STUDENTS’ PERSONAL MOBILE DEVICES IN THE CLASSROOM: A CASE STUDY OF A BYOT DISTRICT

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Abstract

This case study explored the use of students’ personal mobile devices in the classroom for learning. The context was a district with an initiative called Bring Your Own Technology (BYOT), whereby students regularly utilized their personal technology as part of the curriculum. The focus of this study was to better understand how students’ personal mobile devices are pedagogically integrated into the curriculum, how students experience learning in a BYOT classroom, and teachers’ perspectives about student confidence and engagement in this setting.

Using the expectancy-value theory of academic motivation as the guiding lens, data was collected through a document review, classroom observations, student blog, and semi-structured interviews with five teachers and twelve students. The five themes that emerged were 1) students’ personal technologies are pedagogically integrated into a BYOT classroom in a variety of ways that promote collaboration, project-based learning and presentations 2) teachers perceived the use of students’ personal mobile devices in the classroom as contributing to higher student engagement, and both students and teachers found learning relevant to future pursuits fostered motivation 3) the use of personal mobile devices in the classroom, which is preferred by students, promotes differentiation of instruction 4) the major challenges in a BYOT classroom are distraction and network issues and 5) a balance of using students’ personal technologies and traditional classroom methods is advantageous to address the needs of different learning styles. In addition to the findings, limitations and implications for practice were identified and discussed in the conclusion.
Keywords: Personal mobile devices, student motivation, Bring Your Own Technology, Bring Your Own Device, personal technologies

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Finally, I would like to let my son know that I tried my best to end the dissertation with the word Jack, but just could not make it work. Maybe my next research project should be about a
highjack or carjack, lumberjacks, or people who play too much blackjack. Sorry I was not able
do it this time, but I will try to make it up to you, Jack.

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Chapter I: Introduction

Students who enter schools today are 21st century learners, who often walk into a 19th century classroom. In many school districts, they are banned from using personal mobile devices, which are their main form of learning, communicating, and managing content outside of the school environment (November, 2007). One public school district in the Southeast, however, has implemented a program to use these devices to extend the curriculum with a program called Bring Your Own Technology (BYOT). Within the BYOT context, this research study explores how students’ personal mobile technologies are pedagogically integrated into the curriculum, students experience learning in this environment, and the perspectives of teachers about how learning in a BYOT classroom is related to student confidence and engagement. The expectancy-value theory of academic motivation is used as the guiding lens for this qualitative case study, and data from this exploration will be used to better understand how learning in a BYOT classroom affects student motivation. Results from this research have implications for educators, administrators, students, parents, and those involved in creating policy.

Statement of the Problem

Topic

“Our students have changed radically. Today’s students are no longer the people our educational system was designed to teach” (Prensky, 2001, p. 1). This is because students currently enrolled in primary and secondary schools comprise the first generation born into a digital world. They have grown up surrounded by technology, and are accustomed to using computers, cell phones, video games, and other tools of the digital age. Whether the term net-
generation, digital generation, or digital native (Prensky, 2001) is attributed to them, they learn and are motivated differently than students in the past (Beyers, 2009).

**Research Problem**

Despite what is known about this generation, schools continue to operate from a model that was developed over a century ago (Jacobs, 2010; Prensky 2001; Beyers, 2009; Schank & Cleary, 2008). Jacobs (2010) depicts how curriculum began with The Committee of Ten in 1893, which determined that all students should use learn the same information, and is still how the educational system operates today. Schools were not designed for children, but instead, were built on the factory model of organization that was applied to business at that time (Feldman, 1999). According to Beyers (2009), “Schooling today is an attempt to make mini-scholars out of students by giving them doses of what was meant by scholarship in the eighteenth and nineteenth centuries” (p. 218). That largely included rote memorization and learning about a set body of knowledge that was considered necessary for all educated people.

Scholarship, however, has changed dramatically with the information age that we live in today. It is now more necessary for students to direct their own education due to the large amounts of information available (Schank & Cleary, 2008; Traxler, 2010) and demonstrate higher level skills such as analysis, problem solving, creativity, and innovation to be successful (Sternberg, 2003). Jacobs (2010) posits that it is not reform that is needed but new form. Teaching 21st century learners in an environment set up for societies long ago leaves students unmotivated, which directly affects academic achievement (Akey, 2006; Heller, Calderon, & Medrich, 2003; Garcia-Reid, Reid, & Peterson, 2005). It is, therefore, essential to reevaluate how to engage this generation of learners.

**Justification for the Research Problem**
To develop programs that foster student motivation among digital learners within the classroom, one can look to how students are spending time learning outside of the school context. The ubiquitous nature of mobile devices has created a generation that, literally, has learning in the palm of their hands. In his description of modern students, Prensky (2001) claims, “They are used to the instantaneity of hypertext, downloaded music, phones in their pockets, a library on their laptops, beamed messages and instant messaging” (p. 3). These technologies are how students today learn outside the classroom.

According to a 2013 survey by Madden, Lenhart, Duggan, Cortesi, and Gasser (2013) who surveyed 803 teens aged 12-17, 74% claim they access the Internet on cell phones and tablets at least occasionally, and one in four are “cell-mostly” Internet users, compared with 15% of adults. That number increases to half for teens who own a smartphone. Additionally, 95% of teens use the Internet and 93% have a computer or access to one at home. Madden et al. (2013) posits the way teens use the Internet has changed substantially from stationary computers to mobile devices, allowing them to access information everywhere.

As the trend in teen “cell-mostly” Internet usage has increased, and districts lack the funds necessary to provide one-to-one technology for students, programs have been implemented to integrate students’ personal mobile devices into classrooms. A limited number of research studies have focused on BYOT or Bring Your Own Device (BYOD) programs. Miller-Cochran and Gierdowski (2013) investigated a university project to allow student devices in a first year composition class to save money, and Schaffhauser (2011) evaluated a Bring Your Own Laptop (BYOL) program where seventh grade students were able to bring their laptops from home. More common are descriptive articles about the benefits and challenges of BYOT (November
2007) and how personal devices should be implemented in a BYOT classroom for learning (Ackerman & Krupp, 2012; Ullman, 2011).

Although these studies outline some of the themes related to the use of students’ mobile devices in the classroom, there is currently a gap in the literature about BYOT implementation in secondary classrooms, including how students experience learning in this setting, how devices are pedagogically integrated, and teachers’ perspectives. This qualitative case study addresses those issues. Findings from this research will contribute to the current body of knowledge about this topic.

**Significance of the Problem**

The disconnect between how schools currently teach and how students are motivated to learn is especially significant because students today need to be educated to compete in a global economy (Friedman, 2005; Jacobs, 2010). Former president of Massachusetts Institute of Technology, Charles Vest, has warned, “America faces many challenges...but the enemy I fear most is complacency. We are about to be hit by the full force of global competition” (National Research Council, 2009, p. 5). Friedman (2005) describes global competition by using the symbolic phrase *the world is flat* to argue that the global competitive playing field is being leveled. Although there once was a time when only a limited number of countries were considered global superpowers, technology has allowed access to more people around the world, creating a demand for a more educated workforce (Friedman, 2005). To prepare students in the U.S., schools need to begin at the state and local level if they are to be successful. As President Barack Obama (2011) said in his State of the Union address, “We know what it takes to compete for the jobs and industries of our time. We need to out-innovate, out-educate, and out-build the rest of the world.”
Yet, that cannot happen if students are being educated in an environment that is not conducive to them reaching their full potential. Academic achievement is related to student motivation (Hodis, Meyer, McClure, Weir, & Walkey, 2011), and international rankings indicate that academic achievement among American students is weak. According to Peterson, Woessmann, Hanushek, & Lastra-Anadon (2011), only 32% of American students in the Class of 2011 were considered proficient in math, ranking the U.S. 32nd among nations that participated in the Programme for International Assessment (PISA). Reading proficiency for that same group of students was 31%. These rankings illustrate the severity of the problem.

In response to global competition, other countries are making changes to ensure their students are prepared. For example, the government of South Korea has mandated that every textbook will be digital by 2015, and has committed to connecting all schools with Wi-Fi (Kim, 2011). According to Manzo (2009), technology is already part of the national curriculum in Britain, and Australia has launched its own technology revolution to guarantee Internet access, teacher training, and instructional materials throughout the country.

While other countries are preparing students for the 21st century, the U.S. continues to focus on teaching in the antiquated model that was meant for a pre-digital world. A wait and see approach can no longer be accepted. If students in the U.S. are to be competitive in the global economy, the area of student motivation must be explored. Understanding more about the role of students using their mobile devices in the classroom would offer insights that could be useful for developing policies and programs to prepare students for the changing demands of the information age.

**Positionality Statement**
In the interest of full disclosure, it is necessary to describe my perspectives and biases in relation to the research. I am involved in the district that was used for this case study as an elementary educator who teaches English to Speakers of Other Languages (ESOL). In that role, I often go into classes at the elementary level where students are using their personal technology, but am not involved in the secondary setting. Because teachers in this district are expected to provide other technology for students who do not have personal devices in the forms of laptops, desktops, iPod Touches, and iPads, I have often used these tools with students. Typically, my students do not own personal devices, but use school provided technologies.

In addition to teaching in the district, I am the mother of three students who attend school in the district, and participate in the BYOT program on a regular basis. The oldest attends high school and has a personal laptop that he frequently brings to class in addition to his smartphone. The middle student has a Kindle Fire that can be used to go online, and a smartphone. The youngest also has a smartphone that she uses mostly for Internet access, texting capabilities, and ways to keep track of homework assignments, testing dates, and study groups.

Based on preliminary observations of both groups, there is a bias from the researcher that using mobile devices in the classroom, particularly personal devices, is motivating to students. Comments made by the researcher’s personal children also indicate that they prefer to use mobile devices in the classroom because it is easier for homework, and to continue what was started in class. Also communicated is the preference to be able to work on their personal devices at home because they can use it in any room, in any position instead of being confined to the space of a desktop computer.

It is important to note that the researcher has heard complaints from both students and personal children about others in their class having faster, better, newer devices. Because the
school where the researcher works as an educator is a Title I school, it serves students primarily from families with a lower socioeconomic status (SES), and few ESOL students have their own devices. Although this brings up important issues about the equity of students in public schools, a thorough discussion of that topic is beyond the scope of this research study.

**Research Question**

While many schools systems have realized the promise of technology, budgets do not always allow for individual access. As a result, there is an increasing number of people advocating for schools to permit students the opportunity to bring their personal technologies into the classroom (November, 2007; Traxler, 2010; Schaffhauser, 2011). This study uses the context of a suburban public school district implementing the BYOT program to examine the following three research questions:

1. How are students’ mobile devices integrated pedagogically into a BYOT classroom?
2. How do students experience learning in a BYOT classroom?
3. What are the perspectives of teachers about student confidence and engagement in a BYOT classroom?

**Theoretical Framework**

The guiding theoretical framework for this study is the expectancy-value theory of achievement motivation, which stems from motivation theory. Motivation theory is based on the seminal works of Atkinson (1957), which theorize that motivation is based upon two purposes, which are to achieve success and to avoid failure. According to Atkinson and Feather (1966), the drive to achieve success comes from the need to succeed or achieve, the person’s determination of how successful they will be at a particular task, and the incentive for how much the person wants to succeed at the task. In contrast, there exist three conditions that motivate people to
avoid failure; the person’s beliefs about how successful they will be at a task, the individual’s need to avoid failure, which differs among people, and how unpleasant it will be to fail (Atkinson and Feather, 1966). Atkinson (1957) posits, if the motivation to succeed is strong, preferred tasks are intermediate in difficulty, and the person believes that success is reasonable, they are more likely to attempt challenging endeavors. When the motive to avoid failure is strong, however, people seek out simple tasks in which the likelihood of failure is low.

Many other theorists have expanded the work of Atkinson (1957) over the years. Of particular relevance to this study is the expectancy-value model of achievement motivation developed by Eccles, Wigfield, and their colleagues (Eccles et al. 1983; Eccles & Wigfield, 1995; Wigfield & Eccles, 2000). This is due to the focus on motivation in academic settings and on adolescents. Figure 1 shows the complete expectancy-value model, and details the interrelationship of a myriad of causes that contribute to the achievement motivation of students.

This model claims the achievement related choices of an individual are based upon the expectation of success on a given task and the value they assign that task relative to other options. The expectations of success and the subjective task values, which include incentive and attainment value, utility value, and cost are the two areas of the model that lead to achievement related choices. According to Wigfield and Eccles (2000), “Expectancies and values are assumed to influence directly achievement choices. They also influence performance, effort, and persistence” (p. 69).
Figure 1- Expectancy-value model of achievement motivation developed by Eccles, Wigfield and Colleagues (2000).

To understand how the expectancy-value theory of achievement motivation frames this study, it is important to define the constructs in this model. Expectancies of success are considered the child’s belief about how successful they will be at a task (Eccles et al., 1983). Ability beliefs are the individual’s perception of their competence for a task, and differentiated from expectancies based on the time frame. Ability beliefs focus on the individual’s present ability, and expectancies focus on the future. In both instances, the student is asking, can I do the task? If the answer to that question is yes, the results are more likely to include higher academic performance and more difficult tasks selected (Wigfield et al., 2006). Of particular significance, confidence in students who are struggling academically is a strong indicator of academic achievement (National Research Council, 2004).
For this study, investigating the expectancy of success is important because that could directly affect the student’s motivation while using their personal technologies. As students today often use their technology to learn about the world around them (November, 2007), they demonstrate success in using these tools to navigate their way through life. For example, if a student has a question about something, they often turn to their technological devices for information. Once they find the answer, if they have determined that using their devices is a successful way to acquire knowledge on that topic, it is likely they will turn to their mobile technologies the next time they are looking for information. It is, therefore, important to evaluate how this expectation of success with personal devices transfers to the classroom, and how it affects student motivation.

While the expectation of success asks if a student can do the task, the subjective task value asks, do I want to do the task? In the value portion, there have been several defined components of achievement values, which include incentive value, attainment value, utility value, and perceived cost (Eccles et al, 1983; Wigfield & Eccles, 1992). Incentive value is the attractiveness of the goal in the task. This affects motivation, and considering the large amount of time students choose to spend on their mobile technologies outside of the classroom, it is necessary to examine if learning on their devices would contribute to intrinsic motivation for learning.

The concept of attainment value is derived from the work of Battle (1965) and defined as the relationship between the task, and the identities and preferences of an individual. Eccles (2005) posits these characteristics are based on eight different factors: (1) conceptions of one's personality and capabilities, (2) long range goals and plans, (3) schema regarding the proper roles of men and women in one's culture group, (4) instrumental and terminal values, (5)
motivational sets, (6) ideal images of what one should be like, (7) stable personal interests, and (8) social scripts regarding proper behavior in a variety of situations. The use of a variety of mobile technologies in the classroom could allow for differentiation in the identities and preferences of students, in contrast to the traditional methods of a one-size-fits-all pedagogy. This study offers insights about how mobile technologies could meet the various needs of individual students.

Eccles (2005) refers to utility value as the usefulness the individual perceives the task relative to future goals and plans, or how it fulfills another psychological need. For example, if a student had a strong desire to pursue a career in accounting, taking math courses that would provide necessary skills for the daily tasks of an accountant would hold a high utility value. This construct is especially important for this research study because students today often learn curriculum, which is not practical to daily life (Miaoulis, 2010). Developing a better understanding of whether students believe that using their personal technology for research, communication, and to design presentations holds a high utility value can provide useful information about student motivation.

The final concept of the subjective task value is perceived cost, which can be described as the beliefs about the cost of engaging in a given task. Elements of perceived cost can be fear of failure, anticipated anxiety, fear of social consequences which can include rejection of peers, and the rear of a loss of self-worth (Eccles, 2005; Covington, 1992). In his self-worth theory, Covington (1992) posits that children are so frequently assessed in the classroom that protecting a student’s perception of their academic competence is essential to developing a strong sense of self-worth. Alternative assessments facilitated by personal technology, such as those
implemented in the BYOT program, could potentially limit the perceived costs, which ultimately could benefit the self-worth of students.

Taken together, the expectancy-value theory of achievement motivation provides a valuable lens to guide this study. Because of the powerful role they play, the subjective task value aspects of the expectancy-value theory will be emphasized. Expectancies and values in this model are influenced by additional factors, such as ability beliefs and behaviors, previous achievement related experiences, and interpretations of experiences, which will be examined to a lesser degree.

Chapter II: Literature Review

To better understand the use of students’ personal mobile devices in the classroom, it is necessary to have an understanding of what is already known about the topic. This literature review begins with a section on the benefits of mobile technologies, with a focus on using the Internet, communication, differentiation, and the role these devices play in collaboration. The second section identifies some of the challenges associated with these technologies, including how they can distract students from learning and issues related to teachers’ perceptions and training. A discussion of gaming and MUVEs in student learning follows. The fourth section involves student motivation with mobile devices, examining perceptions of teachers and students in general and special education settings. The final section addresses BYOT initiatives, and provides suggestions for implementation.

Benefits of Mobile Technologies in the Classroom

The shift of incorporating handheld devices in schools around the world is changing how curriculum is taught. According to Norris and Soloway (2004), the major value of a handheld-centric classroom is providing all students entry to valuable resources that can be shared and
found quickly. These devices have the potential to provide students access to information in a way that is unprecedented.

**Internet Access for Research**

One of the most powerful uses of handheld devices in the classroom is the ability to get onto the Internet (Norris & Soloway, 2004; Prensky, 2004; Robb & Shellenbarger, 2012). According to Robb and Shellenbarger (2012), “The increase in information and communication technologies provides students with unlimited access to the information superhighway” (p. 260).

Murphy (2012) discusses how people today are often turning first to mobile devices rather than computers to access the Internet because it is easier and more convenient, noting, “A growing number of researchers are engaging mobile devices as search tools. Smartphones, cell phones, and other mobile technologies are now commonly among the first places people turn when seeking information” (p.14). Murphy (2012) further claims that as more libraries and databases have applications which make inquiry easier, people are becoming more reliant on their mobile devices to find everything from quick facts to doing advanced research.

While Internet use in schools has increased dramatically, there has been little research about the Internet skills of students, specifically what would be necessary for success in a classroom environment. van Deursen and van Dijk (2010) identified two types of Internet skills needed to function in the information age. Information Internet skills, which are based on information processing models, include choosing a website or a search system to seek information, defining search options or queries, selecting information, and evaluating informational sources. Strategic Internet skills utilize the Internet by developing an orientation toward a particular goal, taking the right action and decision to meet the goal, and getting the benefit resulting from the goal. Using that framework, van Deursen and van Dijk (2013) evaluated the Internet skills of Dutch
secondary students to test the performance skills in both information and strategic Internet skills. It was found “Dutch secondary students have much room for improvement” (van Deursen & van Dijk, 2013) in both areas, which was similar to the findings of Kuiper (2007) who found that young students use the Internet, but are lacking proficiencies about search results and critical skills evaluating websites.

Norris and Soloway (2004) posit that children learn best when they have multiple representations and perspectives. Using the Internet makes it easy for students to get multiple viewpoints on a given topic, which can help them to better understand the content. It also allows for participation in hybrid online education, such as adventure learning (AL). Doering and Veletsianos (2008) examined AL by using a program called GoNorth!, which provided students with opportunities to explore real-world issues through authentic learning activities within collaborative learning environments. Common themes that emerged included student motivation and positive experiences with text and media.

Communication

Another way students benefit from mobile technologies in the classroom is to communicate with teachers and other students. The use of technologies that promote students communicating often includes a variety of audience response systems (ARS), also called clickers, which allow students to text or type in responses to questions or prompts.

Engel and Green (2011) analyzed how cell phones were used in a classroom as an ARS, where students were polled on topics, and the instructor was able to provide instant feedback. This created a situation where teachers could adjust their lesson immediately based on the responses of students. It also provided anonymity to students who might feel uncomfortable asking questions or making comments to the class (Engels & Green, 2011). Shon and Smith
(2011) noted that ARS systems allowed for both open and closed ended questions that could be sent to a board reviewed by the class.

Engagement was found to increase in classes where the teachers employed an ARS as part of instruction. Shon and Smith (2011) investigated the use of a popular ARS, Poll Everywhere, in two undergraduate social work classes. In addition to findings that revealed 90% of students found the text-based polling easy to use and over 90% believed it was helpful in learning content, instructors noticed that students found the discussions engaging. Karaman (2011) also found that students were engaged in a class using an ARS for classroom discussions. This was based on a survey of student responses, where 100% of the participants indicated that they would prefer to use the ARS more often, and 80% claimed they found lessons using ARS more exciting. Another study by Blasco-Arcas, Buil, Hernandez-Ortega, and Sese (2013) found an increase in student engagement with the use of ARS among students in an undergraduate business program in Spain.

