHER PERCEPTIONS ABOUT THE EFFECTIVENESS OF TECHNOLOGY INTEGRATION IN THE CLASSROOM

Participant _[participantsName]_____

HSC Approval Number _[hscApprovalNumber]__

Principal Investigator _David Irby_____

PI's Phone Number _314-882-7630_____

Hello [participantsName],

1. You are invited to participate in a research study conducted by David Irby under the supervision of Carl Hoagland PhD. The purpose of this research is to gain a better understanding of how students and teachers perceive the effectiveness of computer integration in their classroom.

2. a) Your participation will involve the following:
   - **Survey –** You will be asked to complete an online survey. The purpose of this survey is to help the researcher gain a better understanding of how classroom teachers use technology in their classroom.

     Request for Volunteers - There is a second phase to this study that involves a classroom observation and personal interview. **The researcher would like to encourage you to take the survey even if you do not plan on participating in the second phase of the study.** You will be given the opportunity to volunteer for the second phase of this study at the end of the survey.

Approximately 309 teachers will be surveyed across 5 middle schools.

b) Expect to spend approximately 15-20 minutes taking the survey.

In total, teachers that participate in this portion of the study will spend approximately 15-20 minutes participating in this portion of the study.

There is a slight risk that your confidentiality could be compromised if you participate in this study. To minimize this risk, an alias will be used anytime you are mentioned in the final dissertation, all data for the project will be destroyed after completion of the study and all data will be stored in a secure location during the study.

4. There are no direct benefits for you participating in this study. However, your participation will contribute to the knowledge about technology integration in the classroom and may help educators make more informed decisions about how technology will be used in the future.
5. Your participation is voluntary and you may choose not to participate in this research study or to withdraw your consent at any time. You may choose not to answer any questions that you do not want to answer. You will NOT be penalized in any way should you choose not to participate or to withdraw.
6. By agreeing to participate, you understand and agree that your data may be shared with other researchers and educators in the form of presentations and/or publications. In all cases, your identity will not be revealed. In rare instances, a researcher's study must undergo an audit or program evaluation by an oversight agency (such as the Office for Human Research Protection). That agency would be required to maintain the confidentiality of your data. In addition, all data will be stored on a password-protected computer and/or in a locked office.
7. If you have any questions or concerns regarding this study, or if any problems arise, you may call the Investigator, David Irby at (314)-882-7630 or the Faculty Advisor, Carl Hoagland at (314) 516-4802. You may also ask questions or state concerns regarding your rights as a research participant to the Office of Research Administration, at 516-5897.

☐ **I have read this consent form and understand that I have the opportunity to call the researcher to ask questions. I will also be given a copy of this consent form for my records. By checking this box, I consent to my participation in the research described above.**

Appendix G – Informed Consent for Participation – Teacher Observations, Interviews, and Document Review

Department of Educator Preparation, Innovation, and Research

One University Blvd.
St. Louis, Missouri 63121-4499
Telephone: 314-516-4802

Informed Consent for Participation in Research Activities
MIDDLE SCHOOL STUDENT AND TEACHER PERCEPTIONS ABOUT THE EFFECTIVENESS OF TECHNOLOGY INTEGRATION IN THE CLASSROOM

Participant _____ HSC Approval Number _____

Principal Investigator ___David Irby_____ PI's Phone Number ___314-882-7630_____

---

1. You are invited to participate in a research study conducted by David Irby/Carl Hoagland. The purpose of this research is to gain a better understanding of how students and teachers perceive the effectiveness of computer integration in their classroom.

2. a) Your participation will involve the following:
   - **Classroom Observations -** The researcher will observe the classroom interaction of the teacher and students. Observations will be scheduled during normal classroom hours.
   - **Personal Interview** - You may be selected to participate in a personal interview with the researcher. The interview would take place in the classroom or other designated area. Interviews will last approximately 20 minutes and the questions will address how teachers feel about the effectiveness of the technology integration happening in the classroom.
   - **Document reviews** – You may be asked to share your lesson plans or other materials that you use to organize and plan your lessons.

Approximately 309 teachers will be surveyed across 5 middle schools. The last question of the survey will ask the teachers if they would like to continue to participate in the study. Of those teachers that volunteer to continue, 4 will be selected to participate in the classroom observations and personal interviews.

b) Teachers that volunteers to remain in the study and are selected to be observed and interviewed, will be observed for approximately 50 minutes. The teachers will also participate in a 40 minute personal interview.

In total, teachers that participate fully in the study will spend approximately 110 minutes participating in the study (15-20 minutes on the survey, 50 minutes of classroom observation and a 40 minute interview).

4. It is possible that you might feel bad when answering some of the questions. If you do, please feel free to stop me and we will stop that question and move on. We will stop the entire interview if at any time you feel as though you no longer wish to participate. There is no penalty or consequence if you wish to stop the interview.

   Additionally, your confidentiality could be compromised. To minimize this risk, an alias will be used anytime you are mentioned in the final dissertation, all data for the project will be destroyed after completion of the study and all data will be stored in a secure location during the study.

4. There are no direct benefits for you participating in this study. However, your participation will contribute to the knowledge about technology integration in the classroom and may help educators make more informed decisions about how technology will be used in the future.
5. Your participation is voluntary and you may choose not to participate in this research study or to withdraw your consent at any time. You may choose not to answer any questions that you do not want to answer. You will NOT be penalized in any way should you choose not to participate or to withdraw.

6. By agreeing to participate, you understand and agree that your data may be shared with other researchers and educators in the form of presentations and/or publications. In all cases, your identity will not be revealed. In rare instances, a researcher's study must undergo an audit or program evaluation by an oversight agency (such as the Office for Human Research Protection). That agency would be required to maintain the confidentiality of your data. In addition, all data will be stored on a password-protected computer and/or in a locked office.

7. If you have any questions or concerns regarding this study, or if any problems arise, you may call the Investigator, David Irby at (314)-882-7630 or the Faculty Advisor, Carl Hoagland at (314) 516-4802. You may also ask questions or state concerns regarding your rights as a research participant to the Office of Research Administration, at 516-5897.

I have read this consent form and have been given the opportunity to ask questions. I will also be given a copy of this consent form for my records. I consent to my participation in the research described above.

Participant's Signature	Date	Participant's Printed Name
Signature of Investigator or Designee	Date	Investigator/Designee Printed Name

Appendix H – Approval Letter, Loti Survey

LoTi Connection, Inc.
PO Box 130037 Carlsbad, CA 92013-0037
(V) 760-431-2232 (F) 760-946-7605
www.loticonnection.com

September 4th, 2015

Permission for Use of the LoTi Framework

To: University of Missouri
Dissertation Review Boards

Please accept this letter as notification that David Irby is hereby granted permission to utilize the LoTi Framework and corresponding Digital-Age Survey to collect data for his doctoral dissertation study. David is permitted to use the Digital-Age Survey and the LoTi Framework for purposes of the study only. In addition, David has permission to review all available LoTI Digital-Age results on the individuals taking place in his study.

The guidelines for using LoTi Connection copyrighted material as part of this dissertation study are as follows:

1. Permission to reprint the LoTi Framework is granted provided that the content remains unchanged and that attribution is given to LoTi Connection.
2. Permission to reprint selected results including graphs and tables in the Appendices of the study is granted provided that the content remains unchanged and that attribution is given to LoTi Connection.
3. Permission to reprint selected questions from the Digital-Age Survey in the Appendices of the study is granted provided that the content remains unchanged and that attribution is given to LoTi Connection.
4. LoTi Connection holds the right to restrict usage of any intellectual property if LoTi Connection finds that the content is being used in an inappropriate manner.

