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Student Perceptions of Mobile Phones as a Potential Academic Tool

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Student Perceptions of Mobile Phones as a Potential Academic Tool

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Sincerely,

Tyler Brackey

Abstract

Mobile phones offer many features and functions that could potentially enhance and expand student learning. However, practitioners and scholars have identified several concerning issues commonly associated with extensive student mobile phone use. Those who engage in discussions of the potential role for mobile phones in the learning process face a difficult task in deciding whether the advantages of mobile phone use for students in schools outweigh the disadvantages.

This paper aims to contribute to that discussion by offering the perspectives of 11th and 12th grade students in a rural Minnesota community. This study featured a mixed methods research design. In the first part of the study, a group of participants (n=23) completed a survey detailing rates of mobile phone ownership, Internet accessibility, and experiences using mobile phones in schools. Participants reported a 100% ownership rate for mobile phones and Internet access at home, while 87% of participants rated their Internet connection as "reliable" or "very reliable".

The second part of the study included small group discussions to explore student experiences and perceptions of mobile phone use in schools. Participants (n=11) expressed a desire for teachers not to make generalizations based on the actions of a handful of students. They also offered several examples of how they were using mobile phones effectively to engage in their learning. Finally, the participants encouraged collaboration between teachers and students and voiced support for teacher autonomy in the implementation of mobile phone use in classrooms.

Based on the data collected, recommendations have been made for teachers, administrators, and district policymakers who are considering implementation of mobile phones

as tools for learning in their schools. This includes suggestions for teacher training and policy formation involving collaboration with students. Finally, with the Coronavirus Pandemic forcing mobile learning to the forefront of educational practice, recommendations have been offered for future research aiming to shift the focus from use and access of mobile devices towards effective implementation of mobile phones as a learning tool.

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Chapter One: Introduction

Introduction

In an early episode of the 90's television series *Boy Meets World,* the show's teacher/mentor, George Feeney, gives the following monologue to Corey, Shawn, Topanga, and the rest of their classmates:

> Gutenburg's generation thirsted for a new book every six months. Your generation gets a new webpage every six seconds. And how do you use this technology? To beat King Koopa and save the Princess… Shame on you!
>
> (Jacobs & Kelly, 1997)

As someone who grew up in the 90s, much like Corey and Shawn, I can relate. My family first got a computer with Internet access in 1997, when I was 10 years old. The technology was new, exciting, and academically irrelevant. I recall using instant messaging platforms like MSN Messenger and AIM during my middle school years to chat with my friends online each night. I figured out how to navigate the Internet to play free games and check sports scores. I also downloaded user-to-user sharing software such as Napster and Limewire to build my digital music collection completely, though illegally, free of charge. Had it not been for my teacher mom, building a collection of academically relevant and stimulating CD games that helped me learn to type, practice math facts, enhance vocabulary, and build my knowledge of history and geography, the technology available to me would have been completely wasted from the perspective of learning. Like Corey and Shawn, I too was guilty of underestimating the learning potential of computers and access to the Internet, opting instead to "beat King Koopa

and save the Princess". My family's personal computer with games and Internet connection became a distraction rather than a tool for learning.

Though this episode aired over 20 years ago, Feeney's words remain starkly relevant. A college, high school, or even elementary student in classrooms throughout the country could potentially engage in learning through a vast expanse of online resources. This access to information has grown and developed due in large part to the widespread popularity of smartphones, tablets, and devices used each day by a growing number of teenagers. These devices have become a staple of modern society. Many students are beginning to enter elementary school, middle school, high school, and college classrooms expecting technology to be readily available. Twenge (2017) explains that this "iGen" group of kids, born between 1995 and 2012, has grown up in households with smartphones, tablets, and devices, and do not remember a time before Internet access was widely available. Technology has been engrained into the lives of nearly every kid between the ages of 5 and 22. This is especially true for teenagers. A 2015 study by the PEW Research Center found that 92% of teens accessed the Internet daily. The study also reported that nearly 75% of teenagers have a smartphone, while only 12% of teenagers reported having no phone at all (Lenhart, 2015).

This widespread access to technology delivers limitless opportunities for learning. A simple Google search for "Pythagorean Theorem" returns nearly six million results that include web pages, instructional articles, videos, pictures, and even news publications that describe, explain, and apply the famous mathematical theorem. Popular personal video and file uploading platforms like YouTube and Pinterest provide the opportunity for kids and adults alike to pursue self-directed learning interests. Social media websites such as Facebook, Twitter, and Instagram offer people an opportunity to form a network of colleagues and engage in conversation and

debate with people all over the world, with all sorts of different backgrounds. Formal learning is even expanding beyond the grounds of college campuses by offering college courses online completely free of charge. EdX.org, for example, offers free self-paced online courses from the Massachusetts Institute of Technology (MIT), one of the most prestigious universities in the world.

These opportunities for accessing academic content continue to expand as smartphone ownership increases. A 2018 study by the Pew Research Center indicated that approximately 95% of American teenagers ages 13-17 own or have access to a smartphone. Ownership rates stay nearly consistent regardless of race, gender, or socio-economic status (Pew Research Center, 2018). Despite the ease of access to this educational content through mobile technology, instructors and parents alike may argue that the tools are not being used to their full potential. It is tempting for adults to wag fingers a la Mr. Feeney and think, *Shame on you, kids, for wasting such an opportunity!* Yet before taking a position of judgment, one might do well to pause and reflect.

As a sixth grade teacher and high school basketball coach, I have witnessed firsthand the overwhelming presence of mobile devices amongst adolescents. Casual observation has led me to believe that cell phones currently serve predominantly as tools for distraction, resulting in an abundance of wasted time. Many of my colleagues would tend to agree. I also recognize that cell phones have enormous potential for changing the way students learn and information is delivered both inside and outside of formal academic settings. This technology could significantly impact the field of education for years to come. As such, I aspire to begin a conversation between students, parents, teachers, administrators, and other practitioners on the topic of the role of mobile phones as a potential tool for learning.

Coronavirus Pandemic

As my study neared completion, a global crisis emerged. The Coronavirus, a severe respiratory illness began to spread throughout the world. To date, the Centers for Disease Control and Prevention (CDC) has reported nearly 750,000 confirmed cases of the virus resulting in nearly 40,000 deaths in the United States (2020). In response to the threat of the virus, Minnesota Governor Tim Walz ordered schools across the state to close, forcing nearly 900,000 students to begin learning from home (Bierschbach, 2020).

This abrupt shift to a digital learning platform has intensified the need to consider the role of mobile phones as potential learning tools. In my district, I have observed several examples of mobile phones being used as tools to support learning. My son's preschool teacher is posting videos and daily activities on an App called Seesaw, all of which are accessed on my smartphone. Some of my sixth grade students are checking into daily virtual study halls on their phones through Google Meets. High school students are accessing content and completing activities and assignments, many of which can be done on their smartphones.

The Coronavirus outbreak occurred after my research was conducted. Had data for my study been collected after the outbreak instead, the results would likely look much different. This pandemic could spark significant changes in the field of education for years to come. I will provide further insights from this study as it relates to the Coronavirus Pandemic in Chapter Five.

Problem Statement and Purpose

The idea of using mobile devices as a tool for learning is intriguing. They are widely owned, easily accessible, and offer a significant variety of potential educational resources. There are substantial arguments that can be made for cell phones as a hindrance to learning as well.

Many secondary teachers and college faculty recognize cell phones as a distraction for students. These concerns about student distractibility are not without merit. Several scholars and practitioners (Duncan et al., 2012; Berry & Westfall, 2015; Froese et al., 2012; Tindell & Bohlander, 2012) have published studies indicating frequent technology misuse by students during instruction, resulting in negative effects on performance and learning. As such, many classrooms, schools, and school districts have implemented policies explicitly prohibiting cell phone use during school hours (Obringer & Coffey, 2007).

In addition to the potential for distractibility from mobile devices during school hours, concerns have also been raised regarding the overall impact of frequent mobile phone use on teenagers' well-being. These concerns include social impacts such as cyberbullying (Juvonen & Gross, 2008; Olweus, 1994; Kowalski et al., 2014; Hinduja & Patchin, 2010; (Internet Safety Technical Task Force [ISTT], 2008) and cell phone addiction (Griffiths, 1999; Young, 1998; (Lepp, et al., 2013; Roberts et al., 2014). Additionally, frequent Internet and video game use amongst teenagers has been linked to increased rates of anxiety, feelings of sadness, social isolation, and even thoughts of suicide (Sanders et al., 2000; Lepp et al., 2013; Messias et al., 2011). Furthermore, research is emerging that links heavy cell phone use with physiological changes in the brain (Hong, S-B., Zalesky, A., Cocchi, L. Fornito, A., Choi, E-J., & Kim H.H., et al., 2013).

Despite these concerns, high school and college students generally seem to underestimate the frequency and impact of their personal cell phone use. Several studies (Duncan et al., 2012; Tindell & Bohlander, 2012) have found that students under-reported their in-class cell phone use when compared to third party observation and when cross-referenced with similar studies. If

these students are underestimating their overall cell phone use, it is also possible that they may be miscalculating the impact of that cell phone use as well.

As the societal impact of mobile technology continues to grow, extensive debate over its role in schools is likely to take place. Teachers, administrators, parents, and students need to consider whether mobile phones can be used as a tool to support learning, or if they are simply a hindrance and distraction from learning. At the time of this writing, schools throughout the United States are grappling with the issue of providing students with distance learning opportunities after being shut down to prevent the spread of the Coronavirus. It is possible that this may be a catalyst for change to formal education, pushing the topic of the accessibility and the role of mobile phones as tools for learning to the forefront of educational debate.