Interactivity was also noticed in classes using technology for communication. Shon and Smith (2011) found that students were more likely to participate in a class using an ARS system, which is consistent with findings by Karaman (2011), where 60% of the participants self-reported that ARS increased their contribution to lessons. Blasco-Arca et al. (2012) also noted the importance of interactivity, which was higher in classes using ARS. Additionally, Milner (2006) described how using tablets in an algebra class where the teacher would transmit handwriting, text, images, and internet sites to each student’s computer allowed students to annotate the content. Students would then send back comments and information to create two way communications.
While students and teachers may find discussion using technology engaging and interactive, research about classrooms using ARS and the impact it has on academic achievement is not consistent. Karaman (2011) studied the effects of an ARS, examining academic success and student perceptions in a mixed methods study. Forty-four undergraduate students were randomly assigned to a control or treatment group, with the treatment group receiving instruction with an ARS in class. The control group responded to the same multiple choice question verbally. It was found that the use of ARS significantly increased learning in the first four weeks, but not in the second four weeks, and there was no difference in retention between the groups. Additional researchers have also found that to be the case (Guthrie & Carlin, 2007; Liu, Gettig, & Fjortoft, 2010).

That is in contrast to the findings by other research, which has found an increase in academic achievement in classes where an ARS has been implemented (Blasco-Arca et al., 2012; Cauldwell, 2007). Cauldwell (2007) found students who used ARS have shown an increased academic performance on exams, depending on the extent of their use. A study by Blasco-Arca et al. (2012) also revealed higher academic achievement, and the authors concluded, “The high level of interactivity with peers and with the teacher that is promoted by the use of clickers positively influences active collaborative learning and engagement, which, in turn, improves student learning performance” (p. 102).

**Differentiation**

Differentiation is pedagogically based on the idea that educators should vary the approach they use to meet the unique needs of each learner (O’Donoghue, 2009; Tomlinson, 2000). Tomlinson (2000) posits differentiation should consider the readiness, interest, and learning profile of a student. Readiness refers to the student’s knowledge or skill a student brings to
learning a new topic, interest involves what evokes a student’s passion or curiosity, and learning profile is how a particular student learns best.

Technologies in the classroom can provide a way for differentiation among students (Aronin & O’Neil, 2011; Lightle, 2011; Looi et al. 2009). In the area of readiness, several studies have shown how technology can support differentiation for students with special needs. Campigotto, McEwen, and Epp (2013) describe how the use of an iOS application was implemented in special education classrooms with students in grades 7-12. Results included positive outcomes on student perception of success. Kitsis (2010) also found ways to differentiation by readiness with online literature circles, and noted, “The conversation is slowed down, making it more accessible to students…who struggle to formulate ideas quickly” (p. 53). On the other end of the spectrum, Ash (2011) describes how universities have partnered with local K-12 schools to offer online learning opportunities tailored to gifted students and high achievers.

The use of technology also allows teachers to differentiate based on interest. In their discussion of self-determination theory, Ryan and Deci (2000) posit choice is one determinant to feeling autonomy, motivation, and healthful functioning. That was also observed in research by Patall, Cooper, and Wynn (2010), where it was found that students who were offered choices had higher intrinsic motivation, felt more confident, and performed higher on tests. Additionally, Hobgood and Ormsby (n.d.) pointed out how technology can allow for differentiation of content in almost limitless ways.

Tomlinson (2000) also discusses the importance of learning style on differentiation. There are multiple ways that researchers have been able to incorporate various technologies into classrooms to allow students to learn in a way most conducive to their learning style. For visual learners, Lightle (2011) suggests photo stories using Animoto or Window Photo Story 3 and
online posters using Glogster, while Sawmiller (2010) discusses using video clips or images posted to a blog. Verbal learners can create podcasts and blogs (Aronin & O’Neal, 2011; Lightle, 2011) or create a Blabber on Blabberize (Aronin & O’Neal, 2011). Auditory learners can benefit from the wide range of videorecordings available online and VoiceThreads (Lightle, 2011). Kinesthetic learners can use apps to measure motion or photograph or film reenactments of visual representations of scientific concepts (Gillen, Littleton, Twiner, Staarman & Mercer, 2007). According to Looi et al. (2009), technology is useful in allowing multiple ways of delivering content and assessing students to meet the individual needs of each learner.

Technology further supports project learning and assessment. Aronin and O’Neil (2011) suggest twenty different ways that technology can be used for assessment in classrooms, including online videos, wikis, word clouds, presentations, blogs, video comics, Power Point games, and webquests, which, “requires higher-order thinking skills to complete an inquiry online scavenger hunt” (p. 25).

The Role of Mobile Technology in Collaboration

Mobile technologies provide opportunities for collaboration among students in the classroom (Looi et al., 2009; Liu & Kao, 2007; Norris & Soloway, 2004; Vesisenaho et al. 2010; Wong & Looi, 2010; Wright, 2010). Researchers have analyzed the role of handheld devices in higher education, and found the use of technology to support collaboration (Liu & Kao, 2007; Vesisenaho et al. 2010; Wright, 2010). Vesisenaho et al. (2010) draws from the socio-cultural and socio-constructivist approaches for learning to conclude, “Both of these approaches emphasize students’ collaborative work with their peers and active participation” (p. 273). In evaluating a case study where students took notes from a course and shared them through an online microblog, students were able to view the notes from other people. According to
Vesisenaho et al. (2010), “The interpretations could be new, meaning innovative ways to understand the lecture, based on student’s earlier experiences. The interpretation could also be elaborated by or with fellow students” (p. 277).

The use of technology to foster collaboration, however, is not limited to higher education, and has been shown to also be effective in elementary and secondary classrooms (Looi et al., 2009; Norris & Soloway, 2004; Wong & Looi, 2010). Looi et al. (2009) and Wong and Looi (2010) evaluated case studies, which involved lessons where collaboration was fostered as students worked in groups to complete tasks. Daher (2009) also found that collaboration was important in a study about how middle school students responded to learning math with cell phones, noting that students sought others to work through difficult math problems.

Norris and Soloway (2004) contend that digital infrastructure has the ability to support project-based learning, which in turn, fosters collaboration and offers authentic assessment. According to Norris and Soloway (2004), “Projects are typically multi-subject, multi-person, multi-week, and multi-resource affairs that result in children developing real-world problem solving skills. After all, performing well on worksheets is not how the working world evaluates individuals!” (p. 284).

Ryan, Scott, and Walsh (2010) also found collaboration in multimodal classrooms. In their research, teachers noted that students in a multimodal classroom were more self-directed learners. One teacher commented that they could teach a skill to one student and that child could go and teach the others. The authors also spoke about the cooperative skills that were encouraged by such a classroom. According to Ryan et al. (2010), “One teacher felt that parental fears that computers were very isolating for children were unfounded as in the classroom there was much discussion and sharing around the computers” (p. 483).
It is important to note that other studies have contradicted those findings. Based on previous research, which revealed that students using tablets or PDAs in class lead to a lack of eye contact and awareness on visual focus (Scott, Mandryk, & Inkpen, 2003), Liu and Kao (2007) examined classroom collaboration. The results revealed that, “Students with handheld devices did not demonstrate expected participation ratios and actively interact with group members. In addition, they frequently guessed the visual focus of their partners and did not notice the non-verbal signals of their partners” (p. 296). The authors did, however, find when classrooms had display equipment in classrooms, collaboration increased. According to Liu and Kao (2007), “Experiments confirmed that the proposed shared display groupware attracted group members to perform effective communication…the shared displays enable group members to participate closely in shared activities achieving effective collaboration” (p. 297).

Other

Mobile devices have also been found to be beneficial to language learning (Bosoglu & Akdemir, 2010; Looi et al., 2009; Wong & Looi, 2010). Looi et al. (2009) studied children in Singapore learning English. While working in groups, students were able to move around the campus to find prepositions. They used the camera function to take pictures, and added text to complete the project, which was later shared with others. Wong and Looi (2010) also examined vocabulary learning with handheld technologies. The results of one of their case studies which analyzed improvisation, caused them to conclude that mobile technology was a unique element in supporting contextual learning. Additionally, in their quantitative analysis comparing the use of vocabulary flashcards in a traditional paper format and on mobile phones for college students, Bosoglu and Akdemir (2010) found that vocabulary learning was more effective on mobile phones.
Other ways that technology can benefit classrooms involve voice functioning, which students can utilize to study poetry, public speaking, and storytelling (Prensky, 2004). Blaisdell (2006) advocates having students record their readings so teachers could count the number of words per minute read. Global positioning system, graphic displays, applications and video clips can also be useful for content learning (Prensky, 2004), and technology allows students to digitally store portfolios (Beach, 2012).

**Challenges of Mobile Technologies in the Classroom**

Although there are many benefits to using mobile devices in the classroom, there also exist challenges. Mobile technologies can be distracting for students, causing them to be off-task or do the work at a slower pace. There are also issues with teachers’ perceptions about how and if technology should be implemented, which is influenced by their comfort level and the professional development available. Other challenges included network connectivity issues, fear of devices being stolen, and hype in the rhetoric surrounding the technology integration for educational purposes.

**Distraction**

One challenge of mobile devices in the classroom is that students get distracted (Kessler, 2011; Kirschner & Karpinski, 2010; Wood et al., 2012). In a study that questioned 500 college students, it was found that 73% were not able to study without some form of technology and 38% claimed they could not go more than ten minutes without checking their devices (Kessler, 2011).

A common form of distraction comes from social media sites, including Facebook and Twitter (Junco & Cotton, 2012; Kirschner & Karpinski, 2010; Wood et al., 2012) Kirschner and Karpinski (2010) examined the effects of college students on Facebook, and found that those
who accessed Facebook had a lower grade point average and spent less time studying. That was also found in research by Junco and Cotton (2012), whose study of college students indicated that college students who spent more time on Facebook and instant messaging had lower grades.

Those findings, however, are contradicted with what was revealed by Rouis (2011) who studied Tunisian college students and concluded that academic achievement was not affected by the amount of time spent on Facebook, although students with high Facebook usage reported problems with time management. Another study by Shah, Subramanian, Rouis and Limayem (2012) found that using Facebook in a way that students were cognitively absorbed and involved actually predicted higher academic achievement in a survey of 94 American undergraduate students.

In addition to being distracted by mobile devices during studying, research has shown that students who multitasked using technology during class did worse academically. Wood et al. (2012) described how students using social media sites or instant messaging during college classes scored lower on examinations than students without access. It was also found that the more often students multitasked during lectures, the lower scores were on those exams, causing the researcher to conclude, “When two cognitive tasks were being performed simultaneously there were decrements in performance in at least one of the tasks, namely memory performance” (p. 371).

That is consistent with research by Rosen, Lim, Carrier, and Cheever (2011) in which students were randomly placed into groups and received either zero, four, or eight texts messages during a 30 minute class. The results indicated that students who received four texts did similar to the group who received no texts, but those who received eight texts retained significantly less information from the class, particularly those who responded to texts quickly. Ophir, Nass, and
Wagner (2009) also identified groups of heavy media multitaskers and light media multitaskers to understand the role it plays in being able to ignore distractions, and found that heavy media multitaskers had more difficulty ignoring distractions. According to Ophir et al. (2009), “The present research suggests that individuals who frequently use multiple media approach fundamental information-processing activities differently than do those who consume multiple media streams much less frequently” (p. 15585).

It was also found that students who were off-task took longer to complete assignments (Bowman, Levine, Waite, & Gendron, 2010; Carr, 2010). Bowman et al. (2010) placed college students into three groups; one that read a passage and took a test without any instant messaging, one that had an instant message conversation before the reading, and one that was interrupted with an instant message conversation during the reading. The results showed that the groups did not show a significant difference in reading comprehension, but the group who was interrupted took over 20% longer to complete the task.

Research also suggests that distractions from technology are responsible for changing people’s ability to focus (Carr, 2010; Shepard & Mullane, 2010; Oulasvirta, Rattenbury, Ma, & Raita, 2012). Oulasvirta et al. (2012) examined mobile device user’s behavior to see if checking their devices was habit forming. By tracking the amount of times smartphone and laptop users checked their devices, it was found that those who had smartphones checked substantially more often, which suggested that smartphones prompted habit forming behavior. Carr (2010) also discussed how using technology changes the pathways of the brain, making it difficult for people to concentrate, even when away from their technology. Additionally, Shepherd and Mullane (2010) posit that students can develop a one-click mentality when using computers in the
classroom, and are frustrated when they are not provided with instant gratification, leading to a
generation filled with impatience.

Discussing the finding of the U.S. Department of Labor Secretary’s Commission on
Achieving Necessary Skills (SCANS) report on what skills are needed for students entering the
workforce, Shepherd and Mullane (2010) claim that many digital natives enter the workforce
with the skills described by SCANS, but consider some tasks tedious and do not want to be
bothered by them as a result of the one-click mentality. That is in complete contrast with the
findings by Monk, Trafton, and Boehm-Davis (2008) who claim, “Dealing with interruptions is
not a problem to be overcome as much as it is an inevitable part of life. In fact, the ability to
multitask is considered a desirable job skill by many employers” (p. 299).

Another problem is getting students to understand that these technologies are tools for
learning instead of devices for entertainment (Ryan et al., 2010; Wong & Looi, 2010). When
Wong and Looi (2010) analyzed observations and interviews to identify some of the issues that
had caused an uneven level of participation among students during a project, they found that
students were more interested in the technology as toys than tools. Ryan et al. (2010) also noted
that teachers commented that students’ enthusiasm was often with the technology itself and not
with actual learning.

**Teachers Readiness to Integrate Technology**

Another challenge to the integration of personal technologies within the classroom involves
teacher readiness. Adiguzel, Capraro, and Willson (2011) investigated teacher readiness in
implementing handheld device use based on the technology acceptance model, which has five
constructs: perceived ease of use, perceived usefulness, subjective norms, intention to use, and
dependability. Results indicated that perceived usefulness and perceived ease of use were significant, and that dependability had an effect on the perception of usefulness and ease of use.

Other studies about teacher perceptions of barriers to integrating technology identify first order and second order challenges (Snoeyink & Ertmer, 2001). First order concerns are external, and include lack of equipment, technical support, necessary resources, and issues of unreliability related to technology. Second order barriers are those regarding the school culture and attitudes. A first order change described by Zhao, Pugh, Sheldon, and Byers (2002) is that, although many schools have computer labs, access can be limited if it is shared among numerous teachers. Even when teachers do feel they have enough technology, there are often concerns that it does not work properly (Lim & Khine, 2006; Zhao et al., 2002).

According to Fullan (1982), who wrote about change theory, “Educational change depends on what teachers do and think- it’s as simple and complex as that” (p. 107), which is similar to the belief by Bitner and Bitner (2002) that whether and how a teacher implements technology is ultimately based on their beliefs. Fear, anxiety, and lack of motivation are described as challenges faced by teachers when implementing new technologies (Duhaney, 2001). Bitner and Bitner (2002) posit that these types of problems need to be addressed by schools to ensure that teachers are comfortable using technology, and the changes it will bring to their pedagogy.

Harris and Sullivan (2000) also pointed out, “When teachers are asked to integrate technology they are really being asked to change and adopt new teaching tools” (p. 12), which are often very different than the tools currently use in classrooms.

A lack of knowledge for teachers who do not have the technology skills and pedagogy is another challenge (Hughes 2005; Wachira & Keengwe, 2011). In a meta-analysis of barriers to technology integration, Bingimlas (2009) listed a lack of professional development as one of the
most problematic issues of integration. Even when professional development is available, it is often not adequate to make an impact in student learning (Gaytan & McEwan, 2010). Gaytan and McEwan (2010) investigated professional development in technology integration on student learning by evaluating twenty current studies. According to Gaytan and McEwan, “The primary goal was to propose a high-quality model to evaluate the impact of educators' professional development on student learning” (p.79). The research found that evaluations were primarily focused on measuring the impact of teachers’ perceptions about their competence of integrating their new learning into the classroom. None of the studies reviewed emphasized measuring student learning after professional development, leading the researchers to recommend a five step model to focus on student learning instead of teachers’ satisfaction or self-confidence.

Additionally, Traxler (2010) discussed how education changes in a classroom with handheld devices. With all of the information now available to students, there is a shift in the function of educational institutions, “progressively demystifying their roles as gatekeepers, custodians and arbiters of technology and knowledge” (p. 156).

Other

Another challenge, according to Convery (2009), is that there is more rhetoric surrounding the benefits of technology without a realistic look at the lack of empirical evidence about how high-tech teaching is better than other methods. By analyzing a British government report about technology in the classroom, Convery (2009) depicted overinflated language by technologists, who he claimed are rarely knowledgeable about education or classroom situations. Convery (2009) commented, “Technologists occupy this space vacated by mainstream educators, and in this vacuum, their voices become inevitably privileged” (p.30). Additionally, Convery (2009) posits when technology does not deliver the expected results, the blame falls on teachers, who
are criticized for not implementing a program or technology correctly, instead of on the technology itself. Furthermore, Convery (2009) denies the notion that learning takes place wherever there is technology, which he believes is a popular assumption due to the language that is communicated to the public.

Additional challenges in the literature were about the safety of students who are able to get online (Milner, 2006; Schaffhauser, 2011), managing applications that run on different handheld devices (Milner, 2006), parents refusal to let students use technology because of fears that it will be lost or stolen (Wong & Looi, 2010; Schaffhauser, 2011), students that are unable to type quickly working at a slower pace (Ryan et al., 2010), network access and establishing and maintaining an acceptable use policy (Blaisdell, 2011), and technical problems (Milner, 2006; Wong & Looi, 2010). Cheating is another concern, and a recent study conducted by Common-Sense Media (2011) found that one-third of high school students admitted using their cell phones to cheat. Finally, Shepherd and Mullane (2010) describe concerns that the learning which engages students is often the more superficial aspects, such as its speed and color, and that these technologies are viewed as games instead of learning tools, but that poses the question, can they be both?

**The Role of Gaming and MUVEs**

Gaming can be a powerful means of teaching and learning in a classroom since students, particularly adolescents, find them engaging and stimulating (Charsky & Ressler, 2011; Papastergiou, 2009; Watson, Mong, & Harris, 2011). Because of the strong student motivation to play video games outside of school, it follows that there should be some investigation of the ways they could be employed within the classroom. Additionally, multi-user virtual environments (MUVEs) are three dimensional cyber worlds where users create an avatar that can
move, interact and create in a shared virtual space, and are becoming more prevalent in educational settings.

**Gaming**

Papastergiou (2009) examined the motivational appeal of a computer game used to teach computer memory concepts to high school students in Greece. Groups of students were randomly placed in two groups, one of which used gaming to teach course concepts, and one that did not. Both groups had the same subject matter and curricular objectives. Feedback from a questionnaire and observations during classes indicated that students using the gaming technology were more motivated than those in the non-gaming group. Results from a pretest and posttest of students also showed that students using the gaming application performed significantly higher on the posttest. These findings lead researchers to claim that educational computer games can be used as learning environments within high school computer science courses, since they can improve knowledge of the subject matter and were found to be motivating to students.

Watson et al. (2011) also examined in-class video games for teaching high school history. In their study, the authors sought to understand teacher and student experiences with a video game designed to teach a unit about World War II. By collecting data from four groups of students with the same teacher, it was noted that the differences between the atmosphere of gaming and traditional classes was dramatic. Transcripts from focus groups revealed that students were not only motivated in class, but that further discussions took place about the game outside the classroom, prompting one student to comment, “We kind of formed a little UN over lunch” (Watson et al., 2011, p. 5). This dialogue also included different classes who were involved in playing the game, and went beyond discussions of what happened in class to working on
strategies for their group to win. In addition to motivation, the teacher described how this setting was conducive to teachable moments, leading the authors to posit three theories: video games can enhance student engagement, video games can promote a learner-centered learning environment, and teacher facilitation is an important part of effectively using video games in the classroom (Watson et al., 2011).

In another study on video games in a history classroom, Charsky and Ressler (2010) focused on the use of concept maps with gaming to examine the impact on student motivation. High school students were assigned to one of three groups: one with pre-generated concept maps, one with student made concept maps, and one with no concept maps. All groups played an off-the-shelf game called Civilization III. In contrast to the authors’ prediction that concept maps would increase motivation levels, survey results indicated that students who used a concept map showed lower levels of motivation. Those students who were allowed to play the game without concept maps, however, had a higher rate of motivation in playing the video game than conventional classroom instruction.

The concept maps could have been less motivating because students believed they were designed in a teacher centered way. According to Prensky (2007), for gaming to be motivational, it needs to be created so that students are empowered, whereas many of the educational games today are a reproduction of the existing power structure with information coming from teachers with gaming elements added. Prensky (2007) differentiates between mini and complex games, describing mini-games as those that generally take less than an hour, pertain to a narrow topic, and sometimes have several levels, but are usually a more challenging level of the same skill. In contrast, complex games usually take 20-60 hours to complete, and have various levels of complicated goals and challenges. Multiple skills need to be learned and students must
collaborate for success. While complex games do not fit into the time structures found in most schools today, the skills needed for success are more authentic (Prensky, 2007).

**MUVEs**

Kettlehut, Nelson, Clarke, and Dede (2010) examined a multi-user virtual environment (MUVE) to investigate the effects on academic achievement and motivation in inquiry learning. Using a MUVE called River City to teach middle school biology, students were placed in three experimental groups with varying delivery models and a control group. It was found that students who had access to “live” characters for help while playing and those who played with a situational context with increasingly difficult tasks outperformed students using a traditional curriculum. A significant finding was that students who previously had below average grades in science demonstrated similar knowledge to students who had a history of above average grades in that subject. That was similar to findings by Charles, Charles, McNeill, Bustard, and Black (2011) who examined MUVEs in relations to providing Game-Based Feedback (GBF) to students in a university setting and claimed, “It appears that GBF may be more beneficial to weaker students than the most capable” (p.649). Other benefits noted by Charles et al. (2011) included enhancing educational feedback and student engagement.