Sincerely,

Dennee Saunders
Assistant Executive Director

Date 09/04/2015

Page 1

LoTi® Digital-Age Survey for Teachers

LoTi

Version 2.0

Page 2

LoTi Digital-Age Survey for Teachers

Using the LoTi Digital-Age Survey for professional development planning is part of an ongoing nationwide effort to sharpen educator skillsets as defined by the Partnership for 21st Century Skills. Individual information will remain anonymous, while the aggregate information will provide various comparisons for your school, school district, regional service agency, and/or state. Please fill out as much of the information as possible.

The LoTi Digital-Age Survey takes about 20-25 minutes to complete. The purpose of this questionnaire is to determine your current professional development priorities related to technology and instruction based on your current position (;i.e., pre-service teacher, inservice teacher, building administrator, instructional specialist, media specialist, higher education faculty).

Completing the questionnaire will enable your educational institution to make better choices regarding staff development and future technology purchases. The questionnaire statements were developed from typical responses of educators who ranged from non-users to sophisticated users of technology in the classroom. Survey statements will represent different uses of technology that you currently experience or support, in varying degrees of frequency, and should be recorded appropriately on the scale.

Please respond to the statements in terms of your present uses or support of technology in the classroom. Use the scale to determine your response based on how frequently you experience the activities described in the statement.

Teacher Computer Use (TCU):
How often are you (the teacher) using digital tools during the instructional day?

- 0 ☐ *Never*
- 1 ☐ *At least once a year*
- 2 ☐ *At least once a month*
- 3 ☐ *At least once a week*
- 4 ☐ *At least once a day*
- 5 ☐ *Multiple times each day*

Student Computer Use (SCU):
How often are your students using digital tools during the instructional day?

- 0 ☐ *Never*
- 1 ☐ *At least once a year*
- 2 ☐ *At least once a month*
- 3 ☐ *At least once a week*
- 4 ☐ *At least once a day*
- 5 ☐ *Multiple times each day*

Page 3

LoTi Digital-Age Survey for Teachers

0 Never

1 At least once a year

2 At least once a semester

3 At least once a month

4 A few times a month

5 At least once a week

6 A few times a week

7 At least once a day

Q1: My students use digital tools and/or enriched resources in my classroom to engage in learning activities that require them to analyze information, think creatively, make predictions, and/or draw conclusions.

Q4: My students use digital tools to create web-based or multimedia presentations (e.g., Prezi, PowerPoint) that showcase information gathered on topics that I assign in class.

Q5: My students participate in web-based projects that emphasize complex thinking strategies (e.g., problem-solving, decision-making, experimental inquiry) aligned to the content standards.

Q6: I provide multiple and varied formative and summative assessment opportunities that encourage students to "showcase" their content understanding in nontraditional ways.

Q8: My students use digital tools and/or enriched resources to explore multiple solutions to teacher-directed problems that require creative and innovative thinking.

Q10: My students identify important real world issues (e.g., environmental pollution, elections, health awareness), then use collaborative digital tools and enriched resources within and beyond the school building (e.g., partnerships with business professionals, community action groups) to solve them.

Q12: I promote, monitor, and model the ethical use of digital information and technology in my classroom (e.g., appropriate citing of resources, respecting copyright permissions).

Q13: I use digital tools to communicate and collaborate with students, parents, and peers.

Q14: My students propose innovative ways to use our school's advanced digital tools (e.g., 1:1 mobile devices, digital media authoring tools, probeware with GPS systems) and enriched resources (e.g.,ready access to outside experts) to address challenges/issues affecting their local and global communities.

Q15: I model and facilitate the effective use of current and emerging digital tools to support teaching and learning in my classroom.

Q16: I use digital tools to enhance my lectures or presentations (e.g., multimedia presentations) so that students can better understand the content that I teach.

Q17: I alone use the digital tools due to the amount of content that I have to cover in my classroom by the end of each marking period.

Q18: I use a variety of digital tools that support the evolving nature of my grade level content and elevate student success and innovation in my classroom.

Q19: My students are well versed in current and emerging technologies and readily self-select the most appropriate tool or resource to aid them in completing any given task.

Q20: I employ learner-centered strategies (e.g., communities of inquiry, learning contracts) to address the diverse needs of all students using developmentally-appropriate digital tools or enriched resources.

Q21: My students participate in collaborative projects involving face-to-face and/or virtual environments with students of other cultures that address current problems, issues, and/or themes.

Q22: My students use digital tools and enriched resources for (1) collaboration with others beyond the classroom, (2) publishing, (3) communication, and (4) research to solve issues and problems of personal interest that address specific content standards.

Q23: I model for my students the safe and legal use of digital tools while I am delivering content and/or reinforcing their understanding of pertinent concepts.

Page 4

LoTi Digital-Age Survey for Teachers

0 Never

1 At least once a year

2 At least once a semester

3 At least once a month

4 A few times a month

5 At least once a week

6 A few times a week

7 At least once a day

Q25: My students model the "correct and careful" (e.g., ethical usage, proper digital etiquette, protecting their personal information) use of digital resources and are aware of the consequences regarding their misuse.

Q26: I participate in local and global learning communities to explore creative applications of technology to improve student learning.

Q27: My students use digital tools to solve "real-world" problems or issues of importance to them related to the content standards.

Q30: My students engage in standards-based instructional units and related learning experiences that emphasize innovative thinking, student use of digital tools, and applied learning to the real world.

Q31: I seek outside help with designing student-centered performance assessments using the available digital tools that involve students transferring what they have learned to a real world context.

Q32: My students' questions, interests, and readiness levels directly impact how I design learning activities that address the content standards.

Q36: My students use the classroom digital tools to engage in relevant, challenging, self-directed learning experiences that address the content standards.

Q37: My students complete web-based projects that emphasize high level cognitive skills (e.g., analyzing, evaluating, creating).

Q38: My students use digital tools or enriched resources to supplement their content understanding or to improve their basic math and literacy skills.

Q40: My students use digital tools or enriched resources for research purposes (e.g., data collection, questionnaires, Internet research) that require them to investigate a teacher-directed issue/problem, take a position, make decisions, and/or seek out a solution.

Q41: My students collaborate with me in setting both group and individual academic goals that provide opportunities for them to direct their own learning aligned to the content standards.

Q42: I promote global awareness in my classroom by providing students with digital opportunities to collaborate with others of various cultures.

Q43: My students apply their classroom content learning to real-world problems within the local or global community using the digital tools at our disposal.

Q45: My students use classroom digital tools (e.g., interactive whiteboard, digital student response system) or enriched resources (e.g., manipulatives, graphic organizers, dioramas) to supplement the curriculum and reinforce specific content standards.

Q46: My students use digital tools for higher-order thinking (e.g., analyzing, evaluating, creating) and personal inquiry related to problem-based learning experiences.

Q47: My students use all forms of the most advanced digital tools and resources to pursue collaborative problem-solving opportunities surrounding issues of personal and/or social importance.

Q48: I model and advocate for the use of assistive technologies that are available to meet the diverse demands of special needs students.

Q49: I promote the effective use of digital tools on my campus and within my professional community and actively develop the technology skills of others.

Q50: I consider how my students will apply what they have learned in class to the world they live when planning instruction and assessment strategies.

Appendix I – Complete definitions of Loti, CPU, PCU Levels

Descriptions of LoTi levels.