With this in mind, the purpose of this dissertation is to: 1) Examine cell phone availability and use by high school students in a rural Minnesota school district; 2) Determine to what extent students are aware of their cell phone use and its impact on their day-to-day activities; 3) Explore possibilities for utilizing smartphone technology to enhance learning from the perspective of students. Within these three areas of concentration, I aspire to gain a better understanding of cell phone use and habits from the perspective of students rather than teachers, researchers, and practitioners. Additionally, I aim to provide students the opportunity to engage in this research in an effort to not only analyze and reflect on mobile phone use, but to provide ideas and suggestions for teachers to implement smartphone technology into classroom instruction and design.

Overview of Previous Research

This study aims to contribute to a growing body of research surrounding the implications of cell phone use on learning amongst high school students. Although the topic of teenage cell

phone use is immense, I have narrowed the focus to four main bodies of literature, which will be explored in detail in Chapter Two. I will briefly overview each body of literature framing this study.

The first body of literature offers an explanation of mobile learning in schools. This includes a definition and various applications of mobile learning, as well as a discussion of mobile learning within a pedagogical framework. It also addresses the future potential for cell phones and mobile learning in the 21st century in both academic and non-academic contexts.

The second body of literature examines a variety of concerns surrounding cell phone use and teenagers' social, emotional, and physical well-being. Specifically, this research explores issues resulting from cell phone use, which include cyber-bullying and harassment, mental and physical health concerns, addiction, and the physiological impact of extensive cell phone and Internet use. Although most of this research focuses on cell phone use outside of school, the ubiquitous nature of constant cell phone access makes this a necessary component of the study.

The final two bodies of literature highlight research on mobile phone use within schools. This includes studies that support the notion that cell phone use may negatively impact students in schools as a result of distractions to self and peers. Additionally, studies are presented which investigate students' self-perception of their personal cell phone use and its impact. To conclude, a body of research is included which highlights case studies and classroom best practices from researchers and practitioners demonstrating how cell phones might be used as a tool to support learning.

Research Questions

To guide the work of this dissertation, I will explore three specific overarching research questions, and within each, several sub-questions:

1. How are 11th and 12th grade students in a rural Minnesota school district using mobile technology?
    a. What are rates of ownership of smartphones in a rural setting and how accessible is Internet connection for these mobile phones?
    b. How do students use mobile phones both academically and non-academically?
2. What are student perceptions regarding their personal cell phone use?
    a. What predictions do students have regarding the amount of time they spend on their mobile phones?
    b. In what ways do students believe their cell phone use impacts academic activities (study halls, homework, project completion, etc.)?
3. In what ways could mobile technology support learning?
    a. How have students used mobile phones in an academic setting?
    b. What, if any, training have students received on productive cell phone use for academic purposes?
    c. How would these students suggest teachers use cell phones as a tool for learning?

Overview of the Research Site

Research for this project will be conducted at a high school located in a large, rural community in Southern Minnesota. This setting was selected for a variety of reasons. First, I wanted to conduct research in a rural setting since most research I have read on the topic of mobile phone use in schools focuses on students in urban schools. This site gives me the opportunity to gain information specific to rural high school students. Secondly, I have been a sixth grade teacher and high school basketball coach in this district for eight years, meaning I have taught or coached a majority of the students who will participate in this study. The

qualitative component of this study requires a certain degree of rapport established between the researcher and subject (Creswell & Poth, 2018; Maxwell, 2013) and my previous relationships with these students will help me to build and develop this rapport. Finally, my role within the research site coupled with relationships I had previously established will likely contribute to increased levels of support from administrators, staff, and parents, which will hopefully result in greater student participation and site accessibility. Additional information about the research site and the participants will be discussed in Chapter Three.

Theoretical Framework

To address the research questions above, I used methodological strategies grounded in a post-positivist theoretical paradigm. Though I discuss this framework in greater detail in the third chapter, post-positivism provides an opportunity for me to explore and explain these research questions through the use of descriptive survey statistics and quantitative measurements. Furthermore, post-positivism provides greater flexibility to the researcher to interact with subjects of the study than positivism, which will hopefully encourage deeper participation from the research subjects. This flexibility also allows for the use of qualitative research designs to support this study.

Significance of the Study

Through this dissertation, I hope to contribute to the debate over mobile technology as a hindrance towards, or a tool to support learning in several ways. First, I would like to build on scholarly work that describes and analyzes cell phone ownership, accessibility, and usage by teenagers, with a focus on students from a rural setting. Additionally, I aim to provide research that emphasizes student perceptions of mobile technology. A significant number of the studies I read and described in the review of literature in the second chapter used one of three primary

research designs: 1) self-reported survey data to describe mobile phone use 2) observation or experimental design to determine impact of mobile phone use 3) case studies of teachers and other educational experts describing how cell phones were implemented in classrooms. Few studies that I read allowed for student perspective, reflection, and analysis. I am especially interested in offering insight on the topic from a student lens. Finally, I aspire to provide students an opportunity to engage in the research process with me and create a platform to express themselves and share their ideas. Student self-reflection and idea generating should provide a unique set of data for the discussion.

It is my hope that this study will help to inform all stakeholders as they consider the implications of mobile technology use as a part of the learning process. Administrators and school board members could use this research to drive policy creation. Teachers and faculty may use the results as a component of their instructional design. Finally, students could use this data as an opportunity for reflection of their own cell phone habits, or as a guideline for effective mobile learning practices.

The value of this study has been intensified following the changes to learning caused by the Coronavirus Pandemic. With only days to plan, teachers and school districts were able to shift to a distance learning platform that required student and teacher engagement to be conducted digitally. Students across the country are learning through the use of digital devices, including smartphones. This study, coupled with a shift in perspective resulting from the Coronavirus Pandemic, will hopefully contribute to future discussions of how smartphone technology could be used to support students.

Definition of Terms

There are a number of technical terms related to the topic of mobile phones and learning as well as terms specific to research that are presented in this study. In an effort to establish clarity, I have provided some of these terms along with their definitions.

- **Applications (Apps):** Applications are functions, games, and tools that can be downloaded for use on a Smartphone. Smartphone applications offer a variety of uses. Among adolescents, applications often provide the user with access to games, pictures and video, social media, and audio-visual content.
- **Cyberbullying:** Willful and repeated harm inflicted through the use of computers, cell phones, and other electronic devices (Hinduja & Patchin, 2010, p. 208). The definition of cyberbullying is not clearly agreed upon within the literature. Common examples may range from insulting posts online about a person to threats of harm made through a digital medium.
- **Mobile Learning (m-learning):** Mobile learning has multiple meanings in a variety of contexts, ranging from any learning that is done on a mobile device to an interconnected network of exchanges of information and ideas (Traxler, 2016). The definition emphasized for the purpose of this study will be, "the process of learning mediated by a mobile device" (Kearney, Schuck, Burden, & Aubossun, 2012, p.2).
- **Multitasking:** "Divided attention and non-sequential task switching for ill-defined tasks as they are performed in learning situations" (Junco & Cotton, 2012, pp 505-506).
- **Personal Learning Cloud (PLC):** A term describing mobile learning used in business that offers professional development through online courses, social platforms, and various other digital tools (Moldoveanu & Narayandas, 2019).

- **Smartphone:** A cellular device with Internet access, text-messaging and phone capabilities, pictures and video, and a variety of other tools. Since research indicates that 95% of teens own or have access to a smartphone (Pew Research Center, 2018), any reference to "cell phone", "mobile phone", or "mobile device" in this study is synonymous with "smartphone".

Limitations of the Study

There are several limitations that exist within this study. Although specific research limitations will be discussed in greater detail in Chapter Three, I now identify some of these at the onset of the study. First, and foremost, the rapid advancement in smartphone access and technological capability can result in research being outdated relatively quickly. Research on mobile technology that was published ten years ago may be completely obsolete today. Therefore, my review of literature consists mostly of articles published within the last ten years. This also requires that I extend my research beyond peer reviewed journal publications to include some current news articles and practitioner publications.

Another limitation that exists within the study is that the participants are all students from my school district, which is a rural school district in Southern Minnesota. I selected this group of participants in an effort to gain more insight into the cell phone use habits and availability of the technology from a perspective of learning specific to rural high school students as opposed to urban college students, which many of the studies I read have focused on. As a result, the data from the study will have a relatively small sample size and may not be generalizable to a larger population of students.

As previously stated, a third limitation from this study centers on timeliness. The research was conducted in January 2019 and February 2020. The Coronavirus Pandemic

resulted in schools closing in March 2020, forcing students and teachers to quickly adapt to a distance learning model relying almost entirely on digital interaction. If this study were to be replicated following the Coronavirus Pandemic, it is likely that there would be vastly different student perspectives and data sets.

Finally, I acknowledge that I am approaching this study with somewhat of a negative bias towards smartphone use by students. As a classroom teacher, I have only witnessed, and heard from my colleagues, instances of cell phone use that have had a negative effect on student learning, productivity, and socialization. I also recognize that I, nor any other colleague that I am aware of, has invested time into teaching students how to harness the capabilities of their devices for the purposes of learning. Despite my negative bias towards student cell phone use, my hope is that the students will offer a unique perspective that inspires discussion on the issue.

Conclusion

In this chapter, I introduced the overarching research topic of the role of mobile phones as a tool for learning. Within that topic, I presented three main research questions, which will guide this study. Additionally, I have offered an overview of the theoretical framework surrounding this study, along with an explanation of the significance of this research. In the coming sections, I will frame the study within a larger field of related research. I will then describe the methodology used to gather data for the study. Next, I will provide a summary of the data along with analysis of the information. Finally, I will present the conclusions of the study and situate the implications of the research within the field of education. I begin with a review of literature on mobile phone use and the impact on learning.