Gamage, Tretiakov, and Crump (2011) examined educators’ perceptions of MUVEs. One group of participants had no previous experience with MUVEs and the other group was comprised of early adopters, who were familiar with how they could be used in educational settings. After the group with no MUVE experience was shown a demonstration of how it worked, semi-structured interviews were conducted and analyzed using the constant comparative method. Findings revealed that the perceptions of both groups were similar and overall positive, “suggesting a positive outlook for eventual wider MUVE adoption” (p. 2413).
These studies indicate that gaming and MUVEs can positively influence student motivation. They also show how content can be taught in an alternative format having the same, and sometimes better, academic outcomes. This is especially important for students who have been struggling with traditional methods who were able to find academic success.

**Mobile Devices and Student Motivation**

Student motivation is an important factor in academic achievement (Hodis, Meyer, McClure, Weir, & Walkey, 2011). The use of mobile devices in the classroom can increase motivation levels, both in general and special education settings. Additionally, social media sites, such as Facebook and Twitter, can also affect student motivation.

**Motivation in the General Education Classroom**

Godzicki, Godzicki, Krofel, and Michaels (2013) conducted an action research project with 116 students to increase student motivation among elementary and middle school students using a technology supported environment, which included iPads, iPods, and video recording devices. Results revealed that students were more likely to participate in classroom activities when they involved technology, and one of the teacher researchers concluded, “My students have been more motivated and engaged daily by my implementation of a technology-supported learning environment” (p. 101).

Other research with teachers has found that their perception of technology integration with tablets and netbooks increases student motivation (Ifenthaler & Schweinbenz, 2013; Swan, van’t Hooft, Kratcoski & Unger, 2005). Ifenthaler and Schweinbenz (2013) examined the acceptance of a Tablet-PC integration on teachers during a pilot program. Using semi-structured interviews with eighteen teachers at three different schools, it was found that eleven of the eighteen believed it would be motivating to students to work on the PCs. According to one participant, “Students
are in general more motivated, motivated for the topic and the subject…the students’ motivation is very important to me…normally our students’ attitude towards school is not very positive” (p. 532). Those findings are similar to what was found by Swan et al. (2005) in their interviews of K-8 teachers, who found that students who used mobile devices provided by the school for classwork and homework, “agreed that their students’ motivation to learn and engagement in learning activities was improved by their use of mobile computing, which resulted in increased student productivity and improved quality of work” (p. 106).

Research with students has also found them to be motivated by handheld devices (Bonds-Raacke & Raacke, 2008; Lin & Wu, 2010; Swan et al., 2005) Lin and Wu (2010) examined the effects of netbook mobile computers in a sixth-grade English class in Taiwan. Results from student questionnaires indicated that students were more motivated based on responses that they liked English class better, were more attentive, felt more confident and found learning English less difficult with the netbooks. Swan et al. (2005) also found increased student motivation in their interviews with students, who claimed that writing was “easier” and “more fun” on a mobile device than paper. Those findings were not age specific, with Bonds-Raacke and Raake (2008) having similar results with students in higher education, also reporting higher motivation levels with tablet PCs in Statistic and Psychology classes.

**Motivation in the Special Education Classroom**

As the use of mobile technology is growing in the general education classroom, the use of how these devices affects students with special needs still remains largely unexplored (Ramdoss et al., 2012). O’Malley, Lewis, and Dunhower (2013) studied the effects of using iPads with students diagnosed with autism spectrum disorders in a classroom setting. The iPads were used as part of an intervention to increase independent task completion and basic math skills.
Although results were mixed for math skill improvement, it was found that students increased task completion, and there was a decrease in noncompliant behaviors.

In another study, Fernandez-Lopez, Rodriguez-Fortiz, Rodriguez-Almendros, and Martinez-Segura (2013) examined the use of mobile technology, based on iOS devices which personalize learning, to support students with special needs in Spain. In addition to improving basic academic skills, it was shown to improve motivation with students, causing the authors to conclude, “The use of electronic devices and multimedia contents increases their interest in learning” (p. 86).

Additionally, in a five month study with special needs students in Toronto, Campigotto et al. (2013) explored the uses of an application called MyVoice, and how it would affect motivation with students. That application was chosen because it operates on iOS devices, was created to be used by people with special needs, and has been evaluated for its appropriateness as a cognitive and communication tool. According to Campigotto et al. (2013), “The findings demonstrate that to a large degree using iOS devices was both appealing and motivating” (p. 84).

**Social Networking and Student Motivation**

In addition to gaming, students today also spend much of their time on social networking sites, such as Facebook and Twitter. These popular sites offer potential ways to increase student motivation (Kurtz, 2009; Junco, Heiberger, & Loken, 2010; Wright, 2010) and communicate with others to form a community.

Lam (2012) examined Facebook to develop a model of student motivation by surveying 284 students in higher education courses in Hong Kong. The results revealed that interrelation, communication, participation, and social relationships found on Facebook significantly influence

Using Facebook also increased motivation in a study of college students in Turkey, who used the social networking site for formal educational purposes over a two month period (Coklar, 2012). Student feedback indicated positive attitudes about Facebook for disseminating information, igniting interest and motivation. Other studies investigating Facebook found similar results (Hurt et al., 2012; McCarthy, 2010).

In addition to Facebook, Twitter was also found to increase student motivation. Kurtz (2009) described a classroom where elementary students had multiple opportunities to “tweet” parents by typing in brief messages each day. Knowing that these messages would be read by their parents and friends offered an incentive for authentic writing and encouraged students to write more often. Kurtz (2009) also found that his students created Twitter accounts outside of school, which led him to conclude, “They’re learning the real purpose and power of literacy; communication” (p. 2).

Junco et al. (2010) used an experimental design to examine the connection between social media use, student engagement, and semester grades on college students. Seven sections of a course were randomly assigned to an experimental or control group. Only the experimental group employed Twitter as part of the class, and it was used for the following purposes: to continue class discussions, to offer students a low-stress way to ask questions, for class reminders, to provide academic and personal support, to help students connect with each other and instructors, and to organize study groups. Data from the study revealed an increase in engagement scores from the experimental group and indicated the use of Twitter had a positive effect on grades. Based on the findings, the authors claimed, “Twitter can be used to engage
students in ways that are important for their academic and psychosocial development “(Junco et al., 2010p. 10).

Wright (2010) also examined how Twitter could be used to support learning for students during a seven week practicum, to determine if microblogging helps teacher education students develop self-reflective practices. After posting at least three “tweets” each school day, participants indicated the use of Twitter helped their reflective practices, reduced isolation, and supported a sense of community. Furthermore, they claimed that they initially thought the 140 character would be limiting, but it helped them to think deeply and be succinct about what message they wanted to convey.

BYOT

While there is much research about the implementation of mobile devices in the classroom, it is severely lacking in the area of personal mobile devices in the classroom. The necessity for schools to provide one-to-one technologies along with budget cuts have prompted districts to consider implementing Bring Your Own Technology (BYOT) and Bring Your Own Device (BYOD) programs in their schools. Most of the literature on this topic, however, is descriptive rather than research based.

Schaffhauser (2011) evaluated a program called Bring Your Own Laptop (BYOL), where seventh-grade students were able to bring their laptops from home. Some of the concerns with the program included security of the laptops, students getting access to inappropriate sites, and equity for students. While the school was able to secure computers for students without laptops, that only provided access during the school day. Despite the challenges of the program, there were many benefits, such as higher student motivation, students taking more ownership of their learning, and students no longer having to carry around heavy textbooks (Schaffhauser, 2011).
Miller-Cochran and Gierdowski (2012) also studied an initiative to allow students to bring laptops, and found that to be a cost-effective solution to shrinking budgets. Additionally, Costa (2013) advocates allowing students to bring their own devices, detailing the advantages to budgets. Not only do schools save with the actual devices, but Costa explains how districts can save on the rising cost of software licensing using the 90/10 value. According to Costa (2013), “For most operations, schools can find a program that is legal and free that will do 90% of what the purchased one will...They must ask themselves, is that last 10% of functionality worth 100% of the license cost?” (p.7).

Ullman (2011) also discusses BYOD implementation and outlines “William’s Pyramid” which comprises three necessities for a BYOD implementation. The base of the pyramid is funding and leadership, which are essential for such a program. The next level is technology planning and support, which comes from getting stakeholders involved and having a plan. After those have been developed, standards need to be developed, including hardware, software, instruction, networking, and infrastructure, which comprise the top level.

Ackerman and Krupp (2012) have added onto “William’s Pyramid”, suggesting five components that are essential to consider in a BYOT/BYOD implementation. The first involves security issues, which includes infrastructure, wireless network, access points, and setting up a separate wireless network for students. The second is getting all of the stakeholders vested, and is necessary for success in such an implementation. The third involves policies, particularly an Acceptable Use Policy, that must be considered before allowing students to bring in their mobile devices. The fourth is professional development for teachers to change the way things are taught. Ackerman and Krupp (2012) posit that, instead of focusing on facts that students can readily look up, professional development should focus on teachers emphasizing higher level thinking skills.
The fifth component is financial sustainability, and highlights the need for districts to allocate funds to sustain technological necessities to maintain a BYOT/BYOD program.

Finally, November (2007) discusses the use of students personal technologies in the classroom, criticizing school systems for being a “reality-free zone” due to the restrictions on students’ technologies. According to November (2007), “If we could get past our fear of the unknown and embrace the very tools we are blocking (which are also essential tools for the global economy) then we could build much more motivating and rigorous learning environments” (p. 2).

**Summary of the Literature**

A review of the literature has shown there are many benefits to using mobile devices in the classroom. An important aspect for students today is Internet connectivity, allowing students access to an unlimited amount of information. These devices can be used for quick fact finding or to support more advanced research, and allows students to get multiple perspectives and visual representations of searches, as well as participation in Adventure Learning. Despite the ubiquitous use of internet use among students today, research also reveals that students are lacking the skills necessary for classroom learning, both in Internet information skills and Internet strategic skills.

Another benefit is that mobile devices open up doors for communication. The use of audience response systems encourages students to use their technologies to respond to teacher prompts. This technology allows students more interactivity in classroom discussions, with an opportunity for teachers to provide instant feedback, and respond to adjust lessons based on responses. It also offers anonymity for students who may not feel comfortable speaking in class or raising their hand. Research was consistent that student engagement and interactivity increased using
handheld devices. That was not the case, however, with academic achievement, with some studies indicating higher achievement with mobile devices and other not finding a significant difference.

Differentiation was another benefit of mobile devices in the classroom. Tomlinson’s (2000) seminal work in differentiation describes three traits for differentiation; readiness, interest, and learning profile. Studies with a range of learners from special needs to gifted provided insight about the way mobile technologies can differentiate based on students’ readiness. It was also found that providing students with choices in learning, based on their interest, contributed to higher motivation levels and could be done in limitless ways with the use of technology. Additionally, information was found for ways mobile devices could be used for different learning styles, including visual, verbal, auditory, and kinesthetic learners.

Research on the role of collaboration in classrooms has been inconsistent. Some studies have indicated that the use of technology has decreased eye contact and discussion with peers. In contrast, several studies have shown that students working together with mobile devices have allowed students to interact more and lead to collaborative work, both in K-12 and higher education settings.

It was also found that there are many challenges to using handheld devices for learning. Students getting distracted by social media sites and texting while studying presented issues, although the affect that had on grades was inconsistent. Some studies indicated a decrease in grade point average, while others showed an increase in academic performance. It was also found that multitasking during class led to lower comprehension of material in some research, but other research found it did not have a significant effect. The length of time for tasks, however, was consistently longer when students were multitasking in class. It was also posited
that the use of technology actually changes how the brain works, and makes it difficult to focus on tasks, even when technology is not being used.

Another challenge is teacher readiness for technology integration. One study evaluated the five constructs of the technology acceptance model and found that perceived usefulness and ease of use was most significant. Other research focused on first order and second order barriers. Additional challenges for teachers were fear, anxiety, lack of professional development and technical knowledge. Furthermore, shift from teachers as the source of knowledge to students becoming responsible for their own learning can be threatening to some educators.

An emerging area of research involves how video games and MUVEs are being used for educational purposes. Studies have shown an increase in content understanding and increased motivation levels when video games have been used in class. The one exception was a study where one group of students was required to use a concept map in addition to playing the video game, which was found to be less motivating. One author posited that video games should be created so that students are empowered, whereas many educational games continue the existing power structure with gaming elements added. Multi-user virtual environments were also found to increase student motivation and academic achievement, particularly in students who had struggled with content previously.

The literature supports the notion that mobile devices in the classroom increase student motivation. Research has shown that students are more likely to participate in classes where mobile devices are employed, teacher and student perceptions are that it is more engaging, and students found the work easier and more fun. That was also the case with students with special needs, where personalized applications increased interest in learning, and students with autism
spectrum disorder were able to complete more tasks without non-compliant behavior, which had previously been a problem.

Using social networking sites, such as Facebook and Twitter, for educational purposes was also found to increase motivation. Elementary students who used Twitter were encouraged to send “tweets” out to friends and family were described as being so motivated that they started doing this outside of class. The use of Twitter also helped form a collaborative community of college students and allowed them to self-reflect on a practicum, while another study showed how using social media fostered academic support and a means for communicating with others in the course.

Finally, the literature review concluded with a discussion of BYOT and BYOD programs. One study has shown an increase in motivation in a program where students were encouraged to bring their own laptops from home, and bringing personal laptops was found to be cost effective.

There were also several descriptive reports about the need for BYOT, and how it should be implemented, considering factors such as networks to support mobile technologies, having authorized user policies in place, and the financial considerations involved.

Chapter III: Methodology

Technology has changed the way people today access information. As the first generation of digital learners are now in school systems across the nation, schools must reevaluate what constitutes an effective learning environment, and how to motivate students to want to learn. This study is designed to explore the happenings within a BYOT classroom and the experiences and perceptions of students and teachers in that setting. The research questions to be investigated are:

1) How are students’ mobile devices integrated pedagogically into a BYOT classroom?
2) How do students experience learning in a BYOT classroom?

3) What are the perspectives of teachers about student confidence and motivation in a BYOT classroom?

To investigate these questions, I used a qualitative case study approach. According to Creswell (2007), case study involves exploring an issue through one or more cases within a bounded system, which could be the context or setting. The bounded system in this case is a district that allows students to bring their personal technology into the classroom for learning.

A constructionist paradigm was employed. Crotty (2003) defines constructionism as, “The view that all knowledge, and therefore, all meaningful reality as such, is contingent upon human practices, being constructed in and out of interaction between human beings, and their world, and developed and transmitted within an essentially social context” (p. 42). In line with the constructionist view, the research questions were designed to construct, rather than discover, meaning. The expectancy-value theory of achievement motivation was the guiding lens for this study, particularly the model developed by Eccles, Wigfield, and their colleagues (Eccles et al. 1983; Eccles & Wigfield, 1995; Wigfield & Eccles, 2000).

The role of the researcher in constructionist studies is based upon influences of the researcher’s personal epistemologies, belief systems, cultures and socialization (Denzin & Lincoln, 1994). As Crotty (2003) posits, “Different ways of viewing the world shape different ways of researching the world” (p. 66). The researcher generates the question to be studied, selects the theoretical lens to view the research, and decides what information and whose voices are showcased and whose are edited out completely. In this case, I worked to eliminate bias through self-disclosing relevant information, particularly about being an employee of the district that was studied and being a parent of three students in that district who have experience
bringing their own devices into the classroom. I then gathered enough data to make the study credible and documented the processes I used to construct meaning from the data.

Findings from this study are useful in guiding pedagogical decisions about curriculum within the district and could offer insight to other districts considering the use of a BYOT policy.

Research Design

Denzin and Lincoln (2000) claim, “Qualitative researchers study things in their natural settings, attempting to make sense of, or interpret, phenomenon in terms of the meaning people bring to them” (p.3). Qualitative methods were employed in this study for several reasons. Creswell (2007) claims qualitative research is appropriate when there is a need for a complex, detailed understanding of an issue, which can only be established by talking directly with people, and allowing them to tell their stories. He goes on to content that qualitative research empowers participants to share their experiences, tell their stories, and minimize power relationships. This is particularly significant in research with minors, whose voices are often marginalized (Saldaña, 2009). In this case, exploring the experiences among secondary students and teachers was best approached by qualitative methods because it allowed students to tell their stories and offer insight about this issue, in their own words. Often, decisions in education are made with little regard for the views of students (Birzea et al., 2004). In alignment with qualitative inquiry, this study offered students a voice about practices which are part of their school experience.

A qualitative design was also useful to understand the contexts or settings and the relationship these have with the participants and topic being studied (Crotty, 2003; Yin, 1994). The context in this case was the district that allows students to use their personal mobile technologies in school, and it cannot be separated from the students’ experience as they integrate the technologies into academic learning. To fully explore the issues, the research addressed the context as part of the
study and acknowledges that using personal devices is permitted, and even encouraged, in the district. This practice is in contrast to the many school systems, which have strict policies forbidding the use of personal mobile devices for secondary students.

According to Creswell (2007), “We also use qualitative research because quantitative measures and the statistical analyses simply do not fit the problem…to level all individuals to a statistical mean overlooks the uniqueness of individuals in our studies” (p. 40). This compelling statement illustrates why qualitative methods were the best fit for this study; to learn about the experiences of students and teachers from their voices and to observe the happenings within a BYOT classroom offers a more detailed and holistic perspective of the topic than would be available from other types of inquiry.

**Research Tradition**

This research implemented case study methodology. According to Yin (2009), “A case study is an empirical inquiry that investigates a contemporary phenomenon in depth and within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident” (p.18). Yin (1994) further claims that case studies can be used to generate theories, but cautions that results are generalizable to theories only, and not populations. The focus of this research was to provide a highly descriptive account of the bounded system of one district allowing the use of students’ personal mobile devices. The units of analysis were the students who regularly use their personal technologies in class and classes within the district.

Yin (1994) identifies three specific types of case studies as exploratory, explanatory, and descriptive. Exploratory studies are used to explore a topic and define a research question or hypotheses for future study. Explanatory research is preferred when a causal relationship is under investigation. Descriptive studies are those used to provide a rich description of events and their
contexts, which is the case for this research. Providing a thorough and detailed description of a
BYOT classroom and the experiences of those most directly involved it is the purpose of this
study. Yin (1994) also categorizes case studies between single and multiple, and because there
was one bounded system, this was a single case study.

Stake (1995) differentiates case studies as instrumental, collective, and intrinsic. Instrumental
studies are aimed at providing insight into an issue or problem or to refine a theory. In these
cases, understanding the complexities of the case can be secondary to understanding something
else. Collective studies involve a number of cases studied jointly to understand a phenomenon,
condition or population. Intrinsic studies work to understand a specific case because the case
itself is of interest. That could be because it has unusual characteristics, is ordinary, or has
particular features. This study was an intrinsic study because the objective was to better
understand the case, with the particular feature of the BYOT program as the particular feature.

There are several reasons that the case study approach was chosen for this research. This
method is appropriate to provide a highly descriptive account of a phenomenon in a bounded
system where multiple sources of data are collected (Creswell, 2007; Merriam, 1998; Yin, 1994).
In this case, the bounded system is the district which has implemented the BYOT program.
Observations, interviews, blog postings, and documents were all used for data collection to
provide information about the BYOT classroom, student experiences, and teachers’ perceptions.
Data from those multiple sources was used for the triangulation of data, which Yin (2012)
claims, “Pertains to the goal of seeking at least three ways of verifying or corroborating a
particular event, description, or fact being reported by a study” (p. 81). Triangulation, therefore,
strengthened the validity of the case study (Creswell, 2007; Yin, 2012).
Case study is also used when there is a significant relationship between the context and the phenomenon studied (Creswell, 2007). Yin (2003) posits, "You would use the case study method because you deliberately wanted to cover contextual conditions-believing that they might be highly pertinent to your phenomenon of study" (p. 13). In this case, the lines between the phenomenon of students using their personal technology and the district that promotes BYOT have become blurred, and the context was highly significant to the case.

Additionally, case study methodology is useful to study a contemporary phenomenon (Yin, 1994). The ubiquitous nature of mobile technology has changed the way people learn in the information age, and budget cuts have prompted educators to consider the use of personal technologies in classroom learning. This highly relevant issue is an important topic in education today.

Finally, case study can be useful to build theory from the case to inform practice (Eisenhardt & Graebner, 2007; Yin, 1994). Findings from this research contribute to the current body of knowledge about how students learn with their own technology and student motivation, which can bring about necessary change. Ultimately, the intent of this research is to help inform this type of pedagogical dialogue and improve practice.

**Data Collection**

**Recruitment of Participants**

Purposeful sampling was used for this study. Patton (2002) identifies several types of purposeful sampling, including extreme case, intensity, convenience, maximum variation, typical, and snowballing. Typical sampling and snowballing were employed. The purpose of typical sampling is to illustrate what is average, normal, or typical. To better understand what is typical within a BYOT classroom, both students who use their personal technology in the
classroom and students who do not own or have access to personal technology at school were sought. No students without personal technologies responded to the recruitment information, and none were able to be recruited through snowball, despite several attempts.