LoTi level descriptions

LoTi Level	**Description**
Level 0 – Non-use	Instructional focus may vary; digital tools and resources are not used during the instructional day
Level 1 – Awareness	Instructional focus emphasizes information dissemination; teachers use digital tools and resources for classroom management tasks or instructional presentations
Level 2 – Exploration	Instructional focus emphasizes content understanding; students use digital tools and resources for classroom management tasks or instructional purposes
Level 3 – Infusion	Instructional focus emphasizes engaged higher order learning; students use digital tools and resources to solve teacher-directed problems related to the content under investigation
Level 4a - Integration	Instructional focus emphasized student-directed exploration of real-world issues; students use digital tools and resources to answer self-generated questions that dictate the content, process, and product. Level 4a teachers experience classroom management or climate issues that restrict full-scale integration
Level 4b - Integration (Routine)	Instructional focus emphasizes student-directed exploration of real-world issues; students use digital tools and resources to answer self-generated questions that dictate the content, process and product Level 4b teachers facilitate full-scale inquiry-based teaching regularly with minimal implementation issues.
Level 5 - Expansion	Instructional focus emphasizes global student collaboration to solve world issues; students use digital tools and resources for authentic problem-solving opportunities beyond the classroom.
Level 6 - Refinement	Instructional focus is entirely learner-based; students experience seamless integration of digital tools and resources for their self-directed problem and issues resolution.

Descriptions of CIP levels.

CIP level descriptions

CIP Level	**Description**
CIP Intensity Level 0	No formal classroom setting.
CIP Intensity Level 1	Instructional practices align exclusively with a subject-matter based approach to teaching and learning; teaching strategies lean toward lectures and/or teacher-led presentations
CIP Intensity Level 2	Instructional practices still consistent with a subject-matter based approach to teaching and learning; emphasis on didactic instruction and teacher-generated questions.
CIP Intensity Level 3	Instructional practices align somewhat with a subject-matter based approach to teaching and learning with limited options given to students for their final products.
CIP Intensity Level 4	Instructional practices align with a subject-matter based approach to teaching and learning, but students are given expanded options with the content, process, and/or products.
CIP Intensity Level 5	Instructional practices lean toward a learner-based approach; teaching strategies and assessments used for learning are diversified and driven by student questions.
CIP Intensity Level 6	Instructional practices consistent with a learner based approach; student inquiry and self-directed problem solving influence the content and context of instruction.
CIP Intensity Level 7	Instructional practices align exclusively with learner-based approach; students to teaching and learning; students establish personal goals and monitor their own pace and progress with purposeful learning space.

Descriptions of PCU levels.

PCU level descriptions

PCU Level	**Description**
PCU Intensity Level 0	No inclination or skill level to use digital tools and resources for either personal or professional use.
PCU Intensity Level 1	Little fluency with using digital tools and resources for student learning; may have a general awareness of various digital tools and media but is not using them.
PCU Intensity Level 2	Little to moderate fluency with using digital tools and resources for student learning; does not feel comfortable using digital tools/resources beyond classroom management.
PCU Intensity Level 3	Moderate fluency with using digital tools and resources for student learning; may begin to become "regular" user of selected digital=age media and formats
PCU Intensity Level 4	This is a transition level. Teachers exhibit moderate to high fluency with using digital tools and resources for student learning; commonly uses a broader range of digital-age media and formats in support of curriculum
PCU Intensity Level 5	High fluency level with using digital tools and resources for student learning; commonly able to expand range of emerging digital-age media and formats in support of curriculum.
PCU Intensity Level 6	High to extremely high fluency level with using digital tools and resources for student learning; sophisticated in the use of most existing and emerging digital-age media or format.
PCU Intensity Level 7	Extremely high fluency level with using digital tools and resources for student learning; sophisticated in the use of any existing and emerging digital-age media or format.

Appendix J – Documents and Artifacts

Example Report from Automated Assessment System

Common Assessment
Single Test - Student Report

School Year: 2017
School: [redacted]
Assessment: Grade 1 Math Unit 1 Pre Addition and Subtraction

Student Name: [redacted]			Student Number: [redacted]			
Assessment: **Grade 1 Math Unit 1 Pre Addition and Subtraction**			**Examiner:** **Emily Lemonds**			**Assessment Date:** **08/10/2016**
Item Number	**GLE**	**Content Competency**	**DOK**	**QT**	**Score**	**Max Points**
1	NULL	Use addition and subtraction within 20 to solve word problems involving situations of adding to, taking from, putting together, taking apart, and comparing, with unknowns in all positions, e.g., by using objects, drawings, and equations with a symbol for the unknown number to represent the problem (How many models does John have in all?)	1	SR	0	1
2	NULL	Use addition and subtraction within 20 to solve word problems involving situations of adding to, taking from, putting together, taking apart, and comparing, with unknowns in all positions, e.g., by using objects, drawings, and equations with a symbol for the unknown number to represent the problem (Which number sentence tells how many more toy penguins than tops?)	1	SR	0	1
3	NULL	Use addition and subtraction within 20 to solve word problems involving situations of adding to, taking from, putting together, taking apart, and comparing, with unknowns in all positions, e.g., by using objects, drawings, and equations with a symbol for the unknown number to represent the problem (How many strawberries are there in all?)	1	SR	0	1
4	NULL	Understand subtraction as an unknown-addend problem. (Which addition sentence helps you solve 4 â€“ 1 = ___?)	1	SR	0	1
5	NULL	Understand subtraction as an unknown-addend problem. (11 children were eating lunch. 7 children finished lunch and went out for recess. How many children are still eating lunch? Think addition to help you subtract. Find the missing part.)	1	SR	0	1
6	NULL	Add and subtract within 20, demonstrating fluency for addition and subtraction within 10. (Choose the ten fact that helps you solve the problem. 8 + 3 = ___)	1	SR	0	1
7	NULL	Add and subtract within 20, demonstrating fluency for addition and subtraction within 10. (Which has the same answer as 15 â€“ 7 ?)	1	SR	0	1
8	NULL	Understand subtraction as an unknown-addend problem. (What fact is missing from this fact family?)	1	SR	0	1
9	NULL	Understand subtraction as an unknown-addend problem. (Which is the missing number?)	1	SR	0	1

Professional Development Course Guide

Course Guide

Course Number: ELEM-DD-17-21
Course Name: Conferring in the Reading Workshop
Dates: Nov 8, 2016 1 00 PM
[redacted]
Description: During this session, we will look at various conferring resources that will provide structures to help support us in refining and sharpening our conferring skills. Come spend some time learning through readings and short video clips and then planning on how to incorporate your learning into your practice during your Reading Workshop.

Course Number: COMM-DIYVIDEO-10-6A
Course Name: DIY VIDEO
Dates: Oct 6, 2016 3 00 PM
[redacted]
Description: We know that video content is king. Now learn how to do-it-yourself! Find out tips, tricks and get hands-on training to help you capture the amazing moments that happen at your school with only your smartphone!

Course Number: COMM-DIYVIDEO-COMM10-13A
Course Name: DIY VIDEO
Dates: Oct 13, 2016 3 00 PM
[redacted]
Description: We know that video content is king. Now learn how to do-it-yourself! Find out tips, tricks and get hands-on training to help you capture the amazing moments that happen at your school with only your smartphone!

Course Number: ELEM-DD-17-30
Course Name: Differentiating For Readers
Dates: Nov 8, 2016 1 00 PM
[redacted]MENTARY
Description: Do you ever find yourself wondering how to differentiate your reading workshop to reach all learners? You might teach a minilesson and think, "Now what?" This session will help you make the most of the data you have in order to maximize the work time in your reader's workshop. We will consider how to plan for small groups and conferences and discuss ways to help students take ownership of their learning by helping them set personal reading goals. We will use Jennifer Serravallo's book, The Reading Strategies Book, along with other professional resources to help identify strategies to teach specific students and groups. This session will be differentiated for K-5 teachers.