Chapter Two: Review of Literature

Introduction

The use of cell phones as an educational tool has become more commonplace in recent years as a growing number of students gain access to the technology and incorporate it into their daily lives (Pew Research Center, 2018; Lenhart, 2015; Twenge 2017). Smartphone technology offers students and teachers alike a wide range of potential uses to enhance the learning process (Moneer-Harba, 2012; Thamarasseri, 2014). At the same time, several scholars have identified negative aspects of student cell phone use in the classroom including student distractibility (Duncan, Hoekstra, & Wilcox, 2012; Ali, Papakie, & McDevitt, 2012; Froese et al., 2012) and misuse (Obringer & Coffey, 2007). Others have raised concerns over the impact of frequent cell phone use on students' social, physical, and emotional health (EL Nabawy Ahmed Moawad & Gad Soliman Ebrahem, 2016).

The purpose of this literature review is to examine how scholars have viewed cell phone use, both favorably and unfavorably, in secondary and post-secondary classrooms. Qualitative and quantitative studies analyzing the impact of in-class cell phone use on student achievement will be reviewed. Research surrounding the impact of cell phone use on teenagers and college students themselves will be analyzed. Studies and analysis for best practice regarding cell phone implementation into classroom learning will be highlighted. In the next section, an explanation of smartphone technology and the implications for cell phone use in the classroom will be provided.

Mobile learning

The definition of mobile learning (m-learning) has shifted as technology has grown since the turn of the 21st century. Traxler (2016) identifies three phases of defining mobile learning

from the early 21st century. The first phase considered mobile learning as a technology, in which the mobile learning can be defined as any learning done on a mobile device. The second phase viewed mobile learning as a tool to extend learning outside of traditional environments of education to rural, poor, or sparsely populated areas (Traxler, 2016). The final phase puts learning in the context of a mobile society in which people are becoming more and more interconnected in a digital world in which they are constantly exchanging information and ideas (Traxler, 2016).

Smartphones have numerous features and capabilities that hold the potential to assist with or enhance the learning process as mobile learning tools (Kolb, 2011; Thamarasseri, 2014). A significant function of smartphones is the ability to connect to the Internet. Access to the Internet means expanded access to learning for students (Chiverton, 2017). While the educational benefit to having information so easily accessible seems advantageous, my experience as a teacher has led me to note that web browsing is not always constructive for students. The same digital medium that produces educational content also produces social media, opinions masked as fact, "fake news" and games, videos, and other entertainment sources that could provide easy distractions unless properly handled by both teachers and students.

A noteworthy example of the impact of technology on recent mobile learning educational practices is the push for one to one technology in classrooms and schools throughout the United States. A basic definition of 1:1 technology would be a classroom in which, "students and teachers have access to a personal computing device to use as a tool for academic learning" (Varier et al., 2017, p. 967-968). This definition continues to evolve as technology improves, becomes more accessible, and becomes more affordable. Years ago, 1:1 technology in a school may have meant that students could access computers in a centrally located computer lab for one

class period per day (Means & Olson, 1995 as cited by Penuel, 2006). Today, a 1:1 technology school may have personal laptops, tablets, or devices in each classroom, available for each student, with some schools even allowing students to take laptops home throughout the school year. To provide clarity, Penuel (2006) offers three main characteristics that can be used to identify 1:1 technology implementation in schools:

1. Students are given portable computers with access to software such as word processing and spreadsheets.
2. Students are able to access the Internet through the school's wireless network.
3. Laptops are used to complete academic tasks such as homework, projects, and tests.

These features, which defined 1:1 learning over ten years ago, as well as countless other features are readily available on modern smartphones today. Smartphones can be used to access, draft, and edit documents through a digital platform such as Google Drive or Microsoft Office 365. Smartphones can access not only a school's wireless network, but also wireless networks at home, in the community, or even places where a wifi network is not available[1]. Using these devices, students have the ability to complete countless academic tasks including, but not limited to, projects using pictures and video, research on the Internet (Thamarasseri, 2014).

Research indicates that when implemented effectively, 1:1 technology can provide several benefits for students. An education group sponsored by several major tech companies, including Apple and Intel, launched Project RED in 2011. This project team conducted a study of over 1,000 high schools in the United States. They grouped schools into three categories: Properly Implemented 1:1 schools, All 1:1 schools, and All Other Schools. To define "Properly Implemented Schools," the researchers used the following criteria:

[1] If the user has a data plan that allows for broadband Internet access.

1. Technology is used every day in intervention classes.
2. The administration provides training in technology implementation and change management monthly.
3. Time is provided daily for online student interaction.
4. Core curriculum is taught using technology at least once per week.

(Greaves, Hayes, Wilson, Gielniak, & Peterson, 2012, p. 13).

According to the research, schools in the properly implemented group experienced increased graduation rates, increased scores on standardized tests, and a reduction in discipline referrals and dropout rates when compared to schools in the other two categories and while considering several other variables[2] (Greaves et al., 2012).

However, some scholars argue that technology cannot be the focal point of effective learning. Drawing on the work of Vygotsky (1978), Kearney, Schuck, Burden, & Aubossum (2012) point out that learning is a social process and that it involves interaction between people. Brown and Mbati extend on this idea by explaining, "technology should always be regarded as the enabler and not the driver of our teaching and learning activities" (p. 117). This means that the technology component of mobile devices that drives m-learning and 1:1 classroom initiatives, by itself, cannot generate learning. There needs to be a human component as well. With this in mind, Kearney et al. offer a general definition of mobile learning as, "the process of learning mediated by a mobile device" (2012, p. 2). This study will keep an emphasis on the *mediated* component of that definition of mobile learning by focusing on ways in which mobile devices can enhance the learning process rather than simply imitate it.

[2] For more information, visit the project's website at www.projectred.org.

Access to mobile learning.

Despite the aforementioned potential benefits of mobile learning and 1:1 technology, along with high rates of cell phone ownership among teenagers in the United States (Pew Research Center, 2018), implementation of these devices as an educational tool may not be feasible for certain populations, particularly students in rural communities. A 2016 report on broadband capability in the United States indicated that 39% of rural Americans, 23 million people, lack access to high quality broadband Internet connection[3], compared to 4% of urban Americans (Federal Communications Commission [FCC], 2016). This discrepancy exists for a variety of logistical reasons, but Reardon (2018) argues that the primary cause of lack of rural broadband Internet access is the low population density in those areas (Reardon, 2018). Broadband providers are not willing to invest in building broadband infrastructure in areas where there are not enough customers to make the investment profitable. Without mobile Internet connection, many of the functions of smartphone devices become inaccessible.

Several large companies are making broadband Internet access a high priority. Recently, Cisco introduced an initiative called OpenRoaming. OpenRoaming "creates a link between identity providers, service providers, and enterprises to safely share credentials and access networks" (Chan, 2019, para. 3). This technology would enable mobile devices to automatically join wireless networks in a variety of locations without needing to log in each time a user switches their location. Although this is mostly applicable in urban locations, it is a step toward progress of expanding Internet access for mobile users.

Other initiatives are being introduced to expand Internet access on a more global level. In 2013, Google launched "Project Loon" in an effort to provide Internet access to people in

[3] "High quality" is defined in this report as having met the speed threshold of 25 Mbps download/3Mbps upload.

remote parts of the world. To reach these remote locations where Internet connection is not accessible, a wireless signal from a nearby city is bounced off of a series of balloons in the stratosphere, then relayed to designated remote locations, thereby enabling users to access the Internet using that signal (Loon, 2019). This technology has been primarily used responsively thus far, providing emergency Internet access to flood victims in Brazil and hurricane survivors in Puerto Rico (Loon, 2019). Recently, Project Loon announced a commercial deal in which they will partner with a telecommunications company in Kenya to provide wireless Internet access to remote locations of the country, with each balloon supplying an area of approximately 5,000 square kilometers with wireless Internet connectivity (British Broadcasting Corporation [BBC], 2018).

Mobile learning beyond the classroom.

In an effort to expand leadership development, many business organizations are turning to online learning platforms to replace traditional leadership courses. An article published by the *Harvard Business Review,* Moldoveanu & Narayandas (2019) describes how a collection of online platforms, known as the "personal learning cloud" (PLC) allow businesses and their employees to learn and develop skills through a variety of online courses, websites, and social platforms. Mobile learning through the PLC offers many of the same instructional features of traditional in-person leadership courses, while making several important characteristics of the trainings more efficient and accessible for the participants. These features include:

1. Learning is Personalized- Learners can pursue specific skills relevant to them and can develop those skills at their own pace.
2. Learning is Socialized- PLC learning offers people the opportunity to form teams with similar learners in an effort to solve problems and learn new ideas and skills together.

3. Learning is Contextualized- Professional development is relevant and can be directly applied on the job.
4. Learning Outcomes can be Transparently Tracked- In place of costly professional degrees, employees can instead acquire certifications and micro certifications of skills specific to the workplace.

   (Moldoveanu & Narayandas, 2019, p.2)

In addition to these distinctions, research suggests mobile learning provides a number of other advantages to businesses and their employees. First, there is potential for significant cost savings. Traditional training courses may cost thousands of dollars per employee, while PLC based courses may be available for a fraction of that cost (Moldoveanu & Narayandas, 2019). Secondly, businesses may be able to access a much wider range of training options. Whereas traditional courses may only be cost-effectively available in a limited geographic area, mobile learning makes it possible to access training from more regions of the world without needing to travel (Moldoveanu & Narayandas, 2019). Finally, competition amongst institutions offering cloud-based mobile learning could potentially continue to lower costs and expand offerings, making content even more accessible (Moldoveanu & Narayandas, 2019). Increases in technological capabilities, together with a growing number of notable advantages may cause mobile learning to continue to expand as a tool and resource in a variety of occupational fields.