The sample consisted of twelve student participants. As noted by Miles & Huberman (1994), “Samples in qualitative studies are usually not wholly prespecified, but can evolve once fieldwork begins” (p. 27). Participants were recruited until it was determined that enough perspectives had been obtained to offer a detailed answer to the research questions.

For student recruitment, Appendix A shows the letter went to students and their families by email, explaining the study and asking for participation. Contact information was provided, so that potential participants and their families could ask questions. There was also a meeting scheduled after school, where students and parents have the opportunity to meet with the researcher to discuss any concerns or questions in person.

Because there was a low student response rate, that letter was also placed as a flyer on bulletin boards in public spaces throughout the district to recruit students. When some participants had been identified, the use of snowballing was employed by asking students if they could recommend others that bring their own mobile devices to school on a regular basis or if they know someone who does not bring personal devices to school. To compensate students for their time, an incentive of a Subway gift card was offered for participation.

Of the twelve student participants, seven were girls and five were boys. One student was African American and the other eleven were Caucasian. Table 1 summarizes the student participants.
Table 1

Summary of Student Participants

<table>
<thead>
<tr>
<th>Name</th>
<th>Grade</th>
<th>Age</th>
<th>Gender</th>
</tr>
</thead>
<tbody>
<tr>
<td>Allison</td>
<td>9</td>
<td>15</td>
<td>F</td>
</tr>
<tr>
<td>Bridget</td>
<td>6</td>
<td>11</td>
<td>F</td>
</tr>
<tr>
<td>Hazel</td>
<td>12</td>
<td>17</td>
<td>F</td>
</tr>
<tr>
<td>Jacob</td>
<td>11</td>
<td>16</td>
<td>M</td>
</tr>
<tr>
<td>Joseph</td>
<td>9</td>
<td>15</td>
<td>M</td>
</tr>
<tr>
<td>Katherine</td>
<td>11</td>
<td>17</td>
<td>F</td>
</tr>
<tr>
<td>Maria</td>
<td>6</td>
<td>11</td>
<td>F</td>
</tr>
<tr>
<td>Michelle</td>
<td>9</td>
<td>14</td>
<td>F</td>
</tr>
<tr>
<td>Phillip</td>
<td>6</td>
<td>12</td>
<td>M</td>
</tr>
<tr>
<td>Rachel</td>
<td>7</td>
<td>12</td>
<td>F</td>
</tr>
<tr>
<td>Ted</td>
<td>7</td>
<td>13</td>
<td>M</td>
</tr>
<tr>
<td>Trevor</td>
<td>10</td>
<td>15</td>
<td>M</td>
</tr>
</tbody>
</table>

Similar tactics were taken to recruit teachers. The initial contact came from an email sent out on the district’s intranet, Appendix B, which explained the research study and asked for participation. Two of the teachers who participated responded directly to the email, agreeing to an interview and classroom observation. The other two teachers were recruited through snowballing, with one recommended by the Instructional Technology Specialist at one school and another by a student participant, as a teacher who often used technology. Throughout the interviews, several of the teacher participants mentioned the person who was leading the BYOT initiative, and that person was later contacted by email and accepted a request to be interviewed. Of the educators recruited, four were teachers and one was an administrator in the district. There were two men and three women, and the years of experience ranged from 1 to 25. Table 2 provides a summary of the educator participants.
Table 2

Summary of Educator Participants

<table>
<thead>
<tr>
<th>Name</th>
<th>Number of Years in education</th>
<th>Gender</th>
<th>Frequency of BYOT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Karen</td>
<td>22</td>
<td>F</td>
<td>3 days a week</td>
</tr>
<tr>
<td>Mike</td>
<td>1</td>
<td>M</td>
<td>2-4 days a week</td>
</tr>
<tr>
<td>Dominique</td>
<td>25</td>
<td>F</td>
<td>Every day</td>
</tr>
<tr>
<td>Clint</td>
<td>25</td>
<td>M</td>
<td>N/A</td>
</tr>
<tr>
<td>Maya</td>
<td>7</td>
<td>F</td>
<td>3 days a week</td>
</tr>
</tbody>
</table>

Observations

“Observational data represent a firsthand encounter with the phenomenon of interest rather than a secondhand account of the world obtained in an interview” (Merriam, 1998). For this reason, observations were a useful form of data in this study. Along with other data collection, such as interviews and reviewing documents, observations were also a significant way to triangulate data for case studies (Yin, 2009). Additionally, Kidder (1981) claims that, although we observe things around us all the time, observations become an important research tool when the observations serve a purpose, are planned deliberately, recorded systematically, and are subjected to control on validity and reliability. All of these criteria were met for this study in that observation served the purpose of observing the daily activities to understand the happenings within a BYOT classroom and were planned in advance with the teacher and researcher. Observations were also recorded systematically with an observation tool and memos, and validity and reliability was achieved through member checking, triangulation of data, noting researcher bias, and peer review (Creswell, 2007).

In this study, the role of the researcher was observer-as-participant, where I identified myself as a researcher, but made no pretense of actually being a member of the group being observed.
According to Jorgensen (1989), participant observations are appropriate when the following conditions are met:

1. The research problem is concerned with human meaning and interactions viewed from the insiders’ perspective
2. The phenomenon being investigated is observable within an everyday setting
3. The researcher can gain access to the appropriate setting
4. The phenomenon is sufficiently limited to be studied as a case
5. Research questions are appropriate for case study
6. Research problem can be addressed by qualitative data gathered by direct observation and other means of pertinent to the field setting

In this case study, the research problem is concerned with human meaning because the problem involves students’ and teachers experiences with a particular phenomenon in context. Human meaning and an insiders’ perspective was obtained from observations in this instance. The phenomenon was observable within the everyday setting of a BYOT classroom, and the researcher was able to gain access to that setting. The phenomenon was limited to the BYOT program within the specific district to be studied, and the research questions were directly related to the program. Additionally, the research problem was addressed qualitatively by direct observations combined with student and teacher interviews, a blog, and a review of documents.

There were three observations of classes utilizing students’ personal mobile devices into the lesson, lasting approximately 45 minutes each. Taking as many notes as possible during observations was beneficial to data collection (Glesne & Peshkin, 1992). It was important, however, to be aware that notes should be descriptive and analytic, but not judgmental (Glesne, 2011). Emerson, Fretz, and Shaw (1995) also suggest using shorthand or jottings to assist in
capturing as much detail as possible, while Glesne (2011) posits that drawing and sketches can be useful to help remember and capture what is observed. An observation instrument was designed to look for observable behaviors or motivations, such as conversations about the lesson and activities, time-on task, and non-verbal cues (smiling, scowling, etc.). High quality recording devices were placed in the room to supply additional information (Creswell, 2007). As suggested by Merriam (2009), the thoughts of the researcher were recorded immediately after the interviews. Glesne (2011) also advocates using some type of journal to keep a collection of thoughts and writings about anything that seems important, which I utilized.

Throughout the process of collecting and analyzing data from observations, Wolcott (1994) describes three ways of presenting the data. The first is to stay close to the original data, providing a descriptive account and using words of the participants. The second is to extend beyond a purely descriptive account with a systematic analysis to identify key factors, and the third is to shift from the original data to interpretation. In this study, the second way of presenting data by extending beyond a descriptive account with systematic analysis was employed.

**Interviews**

Another method of data collection was from in-depth interviews. Patton (2002) claims that we interview people to find out those things that we cannot directly observe. These can include thoughts, intentions and feelings. Interviews are an important way to help researchers to understand the participant’s point of view and uncover meanings in their experience (Kvale, 1996). To better understand students’ feelings about motivation, questions were designed to elicit responses that provided answers to the research question.
Roulston (2010) describes different types of interviews as structured, semi-structured, and unstructured. In structured interviews, the researcher follows scripted questions in a predetermined sequence. In contrast, unstructured interviews involve free flowing conversation where the interviewer and interviewee ask questions and make meaning together. In the middle are semi-structured interviews, in which the interview protocol is used as a guide, but adaptable in the order questions are asked and followed up with probes based on the responses of the individual participant. This research used a semi-structured interview format to provide enough structure to provide questions that provide data about the research questions, yet allowed for flexibility to explore the experiences of teachers and students knowing that, “each interview will vary according to what was said by the individual interviewees” (Roulston, 2010, p. 15).

To design the instrument that was used, Patton (2002) identifies six types of interview questions:

1. Experience/ behavior questions- to understand interviewees experiences or behaviors
2. Opinion/value- to understand interviewees views, can begin with “in your opinion”
3. Feeling- participants reflect on their feelings, can begin “How did you feel when”
4. Knowledge-asking participants to recall factual information
5. Sensory- find out about what interviewees heard, saw, etc.
6. Demographic-provide demographic information

For the teacher and student interview protocols, Appendix C and Appendix D, experience behavior/questions, opinion/value questions, feeling, knowledge, and demographic questions were used. Experience and behavior questions were beneficial to understanding the experiences of students in a BYOT learning environment. Opinion and value questions helped to ascertain how students feel about learning using their own devices or learning in a BYOT classroom.
Feeling questions provided information about the students’ emotions while learning in a BYOT classroom. Knowledge questions were used for students to recall the types of devices used by their peers, and demographic questions were used to determine the age and grade of students, as well as providing a starting point whereby students felt comfortable early in the interview with questions that required little thought.

In addition to these types of interview questions, Jansick (1998) describes questions as being descriptive, follow up, experience, clarification, structural/paradigmatic, and comparing/contrasting. This study used descriptive, experience, and comparing/contrasting questions to better understand how students and teachers compare and contrast a BYOT classroom with one where technology is not integrated into the curriculum. Follow up and clarification questions were integrated as appropriate.

In preparing for the actual interviews, McNamara (2009) suggests eight principles that I employed:

1. Choose a setting with little distraction
2. Explain the purpose of the interview
3. Address terms of confidentiality
4. Explain the format of the interview
5. Indicate how long the interview usually takes
6. Tell them how to get in touch with you later if they want to
7. Ask them if they have any questions before you both get started with the interview
8. Do not count on your memory to recall their answers

Once the interviewing was underway, it was important to facilitate a good rapport with participants (Adler & Adler, 2002; Kvale, 1996). This was done by having a brief conversation
with interviewees about how long they have been in the district and general demographic background. I took additional time with students, being cognizant that adolescents may feel more uncomfortable than adults.

Throughout the interview, Seidman (2006) discusses listening on three levels: to the spoken word; to the unguarded intent and terminology; and to non-verbal cues. Seidman (2006) also posits that the interviewer should respond to the interviewee, but not lead their response to the question, asking questions such as, “What was it like for you?” (p.85). Other suggestions from Sediman include jotting down notes for follow-up questions without interrupting participants while they speak and asking interviewees to tell stories about experiences, to give examples, and to ask for concrete details. Additionally, Seidman posits the interviewer should limit sharing their own experiences, listen without agreeing or disagreeing, and be patient with the responses of interviewees, not filling in silences throughout the interview.

As is the case with observations, it was important to write down the thoughts and impressions immediately after interviews in the form of journaling or memoing. Memos provide a trail to document how decisions were made and conclusions drawn (Speziale & Carpenter, 2007) and are especially useful to extract meaning for the data (Birks, Chapman, & Francis, 2008; Speziale & Carpenter, 2007). Other functions of memos are to maintain momentum (Birks et al., 2008, Patton, 2002) and open communication, especially if there is more than one researcher involved in a study (Richards, 2005). Using memos to think about of the data was a useful tool for the research. According to Birks et al. (2008), “Memoing enables the researcher to engage with the data to a depth that would otherwise be difficult to achieve” (p. 68). Through the use of memos, researchers can get immersed in data and explore meanings. Additionally, Eaves (2001)
discusses being completely honest in your memos, which includes documenting self-doubt from the researcher. These suggestions were followed in this study.

There are differing views on how to memo. Charmaz (2006) distinguishes between early and advanced memos while Strauss and Corbin (1998) discuss classifying memos into operational memos, coding memos, and theoretical memos. On the other hand, Glaser (1992) disagrees with the need to separate memos and posits that the separation offers no clear advantage. According to Charmaz (2006) the best approach to memo writing is “do what works for you” (p. 80), which is the advice that I followed. That involved a continual documentation of memos as new data was revealed, with notes that showed ideas evolving with the new information.

**Blogs**

Another method of collecting data came in the form of an online blog. Hookway (2008) posits that a blog provides a low-cost technique for collecting a substantial amount of data. It also provides data in text form, immediately providing a data source without the need for transcription (Liamputtong & Ezzy, 2005). Another benefit is that it provides access to populations that may be geographically far away (Mann & Stewart, 2000).

The blog in this study was used similar to a focus group, where students could answer questions, make comments, and give feedback to others in the group. According to Onwuegbuzie, Dickinson, Leech & Zoran (2009), focus groups allow the researcher to get multiple perspectives on a topic, and Krueger (1994) posits that focus groups can provide a socially constructed environment where people can come together to make meaning of a situation, and in this case, allowed students who bring personal technology to have a conversation about their experiences in a BYOT classroom. Additionally, blogs offered students more time to consider the questions before answering and the ability to piggyback on comments
from others in the group. These thoughtful responses were able to yield more thorough information. It also provided a non-threatening environment to students who may have felt more comfortable expressing their views anonymously, as all students on the blog used pseudonyms (Hookway, 2008).

For this study, a student blog was set up through the district’s website, which is a common practice among teachers in the district. It was secured with a password and only participants had access. The researcher checked the blog at least twice each day to ensure that all conversations were appropriate. Questions for the blog repeated some from the student interviews, but those were used with flexibility, allowing the conversation to flow organically.

**Documents**

The final form of data collection came from documents. Yin (1994) notes that documents are stable, unobtrusive, exact, and have broad coverage. Furthermore, they provided an additional source of data for triangulation (Creswell, 2007). Data from documents came from the district’s policies on BYOT.

Documents that were reviewed were those that are publicly available on the district’s BYOT website, and included pages about BYOT, technology and information services, appropriate use of computers, instructional technology, and the 2012-2015 technology plan. There was an additional request for documents from the district about BYOT that were not publicly available.

**Data Storage**

The interview transcripts, observation instruments and transcripts, as well as all notes, jottings, and memos were on my personal tablet, which had a security passcode. All hard copies of that data were kept in my home safe. The advice of Creswell (2007) to use high quality recording devices was followed, as well as that of Davidson (1996) to always develop backup
copies of computer files. Additionally, a filing system was devised for the substantial amount of information that needed to be analyzed (Plummer, 1983) and a master list of all the information gathered was created (Creswell, 2007). Only I will have access to the data, and it was only shared it with my advisor, Jane Lohmann.

Prior to sharing the data with my advisor, the names of all participants were changed to pseudonyms and there was a single key, which was secured in my home safe. All references to the participants in notes, coding, and written text referred only to the participant by their pseudonym. The researcher was also cognizant not to use any identifying information that could jeopardize confidentiality, and the setting was general enough that readers would not be able to ascertain the specific site involved in the study. After the study has been completed and published, the data and key will be destroyed at a time determined appropriate by the advisor, and the online blog will be completely deleted.

Data Analysis

All interviews, blog postings, observation notes, and memos on documents were transcribed and coded. Saldaña (2009) defines a code as “a word or short phrase that symbolically assigns a summative, salient, essence-capturing, and/or evocative attribute for a portion of language-based or visual data” (p. 3). Coding did not occur in a sequential order, but rather, followed the advice of Miles and Huberman (1994) that, “Coding should not be put off to the end of data gathering. Qualitative research depends heavily on ongoing analysis” (p. 66).

Several types of coding were used throughout the analysis process. Because the focus of a case study is developing an in-depth description of the case (Creswell, 2007), descriptive coding was employed. Saldaña (2009) posits that this type of coding is advantageous for beginning qualitative researchers and can be used to analyze data from interviews, correspondence, and
field notes. This method involves using a word or short phrase to summarize the data. Tesch (1990) points out that these codes should identify the topic in contrast to abbreviating the content. For this study, descriptive codes were used to develop the basic vocabulary and ideas that would be interpreted later.

Another form of coding that was employed was in vivo coding, which uses the actual words of the respondent. Saldaña (2009) claims in vivo codes are particularly useful with children and adolescents to provide a more in-depth understanding. It is also suitable for studies that honor the participant’s voice (Saldaña, 2009), which is especially important in cases where minors are involved.

Throughout the process, Yin (1994) recommends that researcher’s “play” with the data to look at it from different perspectives, and Miles and Huberman (1994) suggest the following ways to use arrays to find meaning and connections:

1. Making a matrix of categories and placing the evidence within such categories
2. Creating data displays—flowcharts and other graphics—for examining the data
3. Tabulating the frequency of different events
4. Examining the complexity of such tabulations and their relationships by calculating second-order numbers such as means and variances
5. Putting information in chronological order or using some other temporal scheme

Although there should be flexibility in the analysis process, and new ideas may come from the manipulation of data in various ways, there must be a general analytic strategy or it is likely that a researcher will waste a lot of time and have false starts (Yin, 2009). Yin (2009) outlines four such strategies which include relying on theoretical propositions, developing a case description, using qualitative and quantitative data, and exploring rival explanations. The
strategies for analyzing data in this study was developing a case description and relying on theoretical propositions.

Developing a case description was employed once the transcripts had undergone initial coding, and a matrix was created with each of the three research questions. Codes were organized to see which question they best answer, although there was an overlap of codes. It is important to remember that data analysis is a highly iterative process and that the codes, arrays, and patterns may be evolving as more insights and connections are made by the researcher (Saldaña, 2009), and that was true of this analysis.

For the research questions about the way mobile devices are pedagogically integrated into classroom and student experiences in a BYOT classroom, Stake’s (1995) method of establishing patterns was used. This method involved the inductive process of finding patterns that emerge from the data. This aligns with pattern coding described by Miles and Huberman (1994) as finding emergent themes by pulling together data in more meaningful ways. That is where Yin’s (2008) strategy of developing a case description was utilized.

For the research question about teachers’ perceptions of student engagement and motivation, Yin’s (1994) pattern matching was implemented. Pattern matching involves using a theory to make sense of the data. The theory for this study stemmed from expectancy-value theory of academic motivation. The focus of this part of the analysis were issues of motivation, particularly the expectation of success and the subjective task values of incentive and attainment value, and utility value that were discussed earlier. That analysis applied Yin’s (2009) strategy of relying on propositions.

**Trustworthiness**
There are differing views on how to evaluate qualitative research. While Patton (2002) posits that reliability and validity are factors which should concern the researcher, Healy and Perry (2000) argue that the quality of research should be judged by the conditions of each paradigm, and uses terms such as credibility, confirmability, and transferability. Stenbacka (2001) posits that because reliability issues concern measurements, they are irrelevant in qualitative research, and Lincoln and Guba (1985) claim, "Since there can be no validity without reliability, a demonstration of the former [validity] is sufficient to establish the latter [reliability;]") (p. 316).

For the purpose of this study, the tenets of Guba (1981) were followed to ensure trustworthiness. Guba (1981) outlines four criteria in evaluating qualitative research; credibility, transferability, dependability, and confirmability. Credibility increases the internal validity by demonstrating that the research measures what is intended to be examined. Some ways the researcher can improve the credibility includes using appropriate methodology, triangulation of data, member checking, iterative questioning, and providing a thick description of the phenomenon. Transferability comes from providing enough details of the context for the reader to determine if the situation could be applied to other settings. Dependability occurs through a detailed description of the methodology, which would be sufficient for another researcher to repeat the study. Confirmability is achieved by the researcher admitting their bias, recognizing shortcomings of the study, and making available enough details where the results can be scrutinized.

This study attained credibility by choosing case study methodology, which is appropriate for this type of research and using member checking. Data was also triangulated by the use of observations, interviews, a blog, and documents. Additionally, items in the interview and blog
were worded so that questions are iterative to determine if the participants answer similar questions in the same way.

Transferability came from the deep description of the context, provided by the documents available, observations within the classroom, and stories of the students and teachers. These descriptions would offer other researchers enough detail to determine if the BYOT program could be applied to other settings.

Dependability was achieved by the detailed description of the methodologies, which included the complete details of the research design, research tradition, sampling strategies, data collection methods, data storage, and data analysis methods. I was transparent with all of these methodological steps so that another researcher could replicate the study.

Finally, confirmability came from a statement of researcher bias, where I revealed professional and personal connections with the district under study. There was also a section outlining the limitations of the research, and enough detailed descriptions provided whereby the results could be subject to scrutiny.

**Protection of Human Subjects**

Kirk (2007) identifies three ethical issues involved when children are participants of qualitative research. The first is power relations. To mitigate this dynamic, it was communicated that participation was completely voluntary, and that participants could stop at any time for any reason. There was also extra consideration in the wording of the interview questions to minimize the power imbalance between the students and me.

The second issue Kirk (2007) discusses is informed consent, which was met by the IRB Informed Consent form, Appendix E, which offered a detailed description of the case study in age appropriate language. The consent form was read and signed by all participants, and
reviewed verbally before each interview. A question and answer session was available after school one day for students and parents to ask questions and learn more about the research.

The final concern raised by Kirk (2007) is confidentiality. As previously mentioned, all students were assigned a pseudonym that was used throughout the study with a key kept in a secure location in my home and there was no identifying information. Additionally, I complied with all IRB instructions to protect this vulnerable population.