Course Number: ELEM-DD-17-32
Course Name: ELEM - "Power Up" your Reading and Writing Teaching with Technology
Dates: Nov 8, 2016 1 00 PM
[redacted]
Description: We have all this technology, now what?!?! This session will be focused on ways to "power up" your use of technology in reading and writing workshops. The session will begin with learning about the SAMR model for technology integration. The Substitution Augmentation Modification Redefinition model offers various methods of seeing how technology might impact teaching and learning. After learning about the SAMR model there will be time to collaborate with one another and plan opportunities in reading and writing workshop where students will be able to use technology to create, communicate, collaborate and think critically. This session will differentiate for primary and intermediate teachers.

Course Number: ELEM-DD-17-03
Course Name: ELEM - 1st Unpacking
Dates: Nov 8, 2016 1 00 PM
[redacted]
Description: Teachers bring their next Parkway unit and with guidance of a math facilitator have time to unpack the unit and learn how enVisionMath 2.0 can support the learning activities of Stage 3. Teachers will have the opportunity to be in a room with grade-level alike collegues.

Course Number: ELEM-DD-17-04
Course Name: ELEM - 2nd Unpacking
Dates: Nov 8, 2016 1 00 PM
[redacted]ADAMS
[redacted]ENTARY
Description: Teachers bring their next Parkway unit and with guidance of a math facilitator have time to unpack the unit and learn how enVisionMath 2.0 can support the learning activities of Stage 3. Teachers will have the opportunity to be in a room with grade-level alike collegues.

Course Number: ELEM-DD-17-05
Course Name: ELEM - 3rd Unpacking
Dates: Nov 8, 2016 1 00 PM
[redacted]
Description: Teachers bring their next Parkway unit and with guidance of a math facilitator have time to unpack the unit and learn how enVisionMath 2.0 can support the learning activities of Stage 3. Teachers will have the opportunity to be in a room with grade-level alike collegues.

Course Number: ELEM-DD-17-06
Course Name: ELEM - 4th Unpacking
Dates: Nov 8, 2016 1 00 PM
[redacted]MENTARY
Description: Teachers bring their next Parkway unit and with guidance of a math facilitator have time to unpack the unit and learn how enVisionMath 2.0 can support the learning activities of Stage 3. Teachers will have the opportunity to be in a room with grade-level alike collegues.

Course Number: ELEM-DD-17-07
Course Name: ELEM - 5th Unpacking
Dates: Nov 8, 2016 1 00 PM
[redacted]
Description: Teachers bring their next Parkway unit and with guidance of a math facilitator have time to unpack the unit and learn how enVisionMath 2.0 can support the learning activities of Stage 3. Teachers will have the opportunity to be in a room with grade-level alike collegues.

Course Number: ELEM-DD-17-38
Course Name: ELEM - Bookmarking: It isn't just for books anymore...
Dates: Nov 8, 2016 1 00 PM
[redacted]
Description: In this session we will look at the value in teaching your students how to bookmark their research in Chrome and how to teach them to do it for themselves. We will also look at Symbaloo and explore how to use it to create resources for your students as well as embed into your own sites. And will we look at youtube as another tool for bookmarking lesson resources, and how to embed them into slides for your lessons as well.

Course Number: ELEM-DD-17-37
Course Name: ELEM - Coding in the Classroom
Dates: Nov 8, 2016 1 00 PM
[redacted]MENTARY
Description: Have you heard about coding and wondered what it's all about? Here's your chance to gain a better understanding of the role that coding can plan in the classroom and the programs that are freely available for your students as they explore STEM topics and computer science. Engage your students in their future with coding in the classroom.

Course Number: ELEM-DD-17-23
Course Name: ELEM - Google Classroom
Dates: Nov 8, 2016 1 00 PM
[redacted]RY
Description: Are you looking for a more efficient way to manage your students shared google documents? In this workshop, we will study how to use Google classroom to organize your assignments.

Course Number: ELEM-DD-17-33
Course Name: ELEM - Google For Littles: K-2
Dates: Nov 8, 2016 1 00 PM
[redacted]
Description: Utilize Chromebooks and Google Apps for Education in the youngest grades! Learn how to make logging in, Google Classroom, Drive, Drawing, Docs, Slides, Sheets, Bookmarks, and more work for primary students. Take your students' learning to the next level!

Course Number: ELEM-DD-17-34
Course Name: ELEM - Google Tourbuilder: Creating context with Maps
Dates: Nov 8, 2016 1 00 PM
[redacted]ITARY
Description: Give context to your stories by connecting your narrative to places around the world. Google Tour builder allows you to create multimedia stories tied to locations on the map through the integration of Google Earth. Use text, images and video to convey your story with each location on your tour. Come to this session to learn how to create and share your tours!

Course Number: ELEM-DD-17-02
Course Name: ELEM - K Unpacking
Dates: Nov 8, 2016 1 00 PM
[redacted]Y
Description: Teachers bring their next Parkway unit and with guidance of a math facilitator have time to unpack the unit and learn how enVisionMath 2.0 can support the learning activities of Stage 3. Teachers will have the opportunity to be in a room with grade-level alike collegues.

Course Number: ELEM-DD-17-17
Course Name: ELEM - Learn to Use READING Learning Progressions to Determine Next Steps - Grade 3-5 Teachers
Dates: Nov 8, 2016 1 00 PM
[redacted]
Description: Are you often stuck wondering what to teach when conferring with readers? Do you often find that you sit beside a student and panic over what to teach because you have not read the book? If so, come to this session to explore using learning progressions to determine next steps for readers. You will find that you do not need to know the book to conference well, you just need to know the expectations for that level of text. We will study the learning progressions for students in grades 3-5 to

better understand the work that is expected of readers. We will learn to think strategically about that next step for readers. Differentiating reading instruction is difficult! Come to this session to learn how this tool can make it easier and more effective!

Course Number: ELEM-DD-17-08
Course Name: ELEM - Math Workshop
Dates: Nov 8, 2016 1 00 PM
[redacted]
Description: Revisiting the format of Math Workshop in Parkway. What are the non-negotiables?

Course Number: ELEM-DD-17-09
Course Name: ELEM - Math Workshop
Dates: Nov 8, 2016 1 00 PM
[redacted]
Description: Revisiting the format of Math Workshop in Parkway. What are the non-negotiables?

Course Number: ELEM-DD-17-15
Course Name: ELEM - Nudging Readers Using Text Bands & Progressions (Gr. 2-5)
Dates: Nov 8, 2016 1 00 PM
Instructor: GRETCHEN MORRISON
Location: HIGHCROFT RIDGE ELEMENTARY
Description: How can we meet the needs of readers who are new to a level or seem to be stuck at their current level? Learn how to use text band characteristics and learning progressions to plan for small group and individual reading instruction. You will have time to apply this learning as you plan for your reading instruction. Grades 2-5

Course Number: ELEM-DD-17-10
Course Name: ELEM - Planning for Formative Assessments/Quick Checks
Dates: Nov 8, 2016 1 00 PM
[redacted]
Description: What is the purpose of the quick-check? How do I respond in the moment? What are some ways to collect this data efficiently?

Course Number: ELEM-DD-17-11
Course Name: ELEM - Planning for Formative Assessments/Quick Checks
Dates: Nov 8, 2016 1 00 PM
[redacted]
Description: What is the purpose of the quick-check? How do I respond in the moment? What are some ways to collect this data efficiently?

Course Number: ELEM-DD-17-36
Course Name: ELEM - YouTube in the Classroom
Dates: Nov 8, 2016 1 00 PM
[redacted]
Description: YouTube opens the door for educators to bring a variety of content into their classrooms but it can also serve as a platform for creating and telling stories. In this session we will explore some of the often overlooked tools that can turn students and teachers into storytellers, not just video consumers.