With mobile learning and technology use in education defined, the study will move to an investigation of observations regarding general cell phone use by teenagers outside of academic settings. The study will then examine research that focus on some of the negative effects of student cell phone use in the classroom. Although these studies do not emphasize pedagogical

instruction for using mobile devices effectively, they present significant issues and concerns from teachers, students, administrators, and policy-makers over the use of cell phones in schools.

Effects of Cell Phone Use by Teenagers

The reviewed literature found that excessive mobile phone use is associated with negative impacts on physical, mental, and emotional health. A brief overview of the research associated with these concerns is provided below.

Impact on physical well-being.

Sedentary behavior, which has previously been associated with high rates of computer use or television viewing, has been linked to multiple health problems, including, "impaired lipid profiles and glucose uptake, greater energy intake and waist circumferences, and greater mortality risk" (Lepp, Barkley, Sanders, Rebold, & Gates, 2013, p. 2). To further investigate the health effects of frequent cell phone use amongst college students, Lepp et al. (2013) conducted a two-part study with a strong research design at a college located in the Midwest United States. In part one, participants were given a survey regarding cell phone use habits and they were asked to predict how many calls and texts they made each day. Using random sampling, participants were selected for the second part of the study, in which a variety of assessments were given to analyze the cardiorespiratory health of the participants (Lepp et al., 2013).

Using regression analysis, the authors noted a significant difference ($p=0.047$) between low intensity cell phone users and high intensity cell phone users in regard to cardiorespiratory health (Lepp et al., 2013). Lepp and his colleagues reasoned that, "cell phone use among this cohort of young people may be a marker for a broader pattern of sedentary behavior" (2013, p. 7). People who exhibit high rates of cell phone use may also demonstrate similar behaviors with computers, televisions, and video games. Mobile phones are poised to become a significant

source of sedentary activity, which could, as Lepp et al.'s study suggests, contribute to health problems for high volume cell phone users in the future.

Another common concern regarding teenagers' cell phone use is the negative impact it has on sleep. In a research brief for the Kaiser Foundation, Zimmerman (2008) described the importance of sleep for adolescents, stating, "Nearly every problem of concern to parents and pediatricians can be brought on or exacerbated by inadequate sleep; from obesity to aggression to hyperactivity'' (p. 1). Zimmerman specifically points out that irregularities in the quality or quantity of a child's sleep may result in impaired executive function, which inhibits a person's ability to perform tasks such as planning, organizing, and paying attention in school (2008).

Recognizing the significant health problems associated with a lack of sleep, several practitioners and researchers (Choi, Son, Park, Han, Kim, Lee & Gwak, 2009; Nuutinen, Ray, & Roos, 2013) conducted various studies that linked excessive screen time to sleep problems. In an extensive research project from South Korea, a group of medical professionals and researchers conducted a quantitative study to evaluate the relationship between Internet addition and common sleeping problems. The research team administered the Young's Internet Addiction Test to a sample of over 2,000 senior high school students and grouped them according to the responses into three categories: non-addicted, possibly addicted, and addicted (Choi et al., 2013). In a follow up questionnaire, the team used the Epworth Sleepiness Scale to measure daytime sleepiness. To account for medical conditions such as snoring, sleep apnea, or teeth grinding, another questionnaire was given to parents in an effort to identify these variables within the study (Choi et al., 2013). In an analysis of the data, the authors noted that, "The prevalence of every sleep problem was highest in Internet addicts, middle in possible addicts, and lowest in

non-addicts, demonstrating an increased rate of sleep problems among more severely Internet-addicted students" (Choi et al., 2013, p. 3).

In a related study, Nuutinen, Ray, and Roos (2013) conducted longitudinal research on younger adolescents in grades four through six in the Netherlands to examine the impact of overall computer and television use and the presence of those devices in a child's room on a child's sleep. A questionnaire was given to a significant sample of over 800 fourth grade students inquiring about sleep habits, computer and television use, and computer and television presence in the child's bedroom. The same questionnaire was given to those students 18 months later to measure change in habits (Nuutinen et al., 2013). The data indicated that children who used computers or watched television excessively slept less and had later bedtimes than those who did not (Nuutinen et al., 2013). Computer use and television viewing in a child's room also predicted a later bedtime for children (Nuutinen et al., 2013). The findings of both studies (Choi et al., 2013; Nuutinen et al., 2013) raise legitimate concerns about the effects of screen time on sleep-related health for young children and teenagers alike.

Furthermore, Zimmerman (2008) notes that parental monitoring of media devices tends to become more difficult for aging adolescents as a result of developmental changes and social pressure. Theoretically, parents of teenagers would have a challenging time developing and enforcing cell phone use rules because of the ease of access and the social pressures requiring teenagers to develop and maintain a digital presence. Each of these factors could contribute to even more sleep problems for both children and teenagers (Zimmerman, 2008).

In another study, Moulin and Chung (2017) shift the focus from televisions and computers to mobile devices such as phones and tablets. Using self-reported questionnaire responses, the researchers determined that over 70% of high school seniors and young college

students sleep with some sort of device (Moulin & Chung, 2017). As many would predict, the direct presence of these devices seems to have a negative effect on sleep habits. Eleven percent of respondents indicated using their device for two or more hours after they went to bed, while over one-third of these students admitted to waking up and accessing their device in the middle of the night (Moulin & Chung, 2017). These actions affect overall sleep time and quality, and the loss of sleep could potentially be greater had the study also investigated the amount of time it takes students to fall back to sleep after accessing their devices in the middle of the night. The study showed that nearly 70% of college students and nearly 90% of high school students reported feeling sleepy during the day, though this data cannot directly prove a connection between device use and sleepiness during the day (Moulin & Chung, 2017).

This section addressed physical risk factors often associated with excessive mobile phone use, with a focus on the negative impact on physical fitness and sleep. In each study presented, it becomes apparent that more time spent on mobile devices appears to reduce the time spent on healthier alternatives such as sleep or physical activity. As cell phones grow in usage and functionality, the risks addressed in this section could continue to become more prominent. Next, the study will focus on issues associated with mental and emotional well-being.

Addiction to mobile devices.

Of the many physical, mental, and emotional health threats associated with cell phone use, addiction to cell phones has arguably the greatest impact. Reductions in physical activity and sleep, as discussed above, can result from excessive cell phone use (Lepp et al., 2013; Choi et al., 2013; Nuutinen et al., 2013; Moulin & Chung, 207). Likewise, issues such as depression, cyber-bullying, and inappropriate activity are often the product of excessive social media use (O'Keeffe & Clarke-Pearson, 2011). Addiction to mobile devices and the Internet encourages

and creates a gateway for many negative behaviors, which may lead to health concerns. This section will discuss some relevant literature on cell phone addiction and continues with a brief examination of other mental and emotional concerns associated with excessive cell phone use.

In a research article published less than a decade ago, Shambare, Rugimbana, & Zhowa (2012) studied behaviors commonly associated with mobile phone use employing self-reported questionnaires. Although the authors noted six behavior types from previous literature, the study mainly supported three behavior types: dependency, habitual, and addictive behavior. The authors concluded, "Mobile phone usage is not only habit-forming, it is also addictive; possibly the biggest non-drug addiction of the 21st century" (Shambare, et al., 2012, p. 573).

The concern over addiction to mobile devices and the Internet has been on-going. Twenty years ago, Griffiths observed that, "social pathologies are beginning to surface in cyber space in the form of technological addictions" (Griffiths, 1999, p. 246). To support this claim, he offered a set of six behaviors that are commonly associated with addiction (Griffiths, 1999):

1. Salience: When a particular activity begins to dominate thinking, feelings, and behaviors.
2. Mood modification: Engagement in the activity results in a change of mood or a "high".
3. Tolerance: More and more time is required to obtain the desired effect.
4. Withdrawal Symptoms: A person experiences unpleasant feelings or physical effects when the activity is taken away.
5. Conflict: The activity creates different conflicts between addicts and the people around them.
6. Relapse: Returning to previous behaviors after a time period of non-use.

Using these criteria, Griffiths identified a handful of subjects for a case study. In his research article, Griffiths (1999) specifically highlighted one subject, a 16 year-old male. He observed

that this teenager spent 70 hours per week on the computer, mostly interacting with other Internet users and reading science fiction, which eventually led to difficulty sleeping, missed classes, and slight obesity.

In another early exploratory study, Kimberly Young investigated the impact of Internet addiction. Using a diagnostic tool, which was modified from a screening instrument for pathological gambling, Young (1998) was able to classify survey respondents into two groups: addicted users (Dependents) and non-addicted users (Non-Dependents). In an analysis of the responses from the Dependents group, Young offered several conclusions. First, she noted that the mean number of leisure hours spent online, not including academic or work related browsing, was 38.5 hours for the Dependents group compared to 4.9 hours for the Non-Dependent group (Young, 1998). The data supports Griffiths' (1999) tolerance classification discussed above, in that people who are addicted to the Internet need more and more time to achieve the desired effect.

Secondly, survey responses indicated a severe impairment in the areas of relationships (53%), financial (52%), and occupational (51%) caused by excessive Internet use (Young, 1998). Internet addiction appeared to have a negative impact on what many would consider to be significant components of these peoples' lives. Finally, survey responses from the Dependents group indicated that 98% of participants reported moderate or severe impairment in academic performance, prompting Young to note:

> Although the merits of the Internet make it an ideal research tool, students experience significant academic problems as they surf irrelevant web sites, engage in chat room gossip, converse with Internet pen-pals, and play interactive games at the cost of productive activity (1998, p. 7).