**Summary**

This chapter outlines the research design for this qualitative case study that explored the way mobile devices are pedagogically employed in a BYOT classroom, students’ experiences learning in this setting, and teachers’ perceptions about student engagement and motivation in a BYOT classroom. Justifications for why each of the methods proposed for this study for data collection, data storage, and data analysis were addressed and supported with research. Additional information was provided about ways to the trustworthiness of the study was strengthened and the protection of human subjects. Findings from this study will contribute to the literature about this highly relevant topic in education today.

**Chapter IV: Report of the Research Findings**

The data collected for this research study was designed to provide information that would answer the three research questions posed. To better understand a Bring Your Own Technology (BYOT) classroom, including the context and the how personal devices are integrated into the pedagogy of a classroom, students’ experiences, and teachers’ perceptions of student confidence and engagement, various methods of data collection were employed. A document review provided valuable information about the context of this initiative, including the history, logistical issues of connectivity, and security. Student interviews, observations, and a student blog were
used to learn about students experience learning in a BYOT classroom. Teacher interviews were conducted to address teachers’ perceptions of student confidence and engagement. Finally, observations, interviews, and the blog provided insight about how student devices are pedagogically employed in a BYOT classroom.

**Case Study District**

**Context**

This case study was conducted in a suburban district outside a major city in the Southeastern section of the U.S. Currently, there are over 37,000 students in thirty-five schools, and growth continues in that area. Table 3 provides the ethnicity of students in the district.

Table 3

**District Demographics**

<table>
<thead>
<tr>
<th>Race</th>
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<tbody>
<tr>
<td>African American</td>
<td>3%</td>
</tr>
<tr>
<td>Asian</td>
<td>9%</td>
</tr>
<tr>
<td>Caucasian</td>
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<td>Hispanic</td>
<td>12%</td>
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<tr>
<td>Other</td>
<td>3%</td>
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Students come from a high variance of socio economic statuses (SES) within the district, with free and reduced lunch rates ranging from 6% to 59%. Slightly more than 20% of families are considered economically disadvantaged, and the district houses five Title I schools. Additionally, 14% of students in the district are served by special education programs, and 4% are classified as Limited English Proficient.

**History of BYOT**

The BYOT initiative began in 2009 with an increase in the wireless connectivity necessary for the program to be successful. A pilot program was then implemented with forty teachers in
seven schools throughout the district. The focus for that group was to integrate creativity, collaboration, communication, and critical thinking (the 4Cs of digital learning) into the standards based curriculum. Parents and students signed contracts, agreeing to use the technological devices appropriately, and absolving the schools of liability for lost, stolen, or damaged property. That August, professional development included breakout sessions to teach other educators how to successfully begin implementing the policy at their schools. The program was not mandated, but encouraged by county officials, with the goal to have all schools participating. By the fall of 2010, thirty-one schools, including all of the county’s high schools and middle schools, had adopted the policy. The program continued to grow, and is now in all district schools from elementary grades to high school. Tours are available for educators around the country to view firsthand how BYOT works to support learning in the classroom.

Currently, the district has a three-year technology plan that has been submitted to the state. In alignment with the mission of the county for students to not only contribute, but to excel, five goals have been set with detailed plans on how to achieve them using technology. The goals are to 1) increase student achievement while expanding educational opportunities, 2) recruit, develop and retain a highly qualified workforce, 3) enhance educational programs through increased community involvement, 4) communicate effectively both internally and externally, and 5) pursue and secure alternate funding and resources while maximizing operational efficiency. The technology plan guidelines go through 2015.

**BYOT Policy Guidelines**

The district provides specific guidelines for both students and teachers. The full responsibility for the device lies with the student, and the policy clearly states that the school is not liable for student owned technology. Students are only allowed access to files or Internet sites which are
used for classroom learning, and those may not be used for non-academic purposes or for cheating. At a teacher’s request, students are required to turn off their technology, as using personal devices is considered a privilege, not a right. There are also restrictions against “hacking” or bypassing any network security or bringing damaging programs that could cause viruses into the system, which are in violation of the Acceptable Use Policy.

Documents from the district prohibit students from using networks other than those provided, stating, “Only the Internet gateway provided by the school may be accessed while on campus,” and mandates that students should not attempt to bypass sites blocked by the filtered network. Both students and teacher participants, however, have noted that it is a common occurrence for students to get off of the BYOT network and onto their personal data plan. An interview with the person leading the BYOT initiative revealed the district is moving away from a policy that prohibits students from using a specified network towards one that teaches personal responsibility.

The BYOT policy of this district is not typical of schools around the nation, as many systems prohibit student devices on school premises. Because student technology is not only allowed in the classroom, but integrated into the curriculum, this context was an ideal setting for this research study.

**Participant Profiles**

**Students**

**Allison.** Allison is a fifteen-year-old student in ninth grade and has been attending school in the district for ten years. She enjoys hanging out with friends, and she uses her iPhone for texting and using Twitter and Instagram when she is not in school.
In school, Allison uses her technology for translating in Spanish and doing research. A learning activity that she enjoyed was going around the school and using an app on her phone to scan QR codes, which lead to information with questions about biology. After one question was done, she would look around the school for the next code.

Although Allison prefers hands-on learning, she finds that her grades have been better with more traditional methods, such as when a teacher lectures. While she mentioned, “It would be fun to work with groups and go out in the hallway,” she is concerned that her grades will be lower working that way.

Allison likes to use her own technology because it is “much faster,” and believes that the skills she is using in a BYOT class will benefit her in college in being a more self-directed learner. She is not sure, however, how those skills will be used for a future career. The challenges she sees with students bringing in mobile devices include students being distracted and websites being blocked.

**Bridget.** Bridget is in sixth grade and eleven years old. She has been going to school in the district for the last seven years. Outside of school, she enjoys hanging out with friends, cheerleading, and horseback riding. The personal mobile device that she brings to school is her iPhone 4S, which she uses to text friends and manage her music when she is not in class.

For learning, Bridget uses apps on her phone, such as dictionary.com and looks up information for projects and papers. A learning activity for which she enjoyed using her own device was creating a Stop Motion project, which is a technique of animation in which objects appear to be moving. Bridget worked with a group on that project, for which they animated different words and images about communication and collaboration. When it was complete, they
presented it to the class. Learning as a group is how Bridget prefers to learn, commenting, “I like working in a group because then you can get everyone’s opinion about what they think about it.”

Bridget feels as though she learns better in a BYOT classroom, and when asked why, she claimed, “It’s kind of just more entertaining, um, it’s easier, it’s faster.” She describes her personal learning style as being visual, and finds that when she looks up information, there are often images that are helpful for her learning. She believes what she is learning in a BYOT classroom will help her in the future. Specifically, she believes that creating presentations, such as the Power Points and Prezi’s she has to do in class, and being able to research will be useful for future goals. The only challenge Bridget noted in this setting is that students are often playing games when they are supposed to be doing research.

**Hazel.** Hazel was the oldest student interviewed for this study, being seventeen and a senior. She and her brother, Jacob, took part in the study and shared information about their BYOT and online learning experiences. Both siblings had attended school in the district for four years when their family moved to Hong Kong for eighteen months. While in Hong Kong, they attended the district’s online virtual school. The family returned to the U.S. approximately one year ago, and the children went back to the schools they had attended previously. Outside of school, Hazel likes to spend time with family and friends, and uses her iPhone and Macbook for social media websites.

In the classroom, Hazel uses her personal devices to write papers, to do research, and for organizational purposes, such as checking the district’s portal that has student assignments, grades and course information. She uses her technology every day in school, although she said not every teacher allows the use of personal technology that often.
An activity that Hazel found particularly enjoyable was using voice threads where the teacher had a Power Point and students could ask questions or comment on the material as it was happening through a phone or laptop. She also enjoyed creating Prezi presentations. When asked if she thought those types of skills would be useful to her in the future, she thought it was limited to a school environment. Hazel also mentioned that she liked learning at her own pace in a BYOT classroom. She did, however, point out that she preferred learning content in a more traditional format, describing how it was very difficult for her being in the virtual school and having to do so much learning on her own. She finds it easier to learn when a teacher presents the material and there are class discussions.

Hazel likes to use her own technology over what is provided by the school because hers is much faster and it takes a long time to start up the school computers.

Jacob. Jacob is Hazel’s brother, and he is sixteen and a junior in high school. He has been attending school in the district for five years, including attending class in person and as part of the virtual program while in Hong Kong. Outside of school, Jacob likes to play sports and games on his computer. He brings his iPhone and iPad to school, and has a Macbook that he leaves at home because it is “kind of awkward to carry around,” but often uses it for homework.

For learning, Jacob described an activity done in an AP European History class where students viewed Power Points with voice threads on his device. In this format, each student went through the information at their own pace and used the voice thread to respond and ask questions about the content.

Jacob also used his devices for research, working on projects, and looking up information on the district’s portal, and mentioned that he uses her personal technology every day for learning at school.
Relating his personal learning style to BYOT, Jacob said he likes learning new content in a more traditional setting. He believes that his virtual learning affected his views on this subject, and claimed, “It definitely changed more after [named virtual school].” Despite that, Jacob mentioned that there is only one class where he does not use technology on a regular basis and he does not particularly like that class. When asked if he thought it was due to the lack of technology, he said he believed it was “somewhat related” and thought it would “definitely” be more interesting if the teacher used more technology. He also likes being able to work at his own pace, which may be particularly advantageous to him as a student who skipped a grade.

Some of the challenges Jacob noticed in a BYOT classroom are students being off-task, leaving the district approved BYOT website to get on their data plan to check Facebook and Twitter, and lack of signal in certain parts of the school campus. He said students often get caught up playing games or texting when they are supposed to be learning.

Jacob strongly prefers his own technology over the school’s because it is much faster. He also described how his laptop, iPad and phone are all connected, so when he works on a document it automatically sends to his laptop “so I can pick up where I left off on my laptop at home.”

Discussing the future, Jacob thought there were several ways that learning in a BYOT classroom would benefit him. He described how technology helps his ability to do things quickly and efficiently, and how getting a balance of self-learning and being in a classroom will prepare him for college. He also described how he wants to be a mechanical engineer and how learning a program called Solid Works, which he described as a 3D AutoCad program, for a class will help him in with that endeavor. Jacob relayed how using that program on the school’s computer was “super-slow,” but is much better on his device, and he can use it at home “if I come up with an idea.”
Joseph. Joseph is a fifteen-year-old freshman in high school, and has been in the district for only one year. He is active in sports, playing on the football and golf teams, and uses his iPhone for texting, getting on the Internet, and playing games in his free time.

In school, Joseph primarily uses his device for doing research on the Internet, looking up assignments on the district’s portal, and accessing online textbooks. He described one of his most enjoyable activities as one where he used his phone to scan in QR codes around the school for a math class where each code lead to a page of information and you would have to answer a question to go on to the next one. In recounting the activity, he recounted, “It was kind of like a game.”

Joseph would prefer to learn about a new topic in a BYOT setting because, “You do more interactive things, instead of just listening to a teacher talk.” He also describes his learning style as hands-on and feels as though he works better in groups since they can learn from one another. He has noticed that he is assigned more group projects in BYOT classes. Joseph likes the overall feel of the room in a BYOT classroom, which he claims is less strict and more laid back. He also finds it easier and more convenient to use his own phone, which is faster, and saves him the trouble of having to save things on a flash drive, although he prefers to use the school’s technology for typing longer papers.

Joseph’s perception is that using personal technology in the classroom will help him with future goals. He believes it helps him to learn on his own, which will get him better grades. He also feels that what he is doing in math with his technology, designing figures out of lines, will help him if he becomes an engineer, which is a career path that interests him.

Some of the challenges that Joseph notices are that a lot of websites, including Twitter, are blocked, and that the network is slow. He also mentioned that he is not able to get service in
certain areas. Additionally, Joseph finds that he plays games and gets distracted at times, which leads to him not finishing his work

**Katherine.** Katherine is a seventeen-year-old junior who has been in the district for approximately one year. She enjoys horseback riding and being with friends. Her personal mobile device that she brings to school is a Samsung 3, and she uses it for social media, calling, and texting outside of class.

Early in the interview, Katherine claims that she “never” uses her technology for learning in school, preferring the school’s computers when she does use technology, but later she described how she uses Google to look things up on her device. She did say that her teachers allow personal technology, describing a literature class where students were reading a book individually and could text comments or questions, which would appear on the screen for others to reply, but that she personally never did that.

Although Katherine says she does not often use her technology, even when given the chance, she responded that she would prefer to learn new things in a BYOT classroom, and likes learning by herself instead of hearing lectures from a teacher. She does believe using her technology will help her with her long term goal of being a pharmacist since she will need to do research and have computer skills.

Some of the challenges that Katherine describes involve lack of signal, which is why she uses the school’s technology more often than her own, and that students are often not on the BYOT network. Instead, she claims, they are using their 3G to spend time on sites that were blocked, such as Twitter and Facebook.
Maria. Maria is eleven years old in sixth grade, and has attended school in the district since kindergarten. She likes to hang out with friends outside of school and uses her Samsung smartphone for calling, texting, going on Instagram for fun.

In school, Maria uses her mobile device to look up information for projects, which are usually done in groups. For her last project, Maria described how partners were assigned a region to research, and she and her friend divided the work. She researched information about climate conditions, while her friend found information about the economy. The completed project was to include a paper and Power Point that would be presented to the class, and Maria commented that she enjoyed working on the Power Point, but did not like writing the paper. She also discussed using her device for a project where students had to create a business with a logo, and looked online for examples. According to Maria, “We had to figure out a logo for the company, and it was really fun looking at the different websites and looking at different types of logos that looked really cool.”

When asked about what Maria liked in a BYOT classroom, she mentioned being able to work with others and having projects instead of tests. She specifically did not like taking tests because everyone does the same thing at the same time. Maria also finds working in a group easier because you can split up the work. Although Maria prefers BYOT classrooms for assessment, she would rather learn new content in a traditional class. She finds that if a teacher explains it, then she knows she has the right information, whereas if she has to find information herself, she is concerned that she may not have learned it correctly, remembering a time when that happened, causing her to get a low grade.
Maria’s perception is that learning in a BYOT classroom will help her in the future. She is considering a career as a scientist working with wildlife, and it would be necessary to use technology to research information about animals.

Some of the problems Maria sees with BYOT classrooms are that phones sometimes go off in class, which is “very annoying,” and a lot of websites are blocked, which is why she prefers her own technology over the school’s. She further communicated that students are often not on the BYOT network checking Instagram or texting when they are supposed to be learning.

Michelle. Michelle is a fourteen-year-old ninth grade student who has attended school in the district since pre-kindergarten. She enjoys horseback riding, cheerleading, being with friends, and going to movies when she is not in school, as well as using also her technology for social networking sites like Twitter and Instagram.

Michelle has an iPhone and iPad that she brings to school with her, although she says that she is only able to use her technology in two of her seven classes because the other teachers do not allow it on a regular basis. Michelle finds that better for her learning style since she prefers a traditional classroom and gets much more distracted when her technology is available. She does, however, use it often in Spanish for translations and presentations, and in biology for online reading and documentaries.

One of the issues with a BYOT classroom that Michelle notices is that students are often not using the technology for learning, but are instead, often going off of the BYOT network and spending time on Twitter, Facebook, and Instagram. Michelle also described how lots of students cut and paste information from websites to use for papers since it’s much easier.
When it comes to using personal versus school technology, Michelle favors using her own. She claims her technology is much faster, but she has to use the school technology in certain classes because she is not able to get signal in all of the buildings on her high school campus.

Phillip. Phillip is a twelve-year-old student who has attended school in the district since kindergarten, and is now in sixth grade. When I went to his home to interview him, he was busy playing video games and wanted to finish his game before doing the interview. He mentioned that he often plays video games outside of school, including playing these games with friends online. He also enjoys being with friends and reading. He brings his iPod Touch and phone to school, both of which have connectivity to the Internet, and often uses his iPod Touch for games and his phone for texting and calling people outside of the classroom.

Phillip uses his devices in school for research, and described an activity where students had an app that allowed them to scan in QR codes so that they can pull up teacher generated questions, which was set up in a scavenger hunt format. He said that was done as an enrichment activity after other classwork was complete. He also described an autobiography that he was working on where students had to research the meaning of their names, which he found interesting. He prefers to use his personal technology to look things up, but for typing papers, he finds it easier to use the school’s computers because it is “hard and annoying” to do that on his phone. Phillip does not see how using personal technology will help prepare him for the future, claiming, “It’s just useful at the time.”

Some of the challenges Phillip noted about BYOT are that phones sometimes go off in class, recalling how once during band, two people’s phone went off in one class period. The teacher threatened to take the phones away, but did not. He commented that, even though teachers are supposed to take technology away and have the parents come to get it, that rule is not often
enforced. He also sees students playing with their technology when they are supposed to be doing something else.

Given the choice of learning about a new topic in a traditional or BYOT classroom, Phillip would rather learn using his personal technology. He feels he learns best with hands-on activities and technology, and that a BYOT classroom is good for his learning style. He also noted that learning is “easier on technology.”

**Rachel.** Rachel is a seventh grader who is eleven years old, and has always attended school in this district. She likes to hang out with friends and plays softball on a local recreational team. She brings her phone and iPad to school with her nearly every day for learning.

In the classroom, Rachel uses her devices to take notes, research information, and for projects. She described a recent project about the lack of education in Sierra Leon, and found the information on her devices, noting that she would not have been able to do that with a textbook because each student had a different issue. Rachel also used her technology to create a digital design that was later turned into a t-shirt.

Rachel considers herself to be a visual learner and believes a BYOT classroom is well suited for her learning style because she is able to view images of content on her technology. She also notes, “If you get to work at your own technology, you get to work at your own pace instead of staying with the class when they go super-slow or super-fast.” She prefers to learn with BYOT, instead of having to take long pages of notes, which she does in some classes. In the future, she is not sure how learning in a BYOT classroom will help her in goal to be a lawyer.

One of the problems that Rachel notices with BYOT is that students often use technology for texting and things other than classroom learning. She describes how students “goof off,” and
when this happens, teachers sometimes do not allow students to use their technology, punishing the entire class.

**Ted.** Ted is a thirteen-year-old seventh grade student, who has attended school in the district since first grade. When he is not in school, he likes to hang out with friends, play football, and compete in lacrosse. He has an iPhone 5, which he uses at home to play video games and text friends.

Some of the ways Ted uses his mobile device in the classroom are for research, using the calculator, for projects, and to get on Safari, which is a learning resource. A specific learning activity that Ted found fun was making a Stop Motion about cells. His group used Jell-O and candy to represent a cell and then, using an app on the iPhone, and made the pictures move. Describing that project, Ted commented, “It was fun, it was a lot of fun, I think that was one of my favorite projects over the years.”

Ted prefers to learn things in a BYOT classroom because he feels that is easier for him to learn. He also works a lot in groups in this environment, which is helpful because he said, “I just don’t think well by myself…it’s good to hear other people’s opinions.” Ted likes using his personal technology better than what the school provides because it is more mobile and he can take the information he looks up in class with him anywhere.

A problem that Ted encounters in a BYOT setting is that he gets distracted and finds himself playing on his phone when he should be looking up information. He often sees students playing games such as Super Stickman Golf, which is blocked by the BYOT network, but available on iPhones if people go to a different network. He also claims that websites are often blocked.

**Trevor.** Trevor is a fifteen-year-old sophomore who has been going to school in the district for seven years. He likes to hang out with friends, watch TV, and play video games, as
well as and football. His personal mobile device is an iPhone, and when he is not in school, he uses it to access Facebook, Twitter, “watch YouTube and other fun things,” to text, and play games.

When he is in school, Trevor uses his device to look up grades, take notes, research things, and as a translator for Spanish. He also uses them for web assigns, which are online quizzes. He prefers to do that on his personal device over the school computers because it is easier for him. He described some polling activities that he has done using his technology, where questions are asked and students text in their answers, which show on the smart board.

When asked how he likes to learn about a new topic, Trevor said, “it depends,” because he likes learning in a traditional classroom and having a person to talk to, but also likes using technology so that he can go at his own pace. He prefers having a balance of both types of learning. Trevor describes himself as a hands-on and visual learner, and believes a BYOT classroom works well with his learning style because if a teacher teaches it one way, he “can go back and learn it another way or I can go back and see a visual of it.” Trevor prefers to use his own technology because he feels it is easier, however, he does use the school computers if his class is in the computer lab or if he has to print something.

One of the problems with BYOT that Trevor notices is getting off-task, claiming that when he gets bored, he sometimes finds himself playing games during class. He also notes that many websites are blocked, including YouTube on the school’s network and that there is no service on some parts of campus. Another challenge is that students sometimes find the answers to homework online, describing an incident when students in one class found answers to an assignment and copied them. Furthermore, at certain times, the Internet is very slow.
Trevor believes that learning in a BYOT classroom will help him with his future goals because technology is advancing and he feels that a basic understanding of technology literacy will be useful. Trevor wants to be an engineer and believes the technology he uses in his engineering classes will help him, describing how much he enjoyed simulations using software that designers use to test things before they are built.