Course Number: ELEM-DD-17-26
Course Name: ELEM- Conferring in Reading by Using Text bands to Help All Readers
Dates: Nov 8, 2016 1 00 PM
[redacted]
Description: Do you have readers in your class who are reading above or below grade level? During this session, we will be learning more about conferring and using text bands to help support all students. We will look at text bands to gain a better understanding of them while using books from that level to see what students are truly doing. Please bring current data you have on your students to help with planning to meet their needs as a reader.

Course Number: ELEM-DD-17-35
Course Name: ELEM- Google Chrome Apps and Extensions
Dates: Nov 8, 2016 1 00 PM
[redacted]
Description: Are you new to Google or just unsure of all the awesome things you can do with Google? In this session we will explore some fantastic Apps and Extensions that will help you teach and learn more efficiently and add functionality to Chromebooks for you and your students.

Course Number: ELEM-DD-17-16
Course Name: ELEM- Planning for Small Group Reading Instruction
Dates: Nov 8, 2016 1 00 PM
[redacted]
Description: Instead of being anxious about doing small group reading instruction "The Right Way," come to this session to lessen your stress! After learning some of the possibilities for small group instruction, we will use what we already know about students to plan personal and responsive small group instruction. We will focus on key features of small group instruction and tips to make planning for small groups as painless as possible! This session will differentiate for primary and intermediate elementary teachers.

Course Number: ELEM-DD-17-13
Course Name: ELEM- Tips for Using the enVisionMath 2.0 website
Dates: Nov 8, 2016 1 00 PM
[redacted]
Description: Come with questions about the on-line resource. Learn some new tips and tricks to help you in your classroom. Bring a charged device.

Course Number: ELEM-DD-17-12
Course Name: ELEM- Tips for Using the enVisionMath 2.0 website
Dates: Nov 8, 2016 1 00 PM
[redacted]RY
Description: Come with questions about the on-line resource. Learn some new tips and tricks to help you in your classroom. Bring a charged device.

Course Number: ELEM-DD-17-18
Course Name: ELEM-Differentiated Word Study
Dates: Nov 8, 2016 1 00 PM
[redacted]ENTARY
Description: "They have great stories and ideas, but their spelling is awful!" Do you ever find yourself expressing these sentiments? If so, come and learn about how you can bring spelling to the next level through differentiated word study. We will look at various word study activities, how word study can support student goals in reading, and how to transfer what they learn in word study to their writing.

Course Number: ELEM-DD-17-31
Course Name: ELEM-Intentionally Planning for Engagement
Dates: Nov 8, 2016 1 00 PM
[redacted]Y
Description: How can we intentionally plan for engagement during workshop? We will review the Kagan principles of engagement and discuss how we can plan to increase engagement. Please bring materials for an upcoming unit you will be teaching.

Course Number: ELEM-DD-17-01
Course Name: ELEM-Introduction to Engineering in the Elementary Classroom
Dates: Nov 8, 2016 1 00 PM
[redacted]CENTER
Description: Learn the basics of engineering in the elementary classroom. What does engineering in the K-5 Classroom look like and how can I try it in the classroom.

Course Number: ELEM-DD-17-25
Course Name: ELEM-Nonfiction Strands of Text Complexity
Dates: Nov 8, 2016 1 00 PM
[redacted]
Description: Have you ever thought about how text bands would apply to nonfiction? In this workshop we will learn about the strands, not bands, of nonfiction text complexity. You will begin to uncover the threads along which expository nonfiction text tends to progress.

Course Number: ELEM-DD-17-19
Course Name: ELEM-Opinion Writing
Dates: Nov 8, 2016 1 00 PM
[redacted]
Description: Are you wondering how to help students improve their opinion writing? Learn how students can use the Learning Progressions to self-assess and set goals to strengthen their writing. Our work will transfer to all types of writing and other content areas.

Course Number: ELEM-DD-17-20
Course Name: ELEM-Writing Conferring
Dates: Nov 8, 2016 1 00 PM
[redacted]
Description: Have you wondered how to refine your writing conferring? Are you looking for ways to push your students as writers? At this workshop we will look at different writing conference structures and the best ways to nudge your writers without overwhelming them.

Course Number: ELEM-DD-17-27
Course Name: Helping ELLs Excel
Dates: Nov 8, 2016 1 00 PM
[redacted]
Description: This session is for teachers who would like to think more about the challenge of helping English language learners. We will focus on some practices to embed into our daily instruction. We will read some articles to gain some understanding of how to better tailor instruction to meet the needs of ELLs.

Course Number: ELEM-DD-17-29
Course Name: Increasing Engagement in Writing Workshop
Dates: Nov 8, 2016 1 00 PM
[redacted]ARY
Description: This session will provide you with a few tools to increase students' engagement during the writing workshop. Topics covered will include writing partnerships, creating learning progressions and studding inquiry in the writing workshop.

Course Number: INTR-100716WS
Course Name: Intruder Training
Dates: Oct 7, 2016 8 00 AM
[redacted]
Description: Tier One Tactical Training will walk participants through the curriculum and strategies of 4E training for a potential dangerous intruder situation. Scenario's will help participants use hands on experience in reacting to a potential threat.

Course Number: ELEM-DD-17-22
Course Name: Minilessons
Dates: Nov 8, 2016 1 00 PM
Instructor: ELLEN WILSDON
Location: BARRETTS ELEMENTARY SCHOOL
Description: Have you been wondering if your minilessons could be tighter? Or, maybe a little shorter? In this workshop we will study the structure of minilessons, watch videos, and talk about tips for making minilessons more engaging and effective.

Course Number: DI-FA-17-01
Course Name: Orchestra Teacher Saturday Development
Dates: Oct 15, 2016 9 00 AM, Nov 5, 2016 9 00 AM, Jan 14, 2017 9 00 AM, Feb 25, 2017 9 00 AM
[redacted]3 Valley Point Ln. Ballw
Description: The orchestra teachers will gather on Saturday mornings as a staff to stay connected and share ideas to help the learning of all of our students. This year we will be discussing topics including monitoring student progress, meaningful assessment, teaching strategies, use of technology, planning, and use of learning environment. This course will include guest speakers to help up learn new strategies specific to different instruments and teaching strategies. This course will serve as a supplement to district Professional Development days, allowing us as a staff to cover additional topics that are necessary for us to be the best teachers we can be.

Course Number: ELEM-DD-17-14
Course Name: Parkway Summer Reading Institute Follow-Up
Dates: Nov 8, 2016 1 00 PM
[redacted]N
CENTER
Description: This session is an option for teachers who attended the Parkway Summer Reading Institute in July. We will continue to work on supporting the work of the institute into our daily practices. Please bring the Reading Units of Study materials you received at the institute this summer.