Young's assertion mirrors George Feeney's fictional lecture, which was presented in Chapter One. Some 20 years later, many practitioners share the concerns raised by Young, and echoed by Feeney, regarding Internet use by students. It should be noted that participants in Young's study were self-selected, and it is possible that data was skewed by motivational factors to respond to the study based on previous experience of the Internet addicts (Young, 1998). In a testament to the longevity of Young's research, concerns still exist in the field of education that the distractions available within mobile devices outweigh the academic potential.

Although addictive behaviors have been traditionally associated with pathological drug use or gambling (Griffiths, 1999; Young 1998), they are commonly observed within the current generation of people who are addicted to their devices. What was considered extreme enough to be highlighted in Griffiths' case study twenty years ago has become more prevalent in present time. In recent quantitative studies of college students in the United States, students have self-reported using their phones between 300 minutes per day and 600 minutes per day (Lepp, Barkley, & Karpinski, 2013; Roberts, Petnji Yaya, & Manolis, 2014). Although neither study featured true random sampling, and both relied on self-reported questionnaires, thereby limiting the validity of the data, the statistics presented are notable. At the rate of use shown in the study, some students reported using their phones between 60 and 70 hours per week, nearly identical to the case study subject in Griffiths' study and almost twice that of the mean Dependent Internet users in Young's study over 20 years ago.

Cyberbullying and online harassment.

As time spent on mobile phones continues to increase, a variety of concerns have surfaced regarding the functions made available by these devices and their effects on children. In 2008, a team of researchers joined with tech companies to form the Internet Safety Technical

Task Force (ISTT) to publish a report on Internet safety. Through an analysis of previous literature on the subject, the research team identified, investigated, and offered advice on four main categories of concern for children's Internet use. These categories included 1) sexual solicitation and Internet-initiated offline encounters, 2) online harassment and cyber-bullying, 3) exposure to problematic content, and 4) miscellaneous risks (Internet Safety Technical Task Force [ISTT], 2008). Although the issues emphasized in the ISTT report are important from an online safety perspective, due to an emphasis on cell phone use in schools, several of these issues are beyond the scope of this study[4]. However, online harassment and cyber-bullying, as well as additional negative effects of social media use are issues that transcend boundaries between home and school, and are therefore worth investigating further.

Cyber-bullying lacks a clear definition[5]. Olweus (1994) offers a widely accepted general definition of bullying by explaining, "A person is being bullied or victimized when he or she is exposed, repeatedly and over time, to negative actions on the part of one or more other persons" (Olweus, 1994, p. 98). Hinduja and Patchin define cyberbullying as, "Willful and repeated harm inflicted through the use of computers, cell phones, and other electronic devices" (2010, p. 208). The overlap in meaning has led some to argue that cyberbullying is simply an extension of traditional bullying. In one study, researchers discovered that 85% of adolescents who reported being bullied online also reported being bullied at school (Juvonen & Gross, 2008). Similar to traditional bullying, cyber-bullying has a number of critical distinctions. These include:

1. Anonymity- Bullies are able to say and do things that they may not say or do face to face.

[4] For additional information, read the full report at https://cyber.harvard.edu/sites/cyber.law.harvard.edu/files/ISTTF_Final_Report.pdf.

[5] Kowalski, Giumetti, Schroeder, & Lattaner offer an extensive review of literature in an effort to refine the definition. For further information, read their paper entitled *Bullying in the Digital Age: A Critical Review and Meta-Analysis of Cyberbullying Research Among Youth.*

2. Accessibility- Whereas traditional bullying often occurs at school or school-related functions, cyberbullying can occur any time and any place.
3. Audience- While only a handful of students may witness a bullying incident at school, hundreds if not thousands of people could view a degrading post about someone on the Internet .

(Kowalksi, Giumetti, Schroeder, & Lattaner, 2014).

These distinctions have implications for adolescents who are increasingly interacting in a digital world. Teenagers who have experienced cyberbullying have reported increased levels of anxiety, emotional distress, and suicidal ideation (Ybarra, 2004, 2006 as cited by Juvonen & Gross, 2008; Hinduja & Patchin, 2010). Scholars have debated the extent to which adolescents experience cyberbullying, with the prevalence of cyberbullying victimization ranging from 10% to 40% (Kowalksi et al., 2014). The lack of consensus over the definition of both bullying and cyberbullying may contribute to discrepancies in the data. In a 2008 study of online interactions in adolescents, researchers changed the word "bullying" in a survey to a broader term of "experienced mean things" and found that over 70% of participants reported incidents that were somewhat synonymous with cyberbullying (Juvonen & Gross, 2008; Kowalksi et al., 2014). The study suggests that instances of cyberbullying may be more common than research shows.

Beyond cyberbullying, students may experience relational issues as a result of extensive mobile phone and Internet use. In an early study on the impact of Internet use on teenagers, researchers discovered a significant statistical difference in the relationship quality between the user and his or her friends and mothers between low usage teenagers and high usage teenagers (Sanders, Field, Miguel, & Kaplan, 2000). In a similar study, a team of researchers using path analysis discovered that reported levels of anxiety amongst college students increased as device

use increased (Lepp et al., 2013). Another study investigating video game and Internet use suggests that students who use these devices five or more hours per day are at an increased risk of reporting feelings of sadness and thoughts of suicide when compared with students who do not use these devices at all (Messias, Castro, Saini, Usman, & Peeples, 2011).

In each of these studies, it is difficult to absolutely conclude that cell phone or Internet use directly contributes to issues such as social isolation, anxiety, sadness, or thoughts of suicide. These youth could have experienced such issues prior to Internet use and could be affected without Internet use as a contributing variable. It is important to note that the highest users of technology reported the highest levels of emotional issues in each of the studies presented (Sanders et al., 2000; Lepp et al., 2013; Messias et al., 2011). The data supports the idea that high usage of Internet and mobile devices could increase the risk of social and emotional disorders.

In this section, relevant literature on a range of issues associated with excessive mobile phone and Internet use has been reviewed. These include physical health problems, addiction, cyberbullying, and other various mental and emotional issues. Although these concerns are primarily founded outside of academic settings, the ubiquitous nature of mobile phones in present society makes it difficult to form direct boundaries between home and school. Having presented general concerns regarding mobile phone use outside of school, a summary of literature specific to mobile phones within academic settings will now be highlighted.

Concerns Regarding Cell Phone Use in Academic Settings

Although cell phones offer potential as an academic tool when properly integrated, a majority of published research accessed for the literature review on the topic addresses the negative impact of cell phone use in the classroom. This section will explore the literature on

cell phone use in secondary and post-secondary classrooms, and discuss and analyze the negative impact of cell phone use on student performance.

Distractions.

Perhaps the most substantial issue regarding cell phone use in the classroom is the widespread use of phones by students without permission. Using student self-reported survey data, several scholars (Duncan et al.,2012, Berry & Westfall, 2015, Froese et al., 2012 Tindell & Bohlander, 2012) have confirmed that a significant number of college students are using their cell phones during class. Duncan, Hoekstra, & Wilcox (2012) conducted a mixed-methods study of a university classroom in an attempt to investigate in-class cell phone use of college students and its impact on academic performance. Using a combination of survey results, direct observation, and semi-structured interviews, the authors were able to gain insight on cell phone use in a college classroom. According to the survey results, nearly 75% of students reported using a phone during lecture, with an average frequency of three times per class period (Duncan et al. 2012).

In a similar study, Tindell & Bohlander (2012) found the number of students who had used cell phones for text messaging during class was closer to 90%, with nearly 30% of these students admitting to texting during class daily (p. 3). Berry & Westfall (2015) provide survey data that indicates students checking their phones significantly more frequently during a typical class period. In this study, nearly 25% of the students checked their phones 3-4 times per class period, 10% checked their phones 5-6 times per class period, and another 10% admitted to checking their phones 7 or more times during class. Less than 20% of students did not report using their cell phones during class (Berry & Westfall, 2015).

Another concern regarding the data of in-class cell phone use is that these numbers may be underrepresented. Although self-reported survey data is easy and convenient to collect and analyze, it is possible that students are underestimating their cell phone use in class. In addition to survey data, Duncan et al. were able to expand on their study by using direct observation notes of student cell phone use in a college lecture hall. In their self-reported surveys, students reported using cell phones approximately three times during a typical class period (Duncan et al., 2012). During direct observation, however, the researchers noted that the frequency of student cell phone use was closer to seven times per class period (Duncan et al. 2012). The data indicates students underestimate their personal cell phone use during class, which could potentially skew some of the survey data that has been collected. Additionally, students may be underestimating the potential for distraction that cell phone use provides.

For many students, cell phone use during class creates distractions and frequent distractions inhibit learning. Several scholars (Duncan et al., 2012, & Froese et al., 2012) have studied the impact of distractions on student learning and achievement. Duncan et al. built on their survey and direct observation research described above by analyzing the grade point averages (GPA) of students in the study. They discovered that the GPA of students who never use cell phones during class is 0.36 points higher than those who do (Duncan et. al, 2012). While this data points to cell phones as having a negative impact on academic performance, the authors point out that caution needs to be taken in identifying cell phone use as the only cause of the decrease in GPA. It is possible that students who are not using cell phones during class are more motivated, disciplined learners, and might be more successful with or without cell phone use by classmates (Duncan et al., 2012).