**Teacher Profiles**

**Dominique.** Dominique is a high school math teacher, who has been teaching for twenty-five years. She has been in the district for eleven years, and has visually impaired students who use their own technology every day, and uses it with others “as appropriate to learning.” The most common devices she sees are phones, including iPhones and Androids, iPads, and laptops.

In her classroom, Dominique uses personal technologies in several ways. She uses Join Me, which allows students to link up to her class discussions with their personal devices. Dominique described how this has also been used with a student who was absent, but was still able to join the class using this program. Her students also use their personal devices for graphic calculator functions and to look up words and terms they may not know.

Dominique’s classroom was set with students in rows, and during the observations, students participated in an activity where practice test questions were on the smartboard and students would text in their responses. Once all students had chosen an answer, Dominique would show the percentage of students that answered correctly, and explain the problem for those who did not understand.

Dominique claimed that she did not volunteer for the study because she felt that she was great with technology, but having recently finished her doctoral degree, understood the importance of generating research about a topic. Throughout the observation, there were several technical
difficulties, and she commented, “These are some of the challenges, you can plan a lesson and technology does not always cooperate.” At times, when she worked on troubleshooting the technical issues, students became off-task holding their phones up to show others in the room pictures and other content. Despite the interruptions, the class was able to complete all of the review questions, with ample time for explanations to student questions.

In addition to technical problems, some of the challenges Dominique finds in students using personal devices is getting over the fear of trying new things in class because the “kinks have to be worked out,” and ensuring there is a plan B in case things go wrong. She also has to make sure to print out notes for students that do not have their own personal devices.

Regarding student confidence, Dominique claimed that working with BYOT, “Students jump in and are ready to interact.” She noted that students are excited about answering questions on the smartboard, providing satisfaction at knowing they were right, yet not being singled out if they have wrong answers. She also believes that working in a BYOT classroom will help students in their future by increasing their access to information and giving them “the ability to be lifelong learners.”

**Mike.** Mike is in his second year of teaching, both of which have been in this district. He was referred to me by the Instructional Technology Specialist when I was recruiting participants, because he was known to use a lot of personal technology in his classes. Mike teaches middle school Title I math, which is a math support program for students who have had previously low scores on the state math examination. He allows the use of personal mobile devices in his class two to four days a week, and noted that he sees a lot of Apple devices, with the most popular being iPod Touches, followed by iPhones, and iPads. When asked about the number of students who had personal technologies, he replied that early in the year about 40% had mobile
technology, but that jumped to close to 75% after Christmas break. He also has a class set of iPads available.

Some of the features of a BYOT classroom that are appealing to Mike is that he believes it fosters collaboration, helps with differentiation, and is useful to students for their future goals. In his class, Mike describes how differentiation occurs through the choice offered on projects, in the apps students choose to use, and in the product created by students. He also likes that students can become the teachers in this environment, where classrooms are more students centered. Mike points out that is especially important for his population of students, who have not had success in math previously.

The biggest challenge for Mike is teaching students how to use the technology appropriately because, “You want to keep students on task,” and he realizes this can be difficult. To help focus students, Mike will allow them to explore new apps and websites before expecting them to use it for learning, saying, “I’ll give them 30 minutes to just play around with it, no education with it, just play around, see what they can do…it sort of gets that out of the way.” He also discusses how teachers have to give up a lot of the control in this type of classroom because, “You no longer are the focus of most lessons, the student becomes the focus of their own lessons, which is very difficult for a lot of teachers.”

Mike strongly believes that what students are learning now will help them with future goals in several ways. He discusses the technology literacy aspect of everything around us, and how it is necessary for students to be proficient in using technology. He also talks about the presentation skills, which will be useful for students in their later careers. Additionally, he described a group of four students who he had a difficult time reaching earlier this year. Realizing that they were interested in technology, Mike began offering to teach them HTML coding, specifically HTML
CSS, which is a website design code, in the mornings before school. Those students continue to come regularly in the mornings, although this is not required or part of the standards. Describing the websites they are now designing, Mike comments, “The level they’re at right now is probably a high school course, maybe a nine week long high school course.” He believes these types of learning experiences helped him to reach these students in a way that would not happen without personal devices.

Maya. Maya has been teaching for seven years, the last five in this district. She was the first to reply to the recruitment email, and her response included a link to a BYOT blog where she had published a posting about BYOT classrooms. She uses BYOT approximately three times a week with her on level literature classes, and once or twice a week with her AP students.

During the observation of her classroom, Maya was teaching an eleventh grade on level math class, which included several students with special needs. The desks were arranged in clusters of four. It was late in the school year and that day was a review of some of the concepts that students would need for the state end of year examination. Students scanned in QR codes, which would lead them to websites with information about various time periods in history and what was popular in literature during that time. The BYOT network was not working that day, so students went on to the 3G network to be able to access the information. Students were working together on-task most of the time, making flashcards with the assigned information for them to study for the exam. Although all of the students with personal devices used their technology to look up information, many students chose to make their flashcards on paper. Toward the end of the class, Maya asked everyone to turn off their device and had a game style review of what they found, offering candy to students with the correct answers.
Maya feels she is able to differentiate for her students using personal technology. The activity that was observed had different QR codes based on ability to meet the different levels of students in her class. Maya also indicated that it is easier for her to see on a screen when students are sending in wrong answers to questions, helping her to quickly identify students that are not understanding the material.

In the future, Maya describes how students will go on to use what they have learned in this district. She believes that students will be using technology daily in their lives and has helped them to make digital portfolios similar to those found at colleges.

Some of the challenges Maya identifies in a BYOT classroom is that many teachers have a fear of the unknown, and are not comfortable giving up control in their classroom or trusting students to stay on task. She also sees students on their 3G network checking Facebook, Twitter, and Instagram, but reported, “Repeat violators, they lose their opportunity to use BYOT and I think the fact that they do feel a little left out when we do full class activities,” and work to get it back. She does point out that students get distracted in traditional classes, commenting “Just like with any other thing, passing notes, it’s the same thing.” Other challenges include students who do not have their own technology, although she pointed out there is always something available from the school, and problems with connectivity on the network.

Karen. Karen has been teaching for twenty-two years, including six years in this district. Students in her sixth grade advanced science class use their technology approximately three times each week, and the most common devices she identified are phones, tablets, laptops, and iPads. Approximately 60-70% of her students bring their own device to her class for learning.

During the observation, Karen began the lesson with a video about Antarctica, then had students get into groups to work on a project where students would creating a song about
Antarctica, and recording it to show her later. Students quickly formed groups, with about a third of the students going out into the hall to work in three separate groups. Some students formed clusters around the school desktops, while others stayed at the desks, which were in the form of a horseshoe with a few rows in the middle. The students began by selecting a song that would be used as the lyrics were changed to meet the specifications on the rubric about information on Antarctica. There were disagreements in some groups about which song should be chosen, with one of the groups in the hall agreeing on a song at the end of the period, but others came to a consensus earlier.

There was a high level of student engagement and focused conversation. One group of students was excitedly using their devices and the school desktop, turning the lyrics of Thrift Shop, a popular fast paced song by rapper Macklemore, into a song about Antarctica. They were frequently laughing and at one point a boy loudly called out, “Oh my God, that is friggin’ hilarious,” prompting students from another groups to come over and look at their computer. Members of the group protectively covered the screen, and told the onlookers, “Go away, we’ll show you when it’s done.” Throughout the observation, Karen acted as facilitator, helping those groups who could not find a song, and reminding groups of elements that needed to be included.

During the interview with Karen, she communicated her belief that students are confident and highly engaged in a BYOT classroom for several reasons. It is easier for students to be able to use their own technology because they are familiar with it and they feel more comfortable working on it. She also discussed how the role of collaboration helps students to have others that can help them with tasks. Additionally, Karen believes that variety is one of the most important parts of keeping students interested, and technology can facilitate that, although she also noted
that some of the lessons where students were most engaged had nothing to do with technology, but were hands-on science experiments.

The biggest challenge for Karen early in the year was students having a difficult time searching for information, becoming overwhelmed at what their searches pulled up. She also mentioned that students are sometimes off-task, and has seen students getting off the BYOT network, as well as cutting and pasting instead of analyzing information.

When asked about how BYOT will help students in the future, Karen described how textbooks are becoming obsolete because websites are more current. She also believes the presentations they do, including Prezis and Power Points will help them in higher education and beyond.

**Clint.** Clint has been an educator for twenty-five years, as a teacher, Instructional Technology Specialist, and now as an administrator, leading the BYOT initiative in the district. He has been in the district for seven years, and has taught and conducted research in BYOT classrooms.

One of the benefits that Clint noticed with students in this setting was that students with different abilities were able to go at their own pace. Clint also mentioned how education is shifting from memorizing facts to higher level thinking skills, and that educators can focus on more creative and collaborative ways of learning using these devices. Additionally, he discussed how students can become producers of information, instead of only consumers. Specifically, Clint says, “We’ve tried to focus on the four Cs of digital age learning, which are collaborate, communicate, critical thinking, and creativity.”

One challenges of a BYOT classroom is “the paradigm shift for teachers because they didn’t learn with these tools.” When asked about the issue of students getting off the BYOT network
and on to blocked sites, Clint explained that the district is actively working on developing a responsible use policy, whereby it will be up to individual schools to address students using a data plan or BYOT filtered network because, “We’re not legally responsible for filtering their own data plan that their parents purchase for them, only for the network that we provide.” Rather than focus on what students are not allowed to view, there will be emphasis on how students can develop responsible use with technology. This also allows for differentiation by age, with Clint pointing out

If there are high school students and their teacher is using something like Facebook or Twitter for an instructional purpose, depending on the students, that might be appropriate and it definitely is not appropriate for someone in elementary school who isn’t even thirteen years old, and can’t even have a Facebook account according to their terms of use.

Some elements of the responsible use policy include using technology for students’ own learning, acknowledging the work of others, and keeping personal information private.

In their long term goals, Clint discussed how students need to learn responsible use with their devices, including when to put down their technology and “have a face to face conversation with someone.”

**Pedagogical Implementation of BYOT**

To answer the first research question about how mobile personal devices are pedagogically employed in a BYOT classroom, data was collected from student and teacher interviews, blog postings and classroom observations. Information was gathered about how personal devices are integrated into the standards based curriculum, the role it plays with collaboration, and challenges to using personal technologies for learning.

**Personal Devices for Learning**
The most common way students used their personal devices in the classroom was for research. Every participant in the study described using personal technology for research, including Katherine, who typically used the school’s computer but saw others on their own devices. Students often worked on projects and papers that required researching information on the Internet. Some of the research described by participants and observed were finding facts about the lack of education in Sierra Leon, learning the meaning of names, looking at logos as examples for designing one, information about different regions, and literature throughout different historical time periods. Blog postings mentioned using the Internet to research the role of the United Nations and how birds are able to fly.

Another way students used their technology was through apps. A popular type of app that was described and observed was one where QR codes are scanned and students are linked to content provided by the teacher. This activity was observed in the high school literature class, where the QR codes brought students information about historical literature. In that classroom, students worked in groups at their desks, but others described how they roamed around the school doing a “scavenger hunt” to find the different QR codes posted. Allison commented, “There would be papers up around the hallways and stuff and you would scan it and get word problems… it’s like doing the work that we would have done on a worksheet, but we just did something different.” Joseph also participated in that type of activity, looking around the school for QR codes which lead him to math problems that had to be solved. In Phillip’s classroom, QR codes are used as an enrichment activity for those who have finished classwork. In addition to the QR apps, Bridget and Michelle mentioned using the app dictionary.com in the classroom to look up word definitions.
Students also used their personal technology for presentations. Bridget created a Stop Motion described as, “kind of like a video and you can like write stuff down and make special effects with the video.” Hers was about communication and collaboration with words associated with those topics, which was presented to the class. Ted also made a Stop Motion to create a movie about a cell that he and his group made out of Jell-O and candy to make it look as though the cell was moving. Additionally, Hazel used her device for creating a Prezi presentation, which she said she prefers over doing a Power Point because she felt they were “more interactive.”

Translations for Spanish were another way students learned with their technology. Allison described how, “You would be like forming different conjugations, and with vocab, we would incorporate that and have to write sentences and add pictures and write stuff in Spanish and then present it to the class in Spanish.” Michelle and Trevor also mentioned that they used their personal devices for translating in Spanish class.

Communicating with teachers and other students in the form of voice threads and texting responses to a smartboard was another way personal devices were used in the classroom. Hazel and Jacob described using voice threads where they watched a Power Point that had the teacher’s voice adding comments. That was especially appealing to Jacob, whose class was able to view these at their own pace, and take a test when they were finished. Katherine’s class used their devices to text in questions or comments about a book that students were reading individually during a class, and Maria, Michelle, and Trevor recounted activities where teachers asked questions and students would text a response that shows on a screen. Trevor described polls for building background, where teachers asked questions for “something we’re about to learn, they want to see if you know it or not,” while Maria had participated in classroom chats. Additionally,
Michelle had been in classes where responses to multiple choice questions were sent to a screen similar to what had been observed in the high school math class.

Personal technology was also used as calculators, to access online textbooks and other readings, to get on Safari, watch assigned documentaries, write in HTML coding, and for simulations. There were also specific software programs licensed through the district, which allowed students to use engineering software on their personal devices.

**What About Students Without Technology?**

In addressing concerns about what happens to students who do not have personal technology, data was collected from teachers and student interviews, blog postings, observations, and a review of documents. It is the policy of this district that teachers will provide school technology for students who do not have access to a personal device in classrooms when BYOT lessons are executed. This was the case in the classrooms observed where desktops and extra laptops were available. Responses from both students and teachers indicated this to be true, and one student commented, “Normally, my teacher will check out laptop carts and stuff, and then she’ll see how many people will bring their technology with them.” Teachers also mentioned that most students have their own technology, but they get a laptop cart or a few extra laptops to ensure that everyone has access.

In addition to school laptops, students without technology often shared with others. According to Karen, “They share, and the ones that do bring their own technology are eager to share because two minds are better than one, especially when they’re trying to find the websites that have the information.” Ted also explained how sometimes a student forgets their technology, so they shared with someone else that day.
When asked if all students have access to some type of technology, it was agreed that there was enough school technology provided for those who do not have their own. Jacob commented, “I think there’s been like one time where we just had to be in groups because there weren’t enough, we had to pair with someone,” and Ted noted, “I can’t think of any times that somebody couldn’t get on something.” There were no responses from teachers or students that mentioned challenges regarding a lack of devices for all students. Blog postings also indicated there was almost always enough technology for all students.

Collaboration

Throughout the interviews and blog postings, there were discussion about how collaboration played a significant role of learning in a BYOT classroom. It was also noticed in two of the three classroom observations that learning was done in groups with students working together to find information, and in one classroom to create a group product.

When asked about how collaboration worked in a BYOT classroom, students explained several people look up websites and, “we look to see which one is closest to what she [the teacher] says.” That is similar to Karen’s description, “The websites that they do pull up, they have to decide which one has the information on it that they need, which one is a good reliable website.” Trevor communicated a benefit of using personal technology for group work by being able to send links to students in his group outside of class.

Several students explained they prefer to work in groups because they were able to get different perspectives on the topic. According to Katherine, “Then you can bounce ideas off of people and all work together, and it’s faster and easier.” Bridget also likes group work because, “You can get everyone’s opinion about what they think about it,” which is similar to Ted’s response that, “It’s good to hear other people’s opinions.”
Students also preferred to collaborate because it allowed them to share the work. Bridget mentioned that, “You can split up the work and teach each other what you don’t know,” which was the sentiment expressed by Joseph that, “We share in a group and are all using our phones to look up different things, like you look up this part, I’ll look up this part, we’ll put it together.” Trevor also noted, “I like doing group work because then it keeps the stress off of you.”

Challenges

There were many challenges noted by teachers and students with students bringing their personal devices in the classroom with them for learning. Some of the issues involved students being off-task and distracted by their technology, websites blocked through the county’s BYOT network, lack of signal in certain parts of the campus, and students plagiarizing work by cutting and pasting text from websites.

Distraction. The most common concern voiced by every participant, both student and teacher, was students being off-task, using their technology for something other than class work. This was also seen in classroom observations. Students reported that friends were often texting, playing games, and checking social media accounts during class. According to Jacob, “Most of the kids have a problem with paying attention… so that a large amount of the time, they’ll usually get caught up in a game or start texting someone.” Michelle also found that to be true, commenting, “When we’re supposed to be looking on for informational stuff, it’s kind of an excuse for us to just play on Instagram,” and Hazel noted, “They’re not using it [personal device] for school, they’re using it for like Facebook and stuff.” In addition to social media, many students described how students play games, including Phillip, who explained how kids play, “under the desk…they look like they’re paying attention, but they’re really not.” Karen, who
teaches sixth grade language arts, also noted that students will “have a game minimized, and when I walk away, they’ll put it up and start playing the game again.”

Allison, Michelle, Trevor, Joseph, and Ted find themselves getting distracted in a BYOT classroom. Michelle said she preferred a traditional learning environment when learning new information because she gets too distracted when her phone is available. Joseph also described his problem with “playing games because you distracted a lot and that leads to talking and you don’t get a lot of work done,” and Ted finds that, “I get distracted and I’ll be playing on my phone when we’re supposed to be looking up something else.” When asked how often he sees students off-task, Jacob replied, “All the time.”

**Network.** Another commonly cited problem with BYOT was the network. According to the documents from the district, students are required to stay on the BYOT network, however, students and teachers notice that students often get onto their personal data plan to have access to sites blocked on the district’s network. During one of the classroom observations, the BYOT network was not working, so students had to go onto other networks to access the QR codes. Often, however, students go off the BYOT network because websites, such as Facebook, Instagram, and Twitter have been blocked. In other instances, students try to access websites for learning, but they are not allowed, as illustrated in Maria’s comment that it is “really annoying when I find a good website and you click it, and it say website blocked.”

It is important to note that Clint, who is leading the BYOT initiative, explained how the district is currently undergoing changes, which will allow students more access to websites. The shift is moving away from restricting content through the district’s network to moving toward a responsible use policy in which students will learn how to navigate the Internet in a more responsible manner.
In addition to blocking sites, students complained that the BYOT network was slower than their personal network, and that signal was not always available, particularly in trailers located at some high schools. Katherine claimed that she uses the school’s technology more than her own because she has a difficult time getting signal, and Phillip noted that, “Sometimes the computers don’t work, or they shut down.” Trevor also commented that his friends “complain that the Wi-Fi doesn’t let them do stuff so they get off of it.”

**Cheating.** Using personal technology to cheat is another issue that was mentioned as a problem in BYOT classrooms. Michelle noted, “It’s really easy copying and pasting to switch the wording, so I think it’s better to learn it in class because then you have to figure it out.” Karen also said that she saw cutting and pasting early in the year, however, does not often see it anymore, “because the questions I’m giving them are higher level, so it’s almost impossible to cut and paste the answer, especially when you have to produce a product.” Another issue with cheating was described by Trevor, “In my AP class, we’re given these graphic organizers, but somebody found the link to a website where you can just copy, like, the answers are already posted there, and so everyone just copied that down.”

**Other.** Other challenges noted by student participants were concerns about theft, phones going off during class, and technology failing during presentations. Also, Phillip and Maria mentioned times when technology had been taken away from a class because a few people were not using it properly. Challenges reported by teachers included difficulties with students finding search terms, teaching students how to use their devices appropriately, and issues with other educators who need to make a paradigm shift to become comfortable teaching in a BYOT environment.
The use of students’ personal technologies was reported to be pedagogically integrated into the curriculum in several ways using the Internet and apps for communication, collaboration, and presentations. There was general agreement that the district provides enough technology for those students without personal devices. In addition to findings that supported learning, however, were also challenges to learning in this environment. The major challenges included students being distracted, issues related to the network, and students using their devices for cheating.

**Students’ Experiences**

Data from student interviews and on the blog offered insight into the second research question about students’ experiences in a BYOT classroom. The information that was found includes the specific types of technology students brought to school with them and the frequency of use. There were also descriptions of how they used their personal devices in the classroom and their preferences of school versus personal technology. Additionally, data was collected about each student’s personal learning style and how that relates to their experiences in a BYOT classroom.