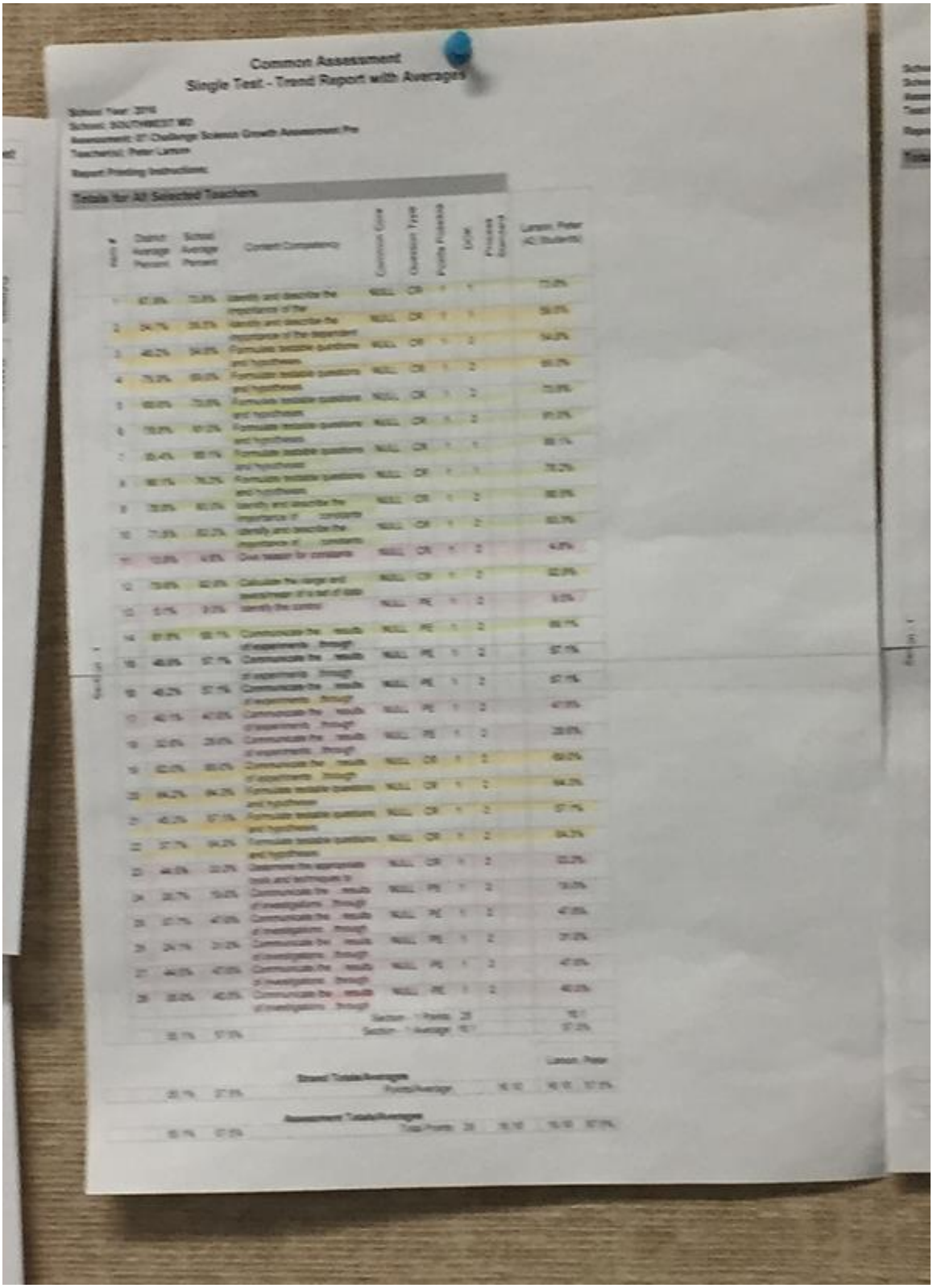
Course Number: ELEM-DD-17-24
Course Name: Reading Closely Grades K-2
Dates: Nov 8, 2016 1 00 PM
[redacted]
Description: Let's go on a journey to help our youngest readers discover how to read closer within the text, and around it, in order to really understand and love what we read! Let's learn from each other, and experts such as Kathy Collins, Kylene Beers and Robert E.:Probst!

Course Number: COUN-17-1
Course Name: Suicide Risk Assessment, Management and Treatment
Dates: Oct 29, 2016 9 00 AM
[redacted]4 St. L
Description: Suicide Risk Assessment, Management and Treatment is a training designed to go beyond recognizing signs of suicide; rather this training will provide skills that will help you engage, assess accurately and confidently, and manage encounters with individuals who express suicidal behavior. Additionally, this training will leave you with tools and strategies for monitoring and working with individuals who engage in suicidal behavior

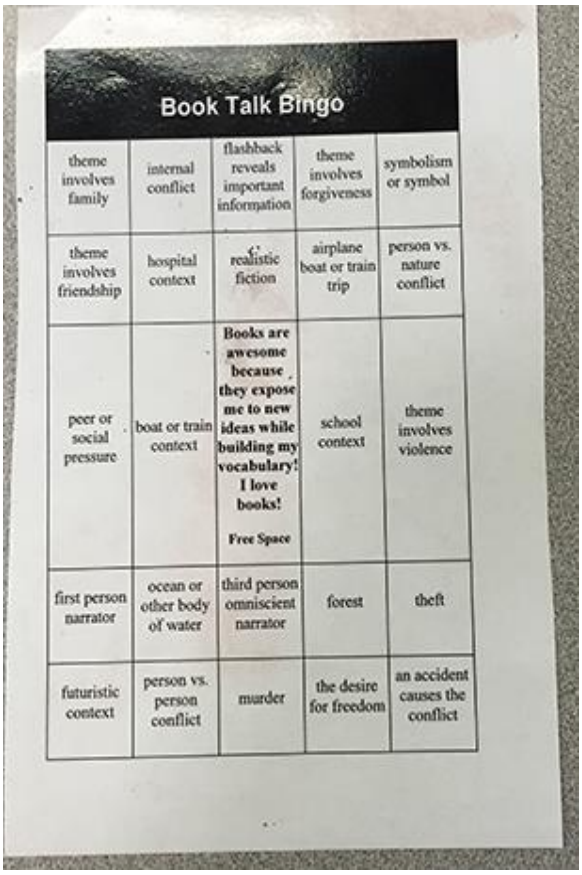
Course Number: ELEM-DD-17-28
Course Name: Using Conferring Notes to Plan for Instruction
Dates: Nov 8, 2016 1 00 PM
[redacted]ARY
Description: This session is for teachers who want to become more intentional about using the information from conferring notes to plan for instruction during independent workshop time. We will view conferences and discuss how to efficiently take notes that can be used as data pieces to inform individual student goals, strategy groups and whole class instruction.

Course Number: TECH-WEB-17-01
Course Name: Websites for Teachers
Dates: Aug 1, 2018 N/A
[redacted]
Description: This course will focus on creating webpages and webpage content, preparing files and and images for the web, leveraging Google Drive on your site, and an overview of the features you'll have access to on the new Parkway website.

Posted assessment in teacher's classroom



Book Talk Bingo Card



Book Talk Bingo

theme involves family	internal conflict	flashback reveals important information	theme involves forgiveness	symbolism or symbol
theme involves friendship	hospital context	realistic fiction	airplane boat or train trip	person vs. nature conflict
peer or social pressure	boat or train context	**Books are awesome because they expose me to new ideas while building my vocabulary! I love books!** **Free Space**	school context	theme involves violence
first person narrator	ocean or other body of water	third person omniscient narrator	forest	theft
futuristic context	person vs. person conflict	murder	the desire for freedom	an accident causes the conflict

Photo of Classroom Technology

Photo of Sign

Appendix K – Category Structure

Category	Subcategory	Properties	Dimensions
I. Shared Experience	A. Motivation	1.	a. no student motivation to complete student motivation
	B. Engagement	2.	a. No increased engagement to complete engagement
II. Technology Integration Readiness	A. Interest in technology	1. quantity	a. No technology usage to frequent technology usage
		2. presence	a. Sparse use of technology to pervasive use of technology
	B. Training	1. personal experience	a. few personal experiences to many personal experiences
		2. professional development	a. quantity - no development to ample development
			b. focus - technical only to technical and pedagogical training
		3. interest	a. desire - no desire to a complete desire
III. Educational Uses of Technology	A. Learning environment	1. preparation	a. no preparation using technology to all preparation using technology
		2. community	a. availability - no additional availability to always available
			b. changing classroom interaction – no change to complete change
	B. Assessing learning	1. procedures	a. variety – traditional to progressive
		2. values	a. helpfulness – not helpful to very helpful.
IV. Obstacles to Technology Integration	A. Distractions	1. impact	
		2. frequency	
	B. Access	1. equality	a. not equal at all to completely equal.
	C. Comfort Level	1. abandonment	a. quickly abandoning technology lessons to continuing to use and refine
		2. usage	a. Routine to advance.