Additional studies also suggest that the use of in-class texting has a negative impact on student performance. In a closely controlled, post-positivist study, Froese, Carpenter, Inman, Schooley, Barnes, Brecht, & Chacon (2012) designed an experiment to explore the impact of text message distractions on learning. In the experiment, participants simulated a classroom environment in which they were shown a brief PowerPoint presentation and then quizzed on it afterwards. One group was required to turn their cell phones off. The other group left their phones on vibrate mode. The participants with their phones on were instructed to respond to a variety of text messages that the researchers sent them throughout the presentation. The process was then repeated, with both groups switching roles. On the ten-point quiz, the text messaging participants earned a mean score of 6.02 while the non-texting participants earned a score of 8.25, indicating a decrease of almost 30% when students were texting during instruction (Froese et al., 2012). The results of this experiment suggested that academic performance is negatively impacted by distractions caused by texting.

Impact of multitasking.

Several scholars (Rosen et al., 2011; Wood et al., 2012; Junco & Cotten, 2012) have built on the body of research examining the impact of student multitasking on academic performance. Multitasking involves divided attention and switching between tasks during a learning situation (Junco & Cotten, 2012). Students who have access to the Internet, games, or text-messages via a smartphone or laptop could attempt to switch back and forth between academic and non-academic tasks during class or homework sessions. Students who engage in off-task activity might divert attention away from the learning activity. This raises the question, "When objects or events go unattended and even inhibited, how deeply are such ignored items processed?" (Chun, Golomb, & Turk-Browne, 2011, p. 86).

To investigate the impact of student multitasking during real-time learning, a group of researchers designed a study in which college students engaged in various types of off-task digital interactions including texting, browsing Facebook, emailing and instant messaging, and more during a series of classroom lectures (Wood et al., 2012). In comparing the results of a post test on the lecture material, the technology multitasking group (m=0.57) scored significantly lower than the pencil and paper control group (m=0.67), with Facebook and instant messaging users experiencing the largest negative impacts (Wood et al., 2012). Although this study presented a difficulty in checking for exact student compliance in the experimental multitasking groups, the data suggests students who accessed technology during classroom lectures performed significantly worse than students who did not.

Multitasking is a significant concern for students outside of the classroom as well. Junco & Cotten (2012) designed a study that examined the multitasking habits of over 1,800 college students and discovered that texting (51% of respondents), browsing Facebook (33%), checking and sending emails (21%) and miscellaneous Internet browsing (16%) were among the most prevalent sources of distraction during students' study time. The researchers conducted inferential statistical analysis, which accounted for variables such as the participants' high school grade point averages (GPA), socio-economic statuses, and computer abilities, and determined that both sending text messages and browsing Facebook while studying were associated with a lower college grade point average (Junco & Cotten, 2012).

Despite a growing body of evidence indicating that multitasking is detrimental to academic performance, one study shows that the impact may be less significant. In an experimental study of undergraduate college students enrolled in a psychology course,

participants attending a lecture were sent either zero, four, or eight text messages [6] at previously determined durations during the presentation of information (Rosen, Lim, Carrier, & Cheever, 2011). Although the zero text message group scored an average of 11% higher on the posttest than the eight text message group; there was almost no difference in scores between the moderate use group, those who sent and received four text messages, and the zero text group (Rosen et al., 2011). The data suggests that multitasking, when conducted in moderation, may not be as harmful for young adults as parents and teachers believe. It should be noted that the study featured a sample consisting of 80% female participants, and it is possible that gender differences in performance may exist.

In addition to the external distractions caused by multitasking, research suggests that the actual presence of a mobile phone may direct attention away from tasks such as studying or completing homework. In a study offering implications to the field of education and learning, over 500 undergraduate students participated in an experiment in which their mobile phones were placed in varying degrees of proximity, such as in a separate room (low salience condition), in their backpacks or pockets (medium salience condition), or on their desks (high salience condition) while they completed a variety of tasks that measure cognitive capacity (Ward, Duke, Gneezy, & Bos, 2017). The results of the experiment showed a clear linear trend between both working memory and fluid intelligence and cell phone proximity, with significant statistical differences between the low salience and high salience groups (Ward et al., 2017). Despite the students' devices being silenced, and self-reported survey data indicating that most participants did not think about their phones at all during the test (Ward et al., 2017), the data may suggest

[6] Some also reported receiving and sending additional text messages to friends outside of the experiment.

that dependence on mobile devices accounts for some amount of internal distraction in addition to the distractions offered through conventional multitasking.

Distraction of others.

Beyond the personal impact of cell phone use during class, scholars have addressed the potential distractions of other students in the class as a result of student cell phone use. Tindell & Bohlander point out that nearly all (97%) of the 267 students in their survey have noticed a classmate texting during class (2012). These distractions are produced almost daily in college classrooms throughout the United States. In a survey conducted by Berry & Westfall (2015), data indicated that approximately 50% of students are interrupted by classmates' cell phone use one or two times during a typical class period, and another 12% report three or four interruptions per class period (p.4). The data shows that a classmate's cell phone use is noticeable and serves as a distraction for peers throughout the group.

Professors and instructors notice cell phone distractions as well. In a case study discussion with faculty at a university in Pennsylvania, Ali, Papakie, & McDevitt (2012) discussed and recorded several recent incidents of cell phone distractions in class. In one instance, an instructor witnessed a student in the back of the classroom who leaned over and showed his phone to a classmate, which was followed by giggling. In another incident, a professor noticed students frequently tapping on their phones and asked them to pay attention. Some of those students claimed that the phones had a digital copy of their textbook, and that they were simply following along on their phones. When the professor caught a glimpse of these same phones, he did not observe textbooks, but rather some type of shopping website (Ali et al., 2012). This particular study relied on practitioner observation rather than strict qualitative

analysis, but it supports the common and frequent cell phone distractions that many college professors experience.

Academic dishonesty.

Another key issue regarding student cell phone use centers on academic integrity. In a survey of high school principals, the use of mobile devices to cheat on tests, quizzes, exams, or other assignments was a significant concern, as 80% of principals agreed that it could be a potential problem (Obringer & Coffey, 2007). Obringer & Coffey explain, "Text messaging features are problematic during tests. Text messaging can take place without teachers being aware of it because phones are becoming smaller and more easily obscured" (2007, p. 45). Although the previous statement was published over ten years ago, it is arguably even more relevant in present time. Since then, applications have been invented that are designed to hide content from parents or adults who happen to access a child's cell phone. Made to look like a common cell phone feature, such as a calculator, these apps allow the user to store pictures, messages, and other content in secret files, unrecognizable to a teacher or an adult upon brief inspection (Woda, 2019). These tools could potentially make it even more difficult for parents or teachers to identify academic misconduct.

Mobile apps that could support academic dishonesty have instructors concerned. In their literature review, Tindell & Bohlander (2012) cite several instances of cell phones used for cheating. In one example, students at the University of Maryland cheated on an accounting exam by getting multiple-choice answers via text message from students outside the room that had access to an online answer key. In another example from Tolson (2008), nursing students from Prairie View A&M University admitted to cheating by texting answers with classmates who had already completed the test (Tindell & Bohlander, 2012). Although these are two basic

and isolated examples of using mobile devices for cheating in post-secondary classrooms, this is a key issue for high school classes as well. Citing a report by CommonSense Media (2010), Thomas & O'Bannon point out that among students between the ages of 13 and 18, "more than one-third of all teens (35%) admitted to using their cell phones to cheat at least once, and two-thirds of all teens (65%) reported that others in their schools cheat with them" (2013, p. 13). With prevalent reporting of mobile devices used for cheating, it is reasonable for teachers and administrators to be concerned with the use of these devices in class.

In this section of the literature review, several common concerns regarding the use of mobile devices by students during instructional time were noted. These included personal distractions, peer and classmate distractibility, interruptions for the professors or instructors, and the potential for using mobile devices to cheat. Most of the studies in this body of literature were epistemologically and methodologically similar. A majority of the data was collected using student or faculty self-reported survey results. Most of the participants in the studies were college students, with some being high school students. In these studies, the authors provide a collection of data and statistics to indicate that the behavior of using a cell phone during class creates the response of distraction, resulting in decreased academic performance. In the next section, an alternate point of view on cell phone use will be cited, in which authors rely mostly on case studies and qualitative review to explain both practical and theoretical applications for effective cell phone use in classrooms.

Effective Cell Phone Use in Academic Settings

Although a great deal of research highlights the negative aspects of cell phone use in schools, a growing body of literature reviewed for this study is developing which explores the potential role that cell phones could play in enhancing and evolving the teaching and learning

process. Kolb (2011) summarized the potential of cell phones' role in the learning process by explaining, "A basic cell phone can be the Swiss army knife of digital learning tools" (p. 41). Even simple functions on a phone such as camera, video, or text-messaging capabilities have the potential to assist in and enhance the learning process. Kolb provides several examples, including using functions on phones for organization, creating digital photo projects using a built-in camera, or creating a podcast by recording a phone call (Kolb, 2011).

Since Kolb's statement, cell phone capabilities have become increasingly advanced and cell phone ownership continues to rise. In a 2015 report by the PEW Research Center, survey results indicated that approximately 90% of teenagers in the United States own some kind of cell phone, and 75% of teenagers own a smartphone (Lenhart, 2015, para. 2-3). In a follow-up study three years later, the percentage of teens who own or have access to a smartphone increased to over 95%. Additionally, 45% of teenagers who were surveyed indicated that they were online "almost constantly" (Pew Research Center, 2018, para. 18-21).