**Use and Frequency of Student Devices in the Classroom**

Student participants in this study had various types of personal technologies that they brought to school, including iPhones, smartphones, iPads, Macbooks, and iPod Touches. The most common were iPhones, with nine of the twelve participants using that technology. There was also a wide range in the frequency of use for personal mobile devices, with one student responding that she “never” used personal devices, and several indicating that they used theirs nearly every day. Table 4 shows a summary of the devices used and the response given about frequency of use.
Table 4

*Summary of Student Participant Devices*

<table>
<thead>
<tr>
<th>Student</th>
<th>Device</th>
<th>How used in classrooms</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Allison</td>
<td>iPhone</td>
<td>Translating in Spanish class, research</td>
<td>2-3 days a week</td>
</tr>
<tr>
<td>Bridget</td>
<td>iPhone 4S</td>
<td>Research, presentations, apps such as dictionary.com</td>
<td>3 days a week</td>
</tr>
<tr>
<td>Hazel</td>
<td>iPhone and Macbook</td>
<td>Research, voice threads, write papers, calendar, look up assignments, presentations</td>
<td>Every day</td>
</tr>
<tr>
<td>Jacob</td>
<td>iPhone and iPad</td>
<td>Research, voice threads, taking notes, looking up assignments (organization), engineering software program</td>
<td>Every day</td>
</tr>
<tr>
<td>Joseph</td>
<td>iPhone</td>
<td>Looking up assignments, research, accessing online textbooks, graphing, apps,</td>
<td>Almost every day</td>
</tr>
<tr>
<td>Katherine</td>
<td>Samsung S3</td>
<td>Uses school technology</td>
<td>Never</td>
</tr>
<tr>
<td>Maria</td>
<td>Samsung</td>
<td>Research, presentations, reminders</td>
<td>3 days a week</td>
</tr>
<tr>
<td>Michelle</td>
<td>iPhone 4 and iPad</td>
<td>Research, apps, translations, texting to board</td>
<td>1-2 days a week</td>
</tr>
<tr>
<td>Phillip</td>
<td>Phone and iPod Touch</td>
<td>Apps, research</td>
<td>2 days a week</td>
</tr>
<tr>
<td>Rachel</td>
<td>iPhone and iPad</td>
<td>Research, take notes, write papers, access online textbooks</td>
<td>1-2 days a week</td>
</tr>
<tr>
<td>Ted</td>
<td>iPhone 5</td>
<td>Research, presentations, calculators,</td>
<td>3-4 days a week</td>
</tr>
<tr>
<td>Trevor</td>
<td>iPhone</td>
<td>Research, take notes, look up grades/assignments, translator, text in answers, engineering software</td>
<td>Almost every day</td>
</tr>
</tbody>
</table>

Despite the variety of learning devices, students were able to work together because many of the devices had similar features, including Internet access, texting capabilities and access to downloading applications. It was reported that this could be a benefit in that students could work together and share technologies.

**Personal Technology Versus School Technology**
Because the district in this study provides desktop computers for each classroom and has laptop carts available, students have the option of using school technology or their personal devices. To better understand their experiences, the interviews included questions about student preferences in using the technologies available. Of the twelve participants, eleven preferred using their own technology to the schools. The most frequently cited reason given by eight of the respondents was that their personal technology was faster, with Bridget claiming, “The school’s takes a little while to log on and everything, but with yours, you can kind of get right on instead of wasting your time you need to use,” and Jacob commenting, “I think my phone is faster than the laptops they give us.”

Another reason students preferred their own technology was because it was more convenient. Allison said she used her device because sometimes the school’s technology does not turn on or connect to the Internet. Similarly, Joseph mentioned issues getting onto the school’s technology, claiming, “It takes really long to log on, so it’s an inconvenience.” Ted finds it convenient that his technology is portable, describing:

My own technology is more mobile, so you can use it when you go out of the classroom, like, if you’re on the desktop, you can only use it at school, if you’re on your iPod, say, you can go back to the same app or whatever you’re using, and go from there, so instead of losing it all and having to use a flash drive to save it all, it’s more convenient, you’re looking up something, you can have it on your phone.

This is similar to Trevor’s description of why he prefers his mobile devices, describing, “It’s easier, you know, I can just come to class and when she’s teaching, I can just whip out my phone and type something in.”
Convenience was also a big factor for Jacob, who talked about the ability to link his devices and automatically share his work among them, and said,

Well, there have been a couple of times where I had forgotten about a project and it’s in like 4th period or something, and in 1st period I work on the project on my device and then just send it to my teacher with email, so that’s kind of nice.

Other reasons students preferred their personal technology were that they knew how to navigate their own devices and that websites were often blocked on the school’s technology. Michelle discussed how things are easier on her device because, “I know how to use it,” and sometimes it takes longer to figure it out on the school’s technology. Trevor described being frustrated by not having access to some websites, claiming that you can choose different networks on your own device. That view is shared by Maria who said, “I like my technology better because on my technology, not every webpage is blocked.”

Only one participant, Katherine, said that she preferred to use the school’s technology, primarily “‘Cause there’s no signal so I can’t use my own.” Katherine described how her Samsung S3 phone was not able to get connected in many parts of her campus, so she opted to use the school’s technology. Additionally, several other students mentioned that, although they typically prefer to use their own devices, the school’s technology was more efficient for certain tasks. According to Phillip, using your phone for typing is “hard and annoying,” and Michelle pointed out, “You can’t do Microsoft Word on your phone, so you have to use the computers.” Students also need to use the school’s technology for printing, but Trevor noted, “If there was a way to like hook my phone up to a printer at school, that would be pretty cool.”

**Future Goals**
Seven respondents believed that what they were experiencing in a BYOT classroom would be useful to them with future goals, either in college or for a career path. Some of the responses of what specifically would be useful included presentation skills, research skills, and general technological literacy, with Trevor commenting, “I know that a lot of technology’s advancing in the future, I know that a basic knowledge of technology will be beneficial for me.”

Additionally, several participants discussed how it would help them learn independently as illustrated in Allison’s comment, “I know that in college it’s going to be more self-learning than it is one on one… it’s going to prepare me to be more of a self-learner than rely on having a good teacher.” According to Trevor, “It gets you kind of a good balance between studying on your own and learning in the classroom setting, so I think that will prepare me for college getting a good balance between those two.” That thought was echoed in Joseph’s comment, “Just having the ability to learn on my own makes me get better grades I feel.”

Thinking beyond college, several of the participants were able to make a connection between working in a BYOT classroom and potential career paths. Some were very general about needing to do research as a nurse, pharmacist, or scientist. Others, however, were very specific, such as Jacob’s description of how software on the personal devices he uses in an engineering class will help him with his future career, “I’ve kind of gotten into programming and everything and that will definitely help me with mechanical engineering, and I have a software…it’s like a 3D AutoCad program that I work on.” Asked to describe the program, Jacob replied, “The program is called SolidWorks, and it’s just basically a 3D AutoCad, and they have it programmed on the school’s, but it’s super-slow and you can bring your own laptops in with it downloaded and everything, so that’s really helpful.” Trevor also is considering a career in engineering and perceives the benefits of the software he can use at school or home, claiming
We did some simulations in building things before they’re built, there’s just some software, I remember we used that real life architects, not architects, designers use and you can test something before you build it… where you can make buildings and 3D models in the computer, which was really cool.

Three participants did not know if their learning in a BYOT classroom would help them with future goals, and Hazel believed it was, “more limited to the school environment.”

**Personal Learning Style**

The twelve student participants in this study were asked about their particular learning style and how they would prefer to learn new content at school. The range of learning styles included visual, hands-on, auditory, teacher centered and student centered. Given the choice, six of the students would prefer to learn new content in a BYOT classroom, five in a traditional classroom, and one student replied, “It depends.”

For those who preferred a BYOT classroom for learning new content, it was believed that went better with their learning style. For example, Bridget, who identified herself as a visual learner, said, “When you’re researching something, websites usually have a picture or some sort of example with it,” and described learning in a BYOT classroom as, “more entertaining, um, it’s easier.” Another visual learner, Rachel, noted, “I usually like to see things, like a visual learner, not like just take long pages of notes.” For Katherine, looking things up by herself is preferable to listening to a teacher, and she claims, “I like doing stuff, not just sitting and listening.” Jacob, who describes himself as a hands-on learner, also likes doing things, explaining what is best for his learning style is “a lot of hands-on activities, so instead of just reading from a textbook, actually show us how things work and just do more hands-on activities where we actually can learn by doing it ourselves.” Trevor, another hands-on learner, explains, “I just can’t sit there and
read a textbook and understand it right away, if I see something like a video, that helps, but if I actually get to simulate it, like those projects, they help more.” Describing one of those simulations, Trevor explained:

I like to design things, so if it’s like that, that one simulator that we made, where you’re basically building roads and trains between each of those towns and trying to make the most economical value… I could do that, it’s like a game to me.

The environment was another aspect of learning in a BYOT classroom that appealed to Joseph. He described it as “less strict and more laid back” and claimed, “It helps me, I like learning it myself a lot, so if they’re more laid back and they give us what we need to learn, I can learn it easier.”

Other reasons BYOT classrooms were preferred by those six students were the ability to use the Internet to research things, which was described as easier than “flipping through a hundred pages in a book and reading and flipping another hundred pages,” and that “if a teacher teaches it one way, I can go back and learn it another way.” According to Phillip, who described himself as a hands-on learner, “It’s just fun to use your own technology.”

Being able to work at your own pace was an advantage communicated by several participants. Rachel pointed out that on “your own technology, you get to work at your own pace instead of staying with the class when they go super-slow or super-fast,” and Jacob noted, “I like the aspect of working at my own pace.”

In contrast to those students, five participants believed a traditional method of delivery for new content worked better with their learning styles. Michelle felt that it was because she was distracted by her technology in a BYOT classroom, and the others all believed that having a
teacher explain things was beneficial for them. Maria, an auditory learner, voiced concerns about having incorrect information if she learned it herself as indicated in her comment,

   It’s just easier for me to hear someone say it and explain it than me reading it in black and white, then I can get it the correct way instead of me trying to figure out myself then it ends up I get it the wrong way.

   Allison also felt the best way for her to learn was, “when a teacher explains it and stands up in front of a class and has a Power Point up and like goes through it,” as does Michelle, who claims “I do better with flashcards and like, if a teacher sits there and shows me a Power Point.”

   Siblings Jacob and Hazel both preferred learning in a traditional classroom, although Jacob feels that is partially from their experience of learning in a completely virtual school while they were abroad for eighteen months. They both described that experience as difficult to stay self-motivated, and felt as though having a teacher direct them, along with class discussions, was best for their learning.

   Several of the students from both categories felt that a balance was best. Trevor, who was not able to specify whether a traditional or BYOT classroom was best for his learning style, felt as though he liked aspects of both types of classrooms. Maria claimed she preferred to learn new material in a traditional classroom, but to be assessed with the projects using her own technology, and Jacob thought a balance was best.

   Several findings were revealed about how students experience learning in a BYOT classroom. Students reported a variety of devices they brought to school, and there was a wide range in the frequency of use. Students identified a preference to use their own technology over that provided by the school. Students also perceived what was learned in a BYOT classroom would be helpful with future goals. Additionally, it was found that different learning styles affected the preference
for delivery of new content. A balanced approach was reported to best address the needs of all learners.

**Teachers’ Perception of Student Confidence and Engagement in a BYOT Classroom**

The final research question addressed teachers’ perceptions of student confidence and engagement in a BYOT classroom. Interviews with four teachers in the district and one administrator provided insight about teacher perspectives in these areas, as well as how it allowed them to differentiate for students. Additionally, educators provided information about how they believed students using personal mobile devices for learning will benefit students with their future goals.

**Student Confidence**

Teachers were asked to describe their perspectives on how learning in a BYOT classroom related to student confidence. Every educator believed that student confidence was improved by the learning that happens in a BYOT classroom, with Mike commenting that it “increases tremendously” in that setting.

Teachers mentioned that students seemed to gain confidence when given the opportunity to ask and answer questions or provide anonymous comments. Dominique found that “Students are excited about answering a question where everyone’s responses show on the whiteboard without names,” and Maya explained it this way:

It eliminates is the barrier of being scared either to ask a question or to be the super-smart kid, who knows all the answers already, you know, I have a lot of students who are mixed ability… and my students with special needs or my students who struggle in a literature course can do things like ask a question anonymously to my board or to my device, and that eliminates the fear of having to raise their hands in front of their peers and always not knowing.
Similarly, Clint’s response depicts how technology can help students feel more comfortable in his description of students whose English was limited:

They were able to write out their ideas and check and see before it became live to everyone else, so they might be more hesitant to just raise their hand and answer a question in class, but by doing it online, they were more empowered with their technology, and felt like they were able to contribute more.

Educators also believed that the familiarity students had using their personal technologies contributed to their confidence because they are comfortable with their own devices. Karen described, “It makes it easier, they definitely whip out their own technology, they know how to use it, they’re familiar with it.” Maya also believes that using their personal devices helps students and commented, “There’s a familiarity with their devices… I think that to use something they already know takes away some of the issues with confidence that a lot of high school students have.”

Another way educators witnessed an increase in student confidence was through the opportunities that students had to become leaders. According to Mike, “Students are able to become the teachers, almost, it goes from a teacher driven classroom to a student driven classroom… so their confidence increases a lot.” Dominique also commented that she relies on students to help her with the technology, asking them to “teach the teacher,” while Clint mentioned how students can help with technical troubleshooting. According to Mike, “It’s no longer sort of teacher stand and delivers, student fills out a worksheet, it’s more of a student gets to create a worksheet, they become much more active in their learning, so the confidence definitely increases.”
Other responses indicated that students showed more pride in their work when they created a project with their technology and that confidence in presentation skills had improved. It was said that early in the year, presenting in front of the class was “very daunting, very nerve-wracking,” but being able to incorporate personal devices made students more comfortable, which increased their overall confidence in presenting.

Confidence is an important aspect of motivation because it helps students believe they are capable of doing a given task. Using BYOT in the classroom helps increase confidence, which in turn, increases motivation. While confidence in the ability to do a task is one part of motivation, the other part involves whether a student wants to do the task.

**Student Engagement**

To find out teachers’ perspectives about student engagement in a BYOT classroom, teachers were asked to describe their experiences and observations. Once again, all five educators believed that engagement was higher in a BYOT classroom and described learning activities and student behaviors that supported their claims.

Mike explained how students in his class are not assigned homework, but will ask “for some extra stuff to do at home,” especially when the class spent a week using the popular game Minecraft for learning math. Mike also described how he was able to engage students that had been struggling in his class by offering to teach them HTML coding. This was not part of the standards and was done outside of school hours, but Mike conveyed how students willingly came early in the morning because they were so excited to learn. During the classroom observation with Karen, there was also a request by a student to work on a class project at home, indicating a high level of motivation.
Another way educators believed BYOT classroom learning increased student engagement was because it provided a more interactive experience with higher level thinking skills. Maya explained how using students’ technology makes learning more interactive:

If they’re sitting there watching a movie, great! If we’re watching a movie and I can add in a side screen of a Twitter feed, where the kids are asking questions about the movie in a live feed as it’s happening, suddenly it’s interactive, and that’s engagement.

Clint also believes that teachers have the opportunity “to focus more on higher level thinking skills rather than again memorizing content or getting in the lull of just delivering content.”

Additionally, teachers agreed that utilizing technology allows them multiple ways to deliver subject matter, which keeps students interested. Karen claimed, “I think they’re more engaged in their learning because they’re not just looking it up in the same textbook on the same page, it’s different.” Maya also noted that “novelty and variety are key in engagement,” and Dominique commented that, “Teachers need to use a variety of digital tools to keep students interested today.” Additionally, Karen described how she changes things up, claiming, “I just try to make every day a little different, we don’t use technology every day, we don’t use the textbook every day, we don’t watch movies or use the whiteboard every day, it’s always different.”

Future

All of the educators believed that what was being learned in a BYOT setting would help students in the future. Some of the learning that was thought to be beneficial was better presentation skills, being able to research information, becoming proficient in technology literacy, and understanding how to use technology responsibly.

The educators agreed that an important proficiency that would help students long-term was teaching them how to research any topic. This skill was thought to be necessary both in higher
education and for future careers. Clint pointed out that “All the information of human history is on these devices,” which students now can easily access. Dominique agreed that research skills would be useful, and would “increase their access to information and give them the ability to be lifelong learners.”

Presentation skills, both in the form of creating presentations and presenting material, were also thought to be skills learned in a BYOT classroom that would help students with their future goals. Clint discussed the importance of creating content, and Mike described how presentation skills would be valuable to students long-term. According to Karen, her students’ presentations are “professional looking, definitely, and when they present to a small group or the whole class, that’s going to help them in college and the real world.”

Educators also perceived that teaching students how to use technology responsibly is another skill that will help them in the future. Clint discussed in detail how students will have a digital footprint, good or bad, that will be available to college admission officers and future employers. He also notes that many adults have been self-taught, and how beneficial it is for students in this district to have guidance in how to use their technology responsibly.

Finally, being proficient in technology literacy was another aspect of BYOT classrooms that educators felt would be necessary for students in the changing world. Maya pointed out that “most of our students are going to go on and use technology daily,” and Mike commented that the technology literacy part of it would be necessary to navigate the world. When asked how she thought using personal technology would help students in the future, Karen laughed and replied, “It is the future.”

Differentiation
All of the educators spoke in detail about the many ways that personal mobile devices facilitated differentiation in classrooms. Some of the responses indicated that teachers differentiated for students to be self-paced learners, to allow more student choice, to deliver content appropriate to the needs of various learners within a class, and through the technologies themselves.

One way teachers were able to differentiate for students was allowing them work at their own pace. Clint described how this was particularly important for students on the extreme ends of needs, claiming, “Different students were able to move ahead at their own pace instead of waiting for the rest of the class.” Dominique likewise explained how students in her class were able to do math problems on their devices, working at their individual pace.

Teachers also differentiated using various devices. Karen mentioned that differentiation came not only in the product, but with the devices themselves. Clint explained how students have school technology available, but can also figure out how to do use their technology to learn, pointing out, “They just might have to do things differently if they were using an iPod Touch instead of an iPad because the capabilities of the devices are different.”

Another way that teachers differentiated was in allowing choice in the way students were assessed. Karen described how most of the projects in her class have a rubric of requirements, but students can present the information in any format they choose. Clint commented that BYOT classrooms move away from the one-size-fits-all instruction, claiming, “Instead of the teacher determining every student will make the same product or project and do it in the same way, we want them to differentiate and allow the students to be more empowered with that.” Mike also described how his students have choices in the projects they do in his class, explaining, “They differentiate among themselves, they don’t realize it but, you know, I’ve got students that’ll pick
the easier ones [projects], I’ve got students that will pick the more challenging ones, and they
don’t realize they are.”

Additionally, teachers are able to differentiate the delivery of content to make it appropriate to the needs of all learners. During a classroom observation, Maya had several QR codes to scan, which she explained brought students to different websites. Students in her inclusion class who had special needs would be brought to websites with simplified content on the same topic, whereas students who were able to understand more complicated text would be brought to more sophisticated sites.

Teachers’ perceptions indicated a belief that learning in a BYOT classroom increased student confidence. It was reported that using devices which are familiar to students, taking on the role of teacher, and being able to provide feedback anonymously contributed to that confidence. Findings also revealed that teachers perceived an increase in student engagement as a result of using their personal mobile devices in class. Additionally, it was found that teachers believed learning in a BYOT classroom would benefit students with future endeavors.

Conclusion

The data collected in this research study was coded and analyzed according to how it best addressed the three research questions. Patterns were identified and five emergent themes evolved. Those themes were:

1. Students’ personal technologies are pedagogically integrated into a BYOT classroom in a variety of ways that promote collaboration, project-based learning and presentations.

2. Teachers perceived the use of students’ personal mobile devices in the classroom as contributing to higher student engagement, and both students and teachers found learning relevant to future pursuits fostered motivation.
3. The use of personal mobile devices in the classroom, which is preferred by students, promotes differentiation of instruction.

4. The major challenges in a BYOT classroom are distraction and network issues.

5. A balance of using students’ personal technologies and traditional classroom methods is advantageous to address the needs of different learning styles.

Chapter Summary

Data collection provided information about how students’ personal mobile devices were employed pedagogically in a BYOT classroom, how students experienced learning in that environment, and teachers’ perceptions of student confidence and engagement in classrooms where students use their personal technology for learning. Information came from a review of the documents about the BYOT program, student and teacher interviews, classroom observations, and student blog. Data was coded, and patterns were found through an inductive process of analysis. Five themes emerged from the data which offer insight into learning in a BYOT classroom.

Chapter V: Discussion of the Findings

This chapter describes the major findings in this research study, and the practical implications they have for improving pedagogy. A review of the problem of practice and methodology are followed by a discussion of the findings. Additionally, limitations of this study are described, as well as suggestions for future research.

Revisiting the Problem of Practice

According to Geist (2011), “Mobile technology, the internet, social media and a slew of future developments that we currently can't even predict, are and will be a part of their [students] life experience and will impact the way they learn and access information”(p.758). This means
the way a student perceives interactions, communication, and learning is substantially different from the experience of most of their teachers (Tapscott, 2009).

The problem that comes from this disconnect is that educators are often designing curriculum and strategies to meet the needs of learners from their own generation, where teachers were “in charge” of knowledge and handed it out they deemed appropriate (Traxler, 2010). Times have changed. Tapscott (2009) posits, “People no longer have to follow the leaders and do what they're told. Now they can organize themselves, publish themselves, inform themselves, and share with their friends—without waiting for an authority to instruct them” (p.75).

If we want students to grow up and be able to compete in a global economy, the way we educate students needs to change. The district in this case study has begun the shift by allowing students to bring their own technology into the classroom for learning. Instead of banning the tools which facilitate their learning and will be part of their daily lives, emphasis is on teaching students necessary skills for success. The purpose of this research was to better understand how these devices are integrated into the classroom and the perceptions of students and teachers about how students learn in this environment.