Appendix L – Codebook

Category	Subcategory	Properties	Dimensions	Examples
I. Shared Experience	A. Motivation	1.	a. no student motivation to complete student motivation	I mean they're pretty excited. Like I notice in sixth grade with the whole sharing in Google – they're pretty excited with being able to communicate and not let the other group or groups in the room know what they're talking about. So they're finding ways that are exciting. When they post those projects on Edmodo in eighth grade they're pretty excited to be able to view other people's and be able to leave comments and communicate with each other TD – 296-302 what I was saying about how I go and just find new stuff, so then I get excited to find something else. Because there's times where I'll learn something on there and I'm like "Whoa, I never knew that." And I'll

				tell someone that and they're like “What? No it's not, “and we'll get in a huge debate about that, like “Look it up, and I'm right (laughter) S12 – 307-310 It depends on what we're doing. Like if it's boring then I would rather be doing stuff that's hands-on S14 – 304-305 75% s14 - 319
	B. Engagement	2.	a. No increased engagement to complete engagement	Whether it's collaborating with me, collaborating with another student. I know the kids from before so I -know that they used to kind of just sit there. I've always used technology but the collaboration part has created a whole new element TB 587-590 I think it makes the curriculum more relatable to the kids and that raises engagement, which always helps the teaching TA 158-159

				Well, I prefer technology outside the school because it's more fun. You can do what you want to do instead of just doing stuff that you learn with S3 243-245 Phones, texting, social media, everything like that. Every kid is on social media texting friends S16 67-68). And outside of school I mainly use my home computer and my phone to play games S1 49-51 Well the teachers obviously really didn't know how to code that much so they had videos on how to do it, and we used this application, I don't… I forgot what it was called, but it was really fun S1 309-312
II. Technology Integration Readiness	A. Interest in technology	1. quantity	a. No technology usage to frequent technology usage	So my day starts with using my phone, my iPhone. And I check my mail; I sometimes check Facebook and some other social

				networking things and do some reading TB 33-35 Oh yes, I have a cellphone which is great because I have a 13-, almost 14-year-old daughter. So it's good to be able to text and know if she needs a ride or something's changed. And certainly my husband uses the calendar and shares the calendar with us, so we use it in those kind of ways TD 27-30 Oh! Okay, well we have four or five computers at home. We have a desktop; we have two laptops; we have a Chrome Book, two iPads… TG 18-20
		2. presence	a. Sparse use of technology to pervasive use of technology	When I get to school I use a desktop computer almost immediately to open up my Google Slide which has my structure for the day for my sixth, seventh and eighth. And I primarily use, detail-wise, Chrome, the Chrome browser and I have

				all my pages loaded in, and it just makes things go more efficiently as far as starting up the day. Throughout the day I am using everything from Net Support to the desktop computer and primarily Google Drive and Google Classroom to teach. And I do use a laptop some when I need to be portable – during the day I have to go to other places in the building and so that gives me the portability to be able to continue planning lessons TB 35-39 We use Google Docs for papers, to write. And we use Google Slides for presentations. And for this experiment that I had to write for a final report, I used Google Sheets to make a graph and data table S9 12-15 So we also use Google Docs and stuff to write papers and Google Slides for like slideshows to present to the class S5 292-

				293
	B. Training	1. personal experience	a. few personal experiences to many personal experiences	Google Translate I used more of course when I was overseas but it still comes in handy sometimes TC 62-64 I have a background purposely of troubleshooting, and so that… I think if I were to say maybe professional development-wise, if I were to go back to that other question, I think everybody should have to go through a basic troubleshooting-type course that would just allow them to not interrupt the teaching based on - I don't have any internet access right this second TB 383-387
		2. professional development	a. quantity - no development to ample development	And the only other thing I would say is so many of the workshops that the district does, while they're great I feel like we get inundated with stuff but then we don't have a lot of time to try it out. So that would be I guess one change, is to build workshops where you actually have time to play with

				the technology or learning, because you walk away with your notes and having seen it but you really wish you had time to try things and build things TD 94-101 I've gone to some workshops but what's been most beneficial for me is our middle school cadre tries to put together a couple workshops that we want, and we find somebody within the district that could present to us TD 65-68 I would like to see a regular time allotted for Google Hangout. So people would maybe put their list of things they wanted to learn about but just didn't have the time to out there and then those people – kind of like a Google Hangout but an on-conference version of the Google Hangout. And then you would join with one person who potentially could give a little more information TB 223-229

			b. focus - technical only to technical and pedagogical training	I've been to a lot of summer PDs over the different types of like learning how to use the SMART notebook; when Senteos were big we had a lot of PDs with those. Most recently the Google Classroom – we had some PD in the mornings, or I went I think once. That's really about it TH 102-106 Well, I had a really good one, it's my first year in {District Name} and I came back to the States in July or in June. And I guess it was in July there was a Google camp for educators here at {District Name}. And it was the whole district. It's a big district, as you know, and yeah, there were about four breakout sessions, two of which were really valuable – one on ways to use YouTube, one on ways to use Google Classroom; and I guess a third one which was just a variety of extensions that are available in Google Chrome. And yeah, it was great. Sometimes you go to a

				professional development, don't learn much. But this one, I walked away with several useful apps and techniques to use TC 191-201
		3. interest	a. desire - no desire to a complete desire	I think I would like to see all-school training then as a follow-up after that, district level - because I know they're… Maybe administration is trying to be sensitive to everybody's maybe at a different level. But if the expectation is that we need to be doing this, then we all do need to be trained and at some point it can't be an option TA 107-112 I would increase the tech integration. It is a part of our evaluation model and I think that I would love to expand my horizons with that TH 169-171 Well we spend a lot of professional development time spinning our wheels, reinventing the wheel, doing a lot of things

				to justify other people's, to justify people's jobs instead of doing cool, new things that are good for kids or that are exciting, or that are really relevant TG 200-204

III. Educational Uses of Technology	A. Learning environment	1. preparation	a. no preparation using technology to all preparation using technology	I do all of my grading at home online TG 33 it just reaches out to the students, especially if it's something where they really need quick feedback. Like I graded those papers last night so that's less than a 24-hour turnaround time TC 306-308 This year I started using the Google Classroom so I have all of my classes set up in Google Classroom. I can send them in assignments and receive assignments that way which works out great. Each classroom has a separate passcode to get in so they can specifically see either their homework or their assignment TA 28-32 Okay, so the technology that I use primarily is really my Google. Google has taken over my life, so I use Google Docs. The kids can access my curriculum which is in a Google Doc. I use Google Slides to break that down on a kind of daily basis into folders TB 78-81