Scholars' and practitioners' research noted in the previous section point to the distractibility of the devices and the potential for cheating as deterrents of incorporating cell phone use into classroom learning. Prensky (2010) offers a rebuttal, arguing that when students are demonstrating off-task behaviors on a device, the students and the technology are not necessarily to blame, and instead a teacher should examine the pedagogy. Prensky explains, "Technology, particularly laptops in class, does not support lecturing or telling pedagogies at all. Given nothing interesting to do on the powerful machines in front of them, students will use them as they wish" (2010, p. 103). Students are unlikely to be distracted by the classroom technology if that technology is being used to engage them in authentic and meaningful learning. The key may be for teachers to develop lessons and projects that consider the role of technology

as a pedagogical tool. This section will explore literature that attempts to frame and describe effective mobile learning in the classroom. Additionally, it will provide examples of successful implementation of cell phones into classroom instruction and offer a variety of examples of cell phones used as instruments and tools for learning. To conclude, this section will examine the potential of m-learning from a critical theory perspective.

Building upon the research and theoretical frameworks of a variety of scholars (Koole, 2009; Danaher, Gururajan, & Hafeez-Baig, 2009; and Parsons, Ryu, & Cranshaw, 2007), Kearney, Schuck, Burden, & Aubusson (2012) developed a framework for defining and evaluating mobile learning. This framework attempts to conceptualize m-learning based on three features: personalization, authenticity, and collaboration (Kearney et al., 2012). Personalization is described as learning in which a student "may have control over the place (physical or virtual), pace and time they learn, and can enjoy autonomy over their learning content" (Kearney et al., 2012, p. 9). Radinsky et al. (2001) describe authentic learning as tasks that "provide real world relevance and personal meaning to the learner" (as cited by Kearney et al., 2012, p. 9). Authentic learning involves instruction that gives the learner opportunities to make connections between the learning and the real world outside of an academic setting. The final category in this framework is collaboration. Collaboration in the learning process involves connections, conversations, and discussions between students, teachers, and resources outside of the classroom. From an m-learning perspective, collaboration could include a limitless network of peers, teachers, and subject experts freely exchanging ideas and information (Kearney et al., 2012).

Thamarasseri (2014) summarizes a collection of literature and research to present a case study for effective implementation of multi-media instruction, which is easily attainable through

the use of smartphones, into classrooms. Based on these studies, Thamarasseri offers the following rationale for using multimedia in the classroom (2014, p. 13-14):

- scaffold learning through activities enhanced by videos and online games
- provide a menu of authentic assessment options
- encourage collaboration and feedback
- address multiple learning styles.

Additionally, Thamarasseri contends that exposing students to technology in schools will help prepare them for jobs that rely heavily on future technology (2014).

Chiverton (2017) expands on the idea of cell phones as a useful instructional tool by offering the perspective that cell phones can help increase access to education for many groups of under-served populations of students. In his article, Chiverton cites a variety of studies and projects from across the world in which students utilized smartphones for specific academic purposes. In one project, students in Bangladesh used a series of brief audio lessons and quizzes to learn English (Chiverton, 2014). Students in Tanzania were given smartphones for academic use to aid in mathematics and science instruction through the BridgeIT project and they showed "significant gains during the 2010 academic year in comparison to test scores of students in the control schools who did not benefit from BridgeIT" (Chiverton, 2017, p. 3). Finally, a study from China demonstrated that students receiving vocabulary study assignments via text message learned more effectively than students who studied vocabulary in the traditional paper pencil method (Chiverton, 2017). Chiverton's research article supports the notion that cell phones have the potential to break some socio-economic barriers in education.

A study, conducted by Tulane, Vaterlaus, & Beckert (2014), used qualitative survey analysis to gain an increased understanding of student motives for cell phone use during a typical

school day. The authors coded the responses and identified three underlying themes. The first theme addressed the issue of text messaging during school as a distraction. Some respondents admitted being distracted by texting or by classmates' texting, while others thought they should be allowed to regardless of the potential for distraction. Another theme involved the use of texting to stay connected. Many participants expressed the need to communicate with family members outside of school or to stay connected with friends during school, and preferred text messaging as the communication medium to accomplish that communication. The third theme involved regulation. Many participants thought that students should be allowed to self-regulate cell phone use during class, while others thought that cell phones should be used circumstantially, such as a reward for good behavior or finishing work early (Tulane et al., 2014).

The body of research surrounding effective cell phone use in the classroom is different both epistemologically and methodologically than research addressing negative impacts of cell phones in schools. Tulane et al. (2014) and Thamarasseri (2014) demonstrate an underlying interpretivist epistemology in their studies. Both studies aim to increase understanding of the place for cell phones in modern education by using qualitative design to include multiple persepctives, including students, teachers, and parents. Chiverton (2017) demonstrates a critical-theory based epistemology in an attempt to illustrate how cell phones have the potential to benefit certain social classes.

Conclusion

The review of literature addressed three central themes of research regarding cell phone use by adolescents. It explored research on the social, emotional, and physical impact of cell phone use, negative effects of cell phone use in the classroom, and the potential for cell phones

as an effective learning tool in modern education. An extensive body of research that used mostly student survey and experimental design suggests that mobile phones present many challenges and difficulties for students inside and outside of schools. However, a small body of research is beginning to emerge supporting the role of mobile phones as tools for learning. As technology becomes even more accessible to younger generations of students, the need to study the impact of increased screen time both inside and outside of school becomes imperative.

There is a need for additional research to advance previous studies of cell phone use by focusing specifically on rural high school students rather than the predominately urban, 18-25 year old age range that most scholars have researched. Research on adolescent cell phone use needs to go beyond strictly self-reported surveys and experiments as data collection tools. Additional research on this topic can be strengthened through the use of direct student engagement and analysis. Gaining perspectives from students regarding challenges and success pertinent to cell phone use in classrooms would be useful. Insight on this topic would be helpful for parents, students, educators, and administrators to determine to what extent mobile phones can and should be used as tools for learning. In the coming section, an outline of the research plan will be provided and specifications for each aspect of the research design will be described.

Chapter Three: Methodology

Introduction

The previous chapters explored the availability of mobile devices, the emergence of mobile learning as an educational platform, concerns regarding mobile phone use by adolescents both inside and outside of school, and effective uses of mobile phones as tools to promote learning. In this chapter, the research methodology will be discussed. The research design was used to help determine cell phone use and availability for high school students in a rural population, in addition to exploring the possibilities of mobile phones as a tool that could potentially inhibit or successfully contribute to students' learning. This included a reflection of the writer's positionality within the study along with a description of the research questions, the research design, the participants of the study, the ethical responsibilities as a researcher, and a discussion of limitations.

Positionality

A characteristic of good research is that the author has openly presented his/her positions and personal contexts in regard to the research topic (McMillan & Schumacher, 2010). In an effort to provide transparency, I will address my positionality relative to the participants, site, and topic for this research project. I enter this study as a self-proclaimed technologically proficient adult. I got my first mobile phone when I was 16 years old. In the 16 years that have since passed, I have been captivated by the exponential growth of capabilities that mobile phones have offered. As a teacher, the idea of using mobile phones as potential tools to promote learning is enticing. At the same time, I have observed firsthand the command that mobile devices seem to have over the attention of an entire generation of people, both young and old.

Throughout this study, I recognize the need to take steps to ensure that my preconceived biases do not interfere with the collection and analysis of data.

In regard to the participants and research site, I have taught within the district for over eight years as a sixth grade teacher. Many of the students who participated in this project will have passed through my classroom as elementary students. Additionally, although I teach at the elementary school, I have been able to form relationships with several administrators and faculty at the high school research site. The positive relationships I have previously established with students and teachers alike helped to promote participation in the study and accessibility to the site during the research phase.

Participants and Setting

This study took place in a large, rural school district in Minnesota. The district draws students from a community of approximately 10,000 residents in addition to a few nearby small, rural towns. The population of the community is almost entirely white, with a low, but growing number of Latino residents, along with a small population of African American, Native American, and Asian residents. Table 1 below describes some socioeconomic information for the community (United States Census Bureau, 2018, table 1)[7]:

Table 1. Socio-Economic Information as per 2018 Census

Median Household Income	$48,973
People over 25 years of age with Bachelor's degree or higher	22%
Residents in the civilian labor force (16 years of age or older)	63.5%
Population Below the Poverty Line	13.9%

[7] The citation for this data has been altered on the reference page to maintain confidentiality in an effort to protect the site and participants of this study.

The community and its surrounding area have deep ties to the agricultural industry, while also housing several large manufacturing facilities and a major medical center.

The school district within this community features a preschool through sixth grade elementary school and a seventh grade through twelfth grade junior/senior high school. The junior/senior high school educates nearly 900 students. This school served as the site for the research. The research was completed during the months of January 2020 through March 2020.

Research Ethics

Ethical issues should be considered during all phases of the research process (Creswell & Poth, 2018). Steps were taken to protect the participants of the study as well as the research site as a whole. Before the research began, a meeting was set up with the administrators at the high school to share and discuss the research proposal. With their input, plans were developed to complete the research in the least obstructive manner possible so that students lost a minimal amount of instructional time. Participation in the project was optional and students' grades and class standing were not impacted if they chose not to participate. Parental permission was obtained before both phases of the study to identify students who were eligible to participate[8]. Additionally, the project was granted approval by the Institutional Review Board (IRB) before any research was conducted[9]

A priority during the data collection was to help the students understand the significance of this research and the value of their roles as research participants. The students worked collaboratively with the researcher to contribute data to the project and build an understanding of the research process and the potential implications of the research. The main emphasis of the approach was to teach the students the value of qualitative research. Thoughtful, detailed insight

[8] See Appendix 1 for a copy of the Parental Notification and Consent Form.
[9] See Appendix 4 for a copy of the IRB approval form

can add depth to the research beyond a simple collection of numbers. After a brief explanation of what qualitative research is and how the research will be collected, the students were given an overview of some key studies described in Chapter Two. I wanted the students to realize that most research studies that have been completed on the topic of mobile phone use in school are quantitative, survey-based, mostly negative towards mobile phone use, and feature very limited qualitative insight from students themselves, instead focusing on adult perspectives. Through this discussion, the importance of the students' roles in this research study was conveyed in hopes that students would respond with enthusiasm and an increased willingness to participate in the research.