Revisiting the Methodology

This case study was designed to investigate a district in the southeastern United States that promotes the use of students’ personal mobile devices in the classroom for learning. The three specific research questions to be addressed were:

1. How are students’ mobile devices integrated pedagogically into a BYOT classroom?
2. How do students experience learning in a BYOT classroom?
3. What are the perspectives of teachers about student confidence and engagement in a BYOT classroom?
To answer these questions, qualitative methods were employed. Participants included twelve students and five teachers who were recruited from the district. A review of the documents, semi-structured interviews with all participants, three classroom observations, and a blog were used to collect data. All interviews were transcribed verbatim and combined with a transcript from the blog, memos from classroom observations, and notes from the documents reviewed. Data was coded using methods described by Saldaña (2009), which were primarily descriptive and in vivo codes. A grid was created with each of the three research questions and coded material was placed according to the question it addressed. Coded information was analyzed repeatedly until patterns emerged and five themes were identified.

Discussion of Findings

According to Stake (1995), an inductive process of analysis will bring forward patterns and themes from the data. In this study, the following five themes emerged:

1. Students’ personal technologies are pedagogically integrated into a BYOT classroom in a variety of ways that promote collaboration, project-based learning and presentations.

2. Teachers perceived the use of students’ personal mobile devices in the classroom as contributing to higher student engagement, and both students and teachers found learning relevant to future pursuits fostered motivation.

3. The use of personal mobile devices in the classroom, which is preferred by students, promotes differentiation of instruction.

4. The major challenges in a BYOT classroom are distraction and network issues.

5. A balance of using students’ personal technologies and traditional classroom methods is advantageous to address the needs of different learning styles.

The Pedagogical Integration of Students’ Personal Technologies
An investigation into the way students’ personal mobile devices were pedagogically integrated into the classroom revealed a variety of learning activities and strategies. Accessing the Internet for research was the most common way students used their devices for learning. This important skill had previously been shown to be lacking in students (van Deursen & van Dijk, 2013), indicating a deficit in the curriculum. Karen’s example of how students had such difficulty with Internet searches early in the year, but have improved dramatically, illustrates how effective this type of instruction can be. Using the Internet for research was also a skill identified by participants as being helpful in achieving long-term goals, creating a high utility value, which increases student motivation (Eccles, 2005). Additionally, students’ personal devices were used to download applications to support learning and were found to be motivating to students, including those special needs. Those findings supported earlier conclusions that identified apps to be a tool that could be useful to reach all learners (Campigotto et al., 2013, Fernandez-Lopez et al., 2013).

Another pattern that emerged was that student learning in a BYOT classroom frequently supported collaboration, which is consistent with previous research on that topic (Looi et al., 2009; Liu & Kao, 2007; Norris & Soloway, 2004; Vesisenaho et al., 2010; Wong & Looi, 2010; Wright, 2010). The majority of students preferred to learn this way since they were able to get multiple perspectives and share the workload, increasing the intrinsic value (Eccles et al., 1983; Wigfield & Eccles, 1992).

The use of personal mobile devices was also found to support communication in the classroom, which substantiates past research in that area (Blasco-Arca et al., 2013; Engel & Green, 2011; Shon & Smith, 2011). Just as Shon and Smith (2011) found benefits to a popular audience response system, Poll Everywhere, teachers in this district reported more interaction
and engagement with that website. Additionally, Maya’s comments that technology provided her instant feedback from student responses supports Milner’s (2006) conclusions that this communication can allow teachers to immediately modify lessons based on the needs of the students.

While all of these findings provide examples of ways personal mobile devices were pedagogically integrated into the curriculum, what make them meaningful to learning are neither the activities nor the devices themselves. Instead, it is the higher level thinking skills that result from learning with these tools. Findings revealed that students used their devices to perform Internet searches that critically evaluated sources, created projects, collaborated and communicated with others, and practiced presentation skills, while improving their overall technological literacy. These are the proficiencies that 21st century students need to become globally competitive, and it is the responsibility of schools to provide these types of learning opportunities.

Student Confidence, Engagement, and Motivation

All of the educators in this research conveyed their belief that students using personal mobile devices for learning increased student confidence, engagement, and motivation. Those findings have been supported in past research with mobile devices (Godzicki et al., 2013; Ifenthaler & Schweinbenz, 2013; Swan et al., 2005). This is highly significant because each of these constructs contributes to the achievement related choices of students (Eccles et al., 1983; Eccles & Wigfield, 1995; Wigfield & Eccles, 2000).

The perceptions of teachers in this study were reinforced by student responses. Several students communicated confidence, such as Phillip’s description of how he was the first to finish the QR scavenger hunt around the school because, “I’m really fast at running and doing my
work, so I’m a double threat.” Evident in this study is that higher expectation of success, which allowed students to feel capable of being competent to learn new content (Eccles, 2005).

A major source of motivation came from the perception of both groups of participants, who believed learning in a BYOT classroom was helpful to achieving future goals. That is consistent with the claim of Wigfield and Eccles (2000) that utility value contributes to student motivation in academic settings. The utility value was strong among most students, particularly those in engineering classes interested in that career path, and described using the same software as professional engineers. According to one such student, working with 3D software was “really cool…I enjoy that sort of creation, even though in some ways it’s kind of hard.” When asked if he would prefer an easier test or harder project using that program, he chose the more difficult task because “it’s like a game to me.” That supports the conclusion that a high incentive value and utility value assigned to a task leads to more challenging achievement related choices (Wigfield & Eccles, 2000).

Confidence was also increased by reducing the perceived costs to students. Personal mobile devices allowed student more time to think of responses before presenting them to others in the form of texts and emails, which avoided putting them “on the spot” having to answer questions. It also afforded students a way to interact with others in the class anonymously, so that they would be less likely to feel embarrassed by incorrect answers. According to Covington (1992), that helps protect the self-worth of students in an academic setting.

Although findings revealed that student motivation increased with the use of students’ personal technologies, it is important to remember the devices are tools that facilitate learning experiences that are engaging and interactive. The use of personal mobile devices provided a high incentive and attainment value of activities with higher level thinking skills, such as
creativity, analysis, and evaluation. It is the incentive and utility value, along with the reduction in perceived cost (Eccles, 2005; Wigfield & Eccles, 2000) that increases student motivation.

**Students Preferences**

Patterns that emerged from students’ experiences in a BYOT classroom revealed student preferences for their personal devices over school technology, and for differentiated instruction. The overwhelming choice to use personal technology was also found in a study by Schaffhauser (2011), where students favored using their laptops. The mobility, familiarity and ease of use contributed to students’ preferences, and were instrumental in providing students with opportunities to be autonomous learners. That self-direction is necessary for students to navigate the massive amounts of information available today (Traxler, 2010).

Student participants also preferred activities involving differentiation. Past research has shown mobile devices support differentiation in a classroom setting classroom (Aronin & O’Neil, 2011; Campigotto et al., 2013; Lightle, 2011; Looi et al., 2009). Choice was an important component, and both teachers and students reported a great deal of choice in BYOT classrooms, in learning content and assessments. Of particular significance was the effect of student choice on motivation, creating a higher intrinsic value for tasks. Karen’s comment that allowing students to choose multiple forms of assessment fostered motivation was supportive of the conclusions reached by Patall et al. (2010), which found student choice increases intrinsic motivation. According to Wigfield and Eccles (2000), an increase in intrinsic motivation will positively affect the academic choices of students.

**Distraction and Network Challenges**

Although there were several challenges reported and observed in a BYOT setting, data analysis revealed two major themes; distraction and connectivity issues. Distraction had
previously been noted as a problem with mobile devices (Junco & Cotton, 2012; Kessler, 2011; Kirschner & Karpinski, 2010; Wood et al., 2012), and was reported by every participant as a challenge in BYOT classrooms. As found with research by Junco & Cotton (2012), a common distraction was students on social media sites such as Facebook, Instagram, and Twitter.

Additional challenges involved issues with the BYOT network. Several students reported signal and connectivity problems, but more common were complaints about websites blocked on the BYOT network. Some of them were gaming and social media sites, which were not being accessed for educational purpose, which was similar to findings by Ryan et al. (2010) that indicated students are more interested in mobile devices for entertainment than educational purposes (Ryan et al., 2010).

Other students, however, described frustration at finding a good source of information for an assignment that was not assessable within the BYOT network. That issue is currently being addressed by the district, and the shift is moving away from restricting websites to teaching more student responsibility in selecting appropriate content.

**Balance of BYOT and Traditional Methods**

Students in this research were asked to identify their personal learning style and how they preferred to learn new material. Findings revealed that students were divided in a preference between learning new content by BYOT and traditional methods, and that many favored a balanced approach of using both. Some students found it easier to learn content from traditional methods like lectures or teacher generated notes, but preferred using their own device for assessments in the form of projects and presentations. Other students liked elements of both, illustrated in Jacob’s comment, “I like the aspect of working at my own pace… it’s not set in stone, it’s just one day I’m working on my own device, and then the next day I just go to a
traditional type of classroom.” Teachers also indicated a need for both types of learning. Maya’s comment, “Novelty and variety are key in engagement” demonstrates how a balanced approach can contribute to student motivation.

**Practical Implications**

“Just as the college students of 2010 do not remember a time in their lives when the Internet did not exist… the future college students of 2025 will not remember a time when there was not pad-based mobile devices” (Geist, 2011). As the shift in education begins to move toward mobile devices, educators need to evaluate how to best integrate these technologies into the classroom. The goal of this study was to provide insights that would contribute to the literature on this topic, and most importantly, to improve practice. Findings from this research will be helpful to teachers and administrators in the case study district, and especially useful to districts that do not currently allow students to bring their personal mobile devices to school, and are considering such an initiative.

Some of the practical implications from the findings of this study support the use of personal mobile devices in the classroom. Not only does that honor students’ preferences, but increases instructional time in that students can quickly navigate their own technology and do not waste time logging on and off each class period. Additionally, the familiarity with personal technologies boosts student confidence, motivation, and engagement, creating an especially valuable way for teachers to motivate students who have previously had difficulties in school or have been unmotivated in traditional settings. Furthermore, allowing students to use their personal devices provides easy access to the Internet, apps, and a host of learning opportunities in a one-to-one format that alleviates the financial burden on districts. Based on the findings from this research and those implications, the following recommendations are suggested:
1. Before a BYOT implementation, districts must have the necessary infrastructure in place to support connectivity, and the issue of a mandated network or choice of network needs to be addressed.

2. Curriculum content should be aligned with capabilities of students’ personal devices as tools to enhance classroom instruction.

3. Explicit teaching of information Internet and strategic Internet skills are necessary.

4. The use of personal mobile devices should be implemented to motivate students, especially those with previous academic challenges or who have been unmotivated with traditional methods.

5. Educators should capitalize on the high utility value perceived by students in a BYOT classroom. Teachers should directly state the connections of BYOT skills and real world applications for future goals.

6. The use of personal mobile devices should be implemented, with apps to support learning, to move from a one-size-fits-all education to one that truly is able to meet the needs of all learners.

7. Teachers must carefully monitor students to redirect off-task behaviors.

8. Schools should implement a balanced approach of strategies into the curriculum, including traditional and technological methods.

Limitations

According to Yin (2009) the limited number of participants in a case study does not allow for the results to be generalized to other populations. One limitation of this single case study was that an especially small number of teachers and students participants, and therefore, the results are limited to this particular case.
Another limitation was that all student participants owned personal mobile technologies. An effort was made to recruit students in the district who did not own a personal mobile device, but nobody who fit that criteria responded to the recruitment materials. Having both perspectives would have provided a more thorough perspective of student experiences in a BYOT classroom.

Additional limitations include the small number of observations that were conducted, the lack of diversity among participants, examining a single case in a suburban setting, and limiting participants to only secondary students.

**Conclusions**

This qualitative case study evaluated a district which allows students to bring their personal mobile devices into the classroom for learning. Research questions were posed about how these devices facilitated classroom learning, students’ experiences learning in a BYOT classroom, and teachers’ perceptions about how that learning affects student confidence and motivation. Data was collected from a review of the documents, twelve student participants, five teacher participants, classroom observations, and a student blog, which provided insight about learning in a BYOT classroom. The following five themes emerged from the data: 1) students’ personal technologies are pedagogically integrated into a BYOT classroom in a variety of ways that promote collaboration, project-based learning, and presentations 2) teachers perceived the use of students’ personal mobile devices in the classroom as contributing to higher student engagement, and both students and teachers found learning relevant to future pursuits fostered motivation 3) the use of personal mobile devices in the classroom, which is preferred by students, promotes differentiation of instruction 4) the major challenges in a BYOT classroom are distraction and network issues, and 5) a balance of using students’ personal technologies and traditional classroom methods is advantageous to address the needs of different learning styles.
Future Research

The findings from this study help to better understand how using personal mobile devices supports students’ learning, yet there is much that remains to be learned about this topic. In this research, it has been found that students’ personal technologies were used to support project-based learning, collaboration, and presentation skills. Further research is necessary to better understand how those skills translate to academic achievement, as well as what other types of learning will be beneficial to 21st century students as they enter the workforce.

Another finding revealed that using personal technologies increased student confidence, engagement, and motivation. As mentioned in the limitations, however, all of the student participants in this research had their own technology. The experiences of students who attend school in a BYOT district, but do not have personal mobile devices should be explored to provide a more comprehensive view about how this setting contributes to their confidence, engagement and motivation levels. Additionally, issues of equity and access for students who do not have their own devices must be addressed.

Because it was revealed that a BYOT classroom supports differentiation, future research should also focus on finding ways that mobile devices can be incorporated into the curriculum to meet the unique needs of each individual. This includes investigating video games and MUVEs that can be used to reach students with a variety of learning styles, as well as how curriculum can be modified to make learning self-directed, where students can work at their own pace. There also needs to be an exploration into the specific devices and features preferred by students and how they support learning in the classroom.

Additionally, future research should focus on the challenges associated with learning in a BYOT classroom. Effective strategies for keeping students on-task in this environment must be
examined, and the issue of which networks and websites will be restricted needs to be addressed. An important part of that research includes learning more about the views of parents pertaining to content their children can view at school.

Finally, research must be conducted to better understand how a balance of traditional and BYOT strategies can be implemented into a curriculum to best meet the needs of all learners. Part of that exploration should include specific apps and software programs that can be used to teach content, provide practice, and offer alternative assessments. Learning more about BYOT has the potential to turn 19th century classrooms into 21st century learning environments.
References


Deaney, R., Ruthven, K., & Hennessy, S. (2006). Teachers’ developing ‘practical theories’ of the contribution of information and communication technologies to subject teaching and


online discussions in the age of social networking. *International Journal for the
Scholarship of Teaching and Learning, 6*(4), 1-24.

Ifenthaler, D., & Schweinbenz, V. (2013). The acceptance of Tablet-PCs in classroom

VA: ASCD.

Sage.


Karaman, S. (2011). Effects of audience response systems on student achievement and long-term

Kessler, S. (2011). 38% of college students can’t go 10 minutes without tech [STATS].

building and assessing higher order inquiry skills in science. *British Journal of
Educational Technology, 41*(1), 56-68.

Winston.


Appendix A

Dear [District] County Student/Parent/Guardian,

As part of a research study about the use of students’ personal technologies in the classroom, secondary school students are being recruited as participants. To take part in the study, you need to have attended school in [District] for at least two school years, and own a personal mobile device, such as a tablet, iPad, Kindle, smart phone, etc. that you regularly use in school as part of learning.

The research will consist of one personal interview that will be held after school for approximately 45 minutes, and participation of an online blog. Parent/guardian consent is necessary for all students. For your time and contribution, participants will receive a Subway gift card of $5.

A question and answer session will be held on ________________ at ________________ for more information. Attending the meeting does not mean that you are committing to participate.

For any questions or concerns, please contact Becca O’Sullivan-Donnell at [email address].

Sincerely,
Becca O’Sullivan-Donnell
Appendix B

[District] Educators,

I am currently working on my Doctor of Education degree at Northeastern University, through which I hope to learn more about BYOT classrooms and the experiences of students that learn in that environment. As part of my doctoral thesis research study about BYOT and teachers’ perceptions on how personal technologies affect student motivation among high school students, I am asking teachers in Forsyth County to participate. To take part in the study, you must be employed with the county for at least one academic year and integrate the use of student technology on a regular basis. Participants will be sought for a scheduled observation of approximately 45 minutes and an interview that will last approximately one hour, or both. If you are interested in participating or have any questions about the research, please contact Becca O’Sullivan-Donnell at [email address].

Thanks,

Becca O’Sullivan-Donnell
Appendix C

Teacher Interview Protocol

How long have you been teaching?

How long have you been teaching in Forsyth County?

Approximately how many times per week do your students use their personal devices for learning?

What types of personal devices do you see in your classes?

Tell me about how it works in the classroom where so many students using different types of technologies at the same time.

Describe what you have noticed about student confidence in the ability to do tasks in a BYOT classroom.

Describe some ways that working in a BYOT classroom will help students in their future?

What are some of the challenges faced in a BYOT classroom for teachers and students?

Tell me about some ways you differentiate for students using their personal mobile devices.

What do you like about teaching in a BYOT classroom? What are examples of some successes you’ve had with it?

Is there anything else you can tell me about how student motivation is affected by students using their personal technologies in the classroom?
Appendix D

Student Interview Protocol

What grade are you in?
How old are you?
How long have you been going to school in Forsyth County?
How do you like to spend time outside of school?
Do you bring personal mobile devices to school with you?
Prompt: If yes, what type/s? What types of things do you use your technology for outside of school?
What type of devices do you see most commonly used among your friends in a BYOT classroom?
Describe some way you use mobile devices to learn in the classroom.
In your opinion, what are some of the problems of students bringing in their own devices?
Describe a learning activity when you did something really cool with technology.
Describe for me how it works to have different students using different types of technologies at the same time.
If you were going to learn about a new topic and you had the choice of learning about it in a traditional classroom or BYOT classroom, which would you choose? Why?
Tell me about your experiences learning in a BYOT classroom. What do you like? What don’t you like?
What is it like using your own technology compared to the school’s technology?
In what ways do you think using technology in school will help you with your future goals?
Tell me about your personal learning style and what helps you to be most successful at learning.
Appendix E

Northeastern University Consent Form

Northeastern University Department

Investigator Name: Becca O’Sullivan-Donnell

Title of Project: Students’ Personal Mobile Devices in the Classroom: A Case Study of a BYOT District

Informed Consent to Participate in a Research Study

We are inviting you/your child to take part in a research study. This form will tell you about the study, but the researcher will explain it to you first. You may ask this person any questions that you have. When you are ready to make a decision, you may tell the researcher if you want to participate or not. You do not have to participate if you do not want to. If you decide to participate, the researcher will ask you to sign this statement and will give you a copy to keep.

Why am I being asked to take part in this research study?

You are being asked to participate in this study because you are a student in Forsyth County Schools and have participated in the Bring Your Own Technology (BYOT) program for at least one academic year.

Why is this research study being done?

The purpose of this research is to better understand how a BYOT class works, and the experiences of students and teachers who learn and teach in that type of classroom.

What will I be asked to do?

If you decide to take part in the study, I will ask you to participate in an interview. The interview will be audio recorded, so that it can be transcribed later. You will also be asked to participate in an online blog, which will have questions about your experiences using mobile devices in the classroom. The blog will only be accessed by other students participating in the study and the researcher. All entries will be anonymous.

Where will this take place and how much of my time will it take?

The interviews will take place at your school or another quiet place that is convenient and comfortable for you. They will take approximately 90 minutes. The online blog can be accessed from any location that has internet, and the amount of time will depend on how often you post entries or respond to others.

Will there be any risk or discomfort to me?

There are no foreseeable risks or discomforts. The inconveniences could include having to get a ride to the interview site.

Will I benefit by being in the research?

There will be no direct benefit to you for taking part in the study.

Who will see the information about me?

Your identity as a participant will only be known to the researcher. To protect your identity, you will be given a pseudonym, which is a fictional name that I will use in my final paper. There will be nothing written that would identify you as a participant. All of the information from interviews will be secured, so that only the researcher has access to them. The blog will be shut down after a specified date, and the transcripts and audiotapes will be destroyed after the study is complete.

What will happen if I suffer any harm from this research?
There will be no special arrangements will be made for compensation or for payment for treatment solely because of my participation in this research.

Can I stop my participation in this study? 
Your participation in this research is completely voluntary. You do not have to participate if you do not want to. Even if you begin the study, you may quit at any time. If you do not participate or decide to quit, you will not lose any rights, benefits, or services that you would have as a student.

Who can I contact if I have questions or problems? 
You can contact Becca O’Sullivan-Donnell at [email address] with any questions or problems. You will get a response within 24 hours. You can also contact my advisor, Jane Lohmann, at [email address].

Who can I contact about my rights as a participant? 
If you have any questions about your rights in this research, you may contact Nan C. Regina, Director, Human Subject Research Protection, 960 Renaissance Park, Northeastern University, Boston, MA, 02115. Tel: 617.373.4588. Email: irb@neu.edu. You may contact anonymously.

Will I be paid for my participation? 
You will be given a $5 Subway gift card after you have completed the interview and submitted your blog responses.

Will it cost me anything to participate? 
There will be no costs to you as a participant.

Is there anything else I need to know? 
You must be 18 years old to participate unless your parent or guardian gives written permission.

I agree to (have my child) participate in this research.

________________________________________ Date________________________
Signature of (parent/guardian) participant

________________________________________
Printed name of person above

________________________________________ Date________________________
Signature of person who explained the study and obtained consent

________________________________________
Printed name of person above