				I like it because of Google Classroom. Google Classroom is a great way for teachers to upload things and you just click on that. You can share things with the teacher, so if you have like a worksheet that's late you can share it with her and she'll get it really fast – it just pops up in her email or Google Drive. And you can share things super-easily, and you can access things easily. And it's really, really fast SB 335-341.
		2. community	a. availability - no additional availability to always available	I mean I post the entire trimester syllabus on my website so they can access it, plus I have documents and things that they might need to access on there. But also when they come in I either freeze an AB calendar up there with deadlines for them or the syllabus to help remind them, because honestly these students' organization is one of their struggles as bright as they are – and so just ways to keep them focused TD 47-54 We use Google Classroom, too. So our teacher posts the things that we need, the resources, and then we open the Google Classroom and we open those

				links. And then we can see what the teacher wants us to do, or if there's any assignment we can get it without having actual paper S8 84-88 It works good. Like on our school website, there's the teachers' pages and so you can get to the homework that we have for today. So if you were to lose it or something you could still find it, so you would be able to do it S8 92-95 It helps my teaching by really, oh gosh, from a communications standpoint when you have the numbers. You're seeing hundreds of kids – it just, it allows me to create videos for example, like a tutorial. It allows me to organize. It allows me to communicate beyond school with the kids who have questions. I get a lot of emails after school with clarification-type questions that probably wouldn't happen otherwise. And I never saw that before Google Drive stuff. So gosh… It helps me make really careful decisions about what technology I'm using and why am I using it TB 326-335

				Yeah, because and like people will send you their stories so you can read about that and then you can comment back on them. And with Google Classroom you can leave comments on there so I like that a lot – with the teachers you can comment back and forth a lot, which is really helpful because you can't see them at night when you need to work on homework S12 443-448
			b. changing classroom interaction – no change to complete change	In sixth grade they're doing Mystery Disease, a group project, problem solving; and they are using it, Google particularly, to share information with each other and put a slideshow together or some of them are using Prezi TD 13-17 I've used VoiceThread; I've used, I can't even think of the name but I worked with a classroom in Mexico and I recorded my kids and they recorded theirs, and then we sent them to each other and we gave each other feedback in the language. And that worked really well. Each kid was paired with a specific kid from that class in Mexico. So they were

				learning English like we were learning Spanish and it was, I kind of forgot the name of the program off the top of my head but that was great because it was a project like 'All About Me.' And they were learning things similar as my -kids were learning it, that level but in Spanish. So that was cool TA 80-97
	B. Assessing learning	1. procedures	a. variety – traditional to progressive	a few of my teachers use [Sentio] to help us with our tests S7 263-264 Generally we use a website called Kahoot which they create like a little quiz or something to review for like a test that's coming up or something like that S6 14-16 today we're doing it, like testing with each eighth grade English class S13 233-234 You can actually have programs on there which can work a lot better with the schools, since I know schools want to use programs to help with MAP testing and things of that sort S7 367-369

				I've used Socrates.com to create mini quizzes online and some of these, you know, are supposed to make it easier to tally the results, so if you're looking to create a format of everyone's results together TA 139-142 Well we do the tests on paper first and then we just input them online. And it helps us, it helps the teacher put it in a different format, see it all together in one thing on digital, already made for them S7 268-271 In math we enter our grades… So they have the answers… So we do our homework and then they have random questions on the board. So it'll be like questions 1, 7, 9 and 10 or something like that, and then you go back and then you check them. But it's like you only check those four questions and then say you've got two right out of the four. Then you would go to the computer; you would enter your name, what assignment it was and then you would click whether you completed the assignment or not,

				and then you would put the score that you got on the four. And then they enter your grade based off of that S14 183-192
		2. values	a. helpfulness – not helpful to very helpful.	We started flipping after winter break I guess it was two years ago, and so I saw a definite increase in their scores from the previous year's assessment grades to these. They can just understand it better in my opinion TH 472-475 It also helps with giving the teachers that my students will have next year a head's up: "Look, here are his or her writing samples from last year." I can just share them via Google Classroom or Google Drive and they don't have to scratch their heads and start from ground zero to try to figure out "Where am I going to, what direction am I going to go in to help this student write? TE 264-270
IV. Obstacles to Technology Integration	A. Distractions	1. impact		Well some people sort of seem distracted with their phones and personal devices especially during classes that they seem, that are boring. So they'll get distracted on their phone and sometimes the teacher can't always see it. So while they're like doing

				something on their phone they can't pay attention to the lesson and therefore they can't learn S10 469-474 I'm good at noticing if they're looking down at their crotch. I mean it's usually pretty obvious to me if they're distracted TC 409-411 If I'm like looking something up on my phone, it's usually distracting; because the teacher's basically giving a free pass to do whatever you want on your phone. And on computers I know that kids will always play a game and then whenever the teacher gets close they'll X out of the browser and go back to whatever they were supposed to be working on. So it's really distracting to kids. And then if you're doing that then other people will probably be watching what you're doing. So it's just really distracting nowadays with all the technology in schools S14 401-409
		2. frequency		But you know, I embraced it and I accepted it and

				you just had to have boundaries when and where it's appropriate. It needs to go off as soon as they come into the classroom. So it makes you check your classroom expectations, make sure you're clear with them. And some kids have tablets, too, so that can be a hindrance. I've tried different things before, like having a shoe pocket where they put their phones when they come in – that didn't work. So now I just, I give them a warning and then I just am consistent with I take their phone, it goes to the office and they can't, they get it at the end of the day. And that's like taking their heart out, you know? But it is challenging TA 209-220 Yeah, just the distraction piece, it does. You constantly have to be on a watchful eye for them texting or Snap Chatting or getting on Instagram. I mean the minute that they have a down second they're on their phone trying to do something with it. So it can be hard. Also I had Ac lab today and so the kids all have their Chrome Books out and everything and you just have to be vigilant about

				going around and making sure they're on the right tab and not on YouTube watching some pilot. And you know, it's like "Nope, put it away," and he's like "Oh, I'm on Infinite Campus!" and switches over to that. I'm like "Nope, let's close out the YouTube window." So just very easy to get off task and distracted TH 324-335
	B. Access	1. equality	a. not equal at all to completely equal.	I have a phone. I have an iPad and we do have multiple laptops and computers in our house because that's the industry my dad's in" S4 87-89 Interviewee: Well I don't really have a computer at home so mostly I do all my like writing on my iPod, which is not very good but… Interviewer: You do, you write on the iPod? Interviewee: Yeah, like if I have an assignment due I type it on my iPod. S10 63-69
	C. Comfort Level	1. abandonment	a. quickly abandoning technology lessons to continuing to use and refine	A couple of summers ago I did Moodle technology and that was taught by BB, and that was incredible and of course now we don't use Moodle. So I feel like, not that it was a waste necessarily but…" Interviewer: "Did you invest time in Moodle?"

				Interviewee: A lot, a lot of time in Moodle. So I haven't been investing as much time in learning new technologies super thoroughly like in the past couple years because I feel like everything moves so fast and you know, I could be spending my time just learning something in a kind of half-baked way if that's the word TG 150-163 So it turned into well, if the majority of class doesn't know what's going on we can't proceed the way we want to. So we'd end up showing the video during regular class hours or during lunch, and so we thought well, we might as well just teach the mini lesson to everybody because we know everybody's here. I think Flipped Classroom could work but I think right now the way I'm seeing it with students in seventh grade, it might work better for kids who are absent and need to catch up. Maybe they're not so sick that they can't focus on something and maybe I could put it, or give them the key to the private YouTube page to go look at it if they were out and missed the mini lesson in person. But as far

				as making it an assignment it just kind of didn't work for us TE 190-201
		2. usage	a. Routine to advance.	Right now we're in an informational text unit so we're doing a lot of research. We're doing a lot of drafting using the computers, either laptops, Chrome Books or the desktops that are in the computer lab TE 32-35

Appendix M - Mind Map Demonstrating Categories and Subcategory Interaction