During the interview portion of the study, students answered questions that were intended to create open, honest, and insightful discussion on the issue of mobile phone use in schools. The collected data was stored in a secured file, in a locked location that was only accessible to me. To protect the participants during research analysis and publication, pseudonyms for specific student names as well as a pseudonym for the research site were utilized. Finally, when the research project was completed, the findings were presented to the class and a request for reflection and feedback was sought. The outlined steps worked to fulfill my obligation as a researcher to minimize risk or harm to the participants of the study (McMillan & Schumacher, 2010).

Overview of the Research Design

As discussed in Chapters One and Two, I have drawn on a combination of practitioner experiences, as well as research in a variety of fields, to frame this study. Within this framework, answers to the following research questions were sought:

1. How are 11th and 12th grade students in a rural Minnesota school district using mobile technology?

   a. What are rates of ownership of smartphones in a rural setting and how accessible is Internet connection on students' smartphones?
   b. How do students use mobile phones both academically and non-academically?

2. What are student perceptions regarding their personal cell phone use?
   a. What predictions do students have regarding the amount of time they spend on mobile phones?
   b. In what ways do students believe their cell phone use impacts academic activities (study halls, homework, project completion, etc.)?

3. In what ways could mobile technology support learning?
   a. How have students used mobile phones in an academic setting?
   b. What, if any, training have students received on productive cell phone use for academic purposes?
   c. How would these students suggest teachers use cell phones as a tool for learning?

With question one, insights were gained as to how and at what frequency high school students use their mobile devices both inside and outside of school. Data on students' access to a reliable Internet connection beyond school grounds were also collected. As stated in Chapter Two, research indicates that nearly 40% of rural Americans lack access to quality broadband Internet connection (FCC, 2016). Since the potential academic features of mobile phone use outside of school depends on access to quality, high-speed Internet; statistical insight into Internet availability for students becomes a significant component of this research topic.

For questions two and three, expertise of students in regard to the role that mobile devices has or could have in their learning experiences was revealed. Students engaged in discussion of past and current experiences with mobile devices in an academic setting. Additionally, students were prompted to generate ideas for implementing mobile phone technology into the learning process. The topic of cell phone use in schools has a large body of information collected from researchers and practitioners, as evidenced in Chapter Two. Very little research has been provided from the perspective of the students. This study therefore is an attempt to provide insight that is unique from much of the previous research on mobile phone use in schools.

The research for this study featured a mixed-methods research design. Specifically, the study follows a design, in which both qualitative and quantitative data are collected and then triangulated to form a "more comprehensive set of data" (McMillan & Schumacher, 2010, p. 26). The research study was approached with an underlying postpositivist epistemology, which is a paradigm that allows the researcher to gain insight from multiple perspectives through the use of rigorous methods of data collection and analysis (Creswell & Poth, 2018). A mixed-methods research design rooted in postpositivism enables the researcher to approach the project aiming for a certain degree of objectivity, while still allowing for contact with the participants of the study. Having identified the overall research design and underlying epistemological position, the specific plan for conducting the research will be described.

Procedures and Analysis

Student self-reported surveys.

The first part of the research featured a collection of data through a student self-reported survey[10]. The primary purpose of this survey was to gain insight into mobile phone use habits and wireless Internet accessibility for junior and senior high school students in a rural setting. The intent was to gain a better understanding of students' attitudes, beliefs, and perceptions regarding their mobile phone use, as well as their experiences using these devices as a tool for learning. Using convenience sampling, in which participants are chosen on the basis of accessibility (McMillan & Schumacher, 2010), the survey was completed by a group of junior and senior students (n=23) whose parents had submitted the permission forms, which were sent both physically with students and digitally via email.

[10] See Appendix 2 for a copy of the survey.

The survey was administered online using Google Forms sent via student email based on the parental consent list mentioned previously. The estimated time for completion of the survey was approximately 10-15 minutes. After a low response rate from parents signing the paper copy of the permission form an email was sent, resulting in a higher response rate. To ensure validity, I reviewed the survey with high school faculty before giving students the final survey.

Once the survey was completed, the results were compiled in an Xcel file in Google Drive for analysis. These results provided descriptive statistics that offer a surface level snapshot of answers to the three research questions stated in the previous section. Using a combination of significant data landmarks including mean and median as well as percentages, a statistical summary of perceived cell phone use and its impact, cell phone ownership and availability, and experiences with cell phone use in schools was generated. This data is summarized and analyzed in Chapter Four.

Small group discussions.

The second phase of the study consisted of a small group discussion involving an advisory group of high school seniors selected based on availability and accessibility. These discussions took place in January and February of 2020 and lasted approximately 30 minutes each. The purpose and value of the participation of the students was explained and a brief overview of the qualitative research process as described previously in the Research Ethics section of Chapter Three was provided. The preliminary data results from the survey were shared with the group to promote transparency and build background knowledge. Once students had gained an understanding of their role in this research process, a small group discussion was conducted.

To engage the students in discussion, a set of overarching interview questions was presented to the group[11]. These questions were related to two primary interview topics. The first was a general exploration of the role that cell phones play in the lives of students. Within this topic, I aimed to better understand students' perceptions on their own personal cell phone use and reflect on the overall impact of cell phones on society. For the second topic, I wanted to gain students' perspectives on how they have used cell phones for learning and what the students' beliefs are about the potential for using cell phones as tools for learning.

Although I structured a set of anchor questions in advance, I approached this research through the use of a semi-structured interview. Maxwell (2013) argues that semi-structured interviews, "allow you to focus on the particular phenomena being studied, which may differ between individuals or settings" more so than a tightly structured interview (p. 88). With a point of emphasis of this research being student perceptions, I believe that it was necessary to be flexible and let the students drive the conversation. Epistemologically, this approach also allowed for the potential development of unforeseen themes, which may provide perspectives that differ from the predominately quantitative, survey-based research on the topic of student mobile phone use. Deviations from the preset list of interview questions were permitted when the students engaged deeply in a tangential topic. The class discussion was recorded and transcribed for analysis.

Once this portion of the research project was completed, the results were analyzed. First, the recorded small group discussions were transcribed manually. To efficiently organize the transcribed interview, I followed the advice of Saldana (2016), who suggested recording the interview and researcher field notes onto a word document and leaving a wide margin on one

[11] See Appendix 3 for a list of the survey questions.

side for recording codes and themes. Once the data had been transcribed, I engaged in a process seeking meaningful points of discussion and interactions amongst the participants. Within this discussion, I identified themes in which students provided similar thoughts and ideas to each other or to previous literature within the study. Additionally, I sought to identify themes of student ideas that diverged from typical student responses or those that did not align with previous research.

Saldaña (2016) suggests that the process of grouping codes into themes is similar to finding the mean in a quantitative set of data. A researcher essentially takes a group of varying points of data and synthesizes that data into one "consolidated meaning" (Saldaña, 2016, p. 10). Throughout the data collection and analysis process, memos were kept to help document procedures and analyses and to begin to recognize emerging themes and ideas in the students' responses. These memos not only provided organization to the process, but served as a valuable form of data analysis as well (Maxwell, 2013).

Finally, a follow up discussion with the participants of the qualitative components of the study was conducted. As a check for validity, code themes were discussed with the group based on the small group discussion. Participant feedback was used as a form of member checking to improve the validity of the study. Using these results, along with the results of the survey described above, the group discussed overall perceptions of student cell phone use. Participants were encouraged to reflect on their beliefs of whether or not mobile phones could be used to improve learning. The students were challenged to discuss suggestions for teachers for implementing mobile devices into classroom instruction and the learning process overall.

Limitations

A primary limitation to the study involved a shift in policy resulting from a change of administration at the research site. In the past few years, students at the high school had been permitted to "flex out" of a class, meaning they were allowed to complete their classwork outside of the classroom in designated areas. Students were permitted to use their cell phones and other devices while in these areas, as well as being allowed to use their phones during passing time between classes and during lunch. The new administration has implemented a revised phone policy and eliminated the opportunity for many of the students to flex out of class. This policy may have limited the ideas that students were able to generate for the research project due to lack of experience using mobile devices in school.

Another limitation was the lack of time to complete the small group discussions. The intent was for the study to be as non-intrusive as possible for the participants. As such, the study was designed to have the students miss the least amount of class time possible. Using advisory time eliminated the need for students to miss core classes, but it also reduced the time available for discussion.

An additional limitation to the study involves the generalizability and transferability of the data. Lack of a true random sample and a small sample size (n=23) inhibited the generalizability of the quantitative data component of the study. Additionally, studying only participants at a single research site naturally limits transferability of the research to populations of students with different contexts or locations. The focus of the study was to gain additional perspective from rural high school students in Minnesota. The experiences, conditions, and perceptions of the participants in the study may vary a great deal from a similar student from an urban setting, a student from a rural setting in a different part of the country, or students with

different socioeconomic conditions. However, as Lincoln and Guba (1985) assert, "It is, in summary, not the naturalist's task to provide an index of transferability, it is his or her responsibility to provide the database that makes transferability judgments possible on the part of potential appliers" (p. 316).

Finally, throughout the research process, there were several alterations to the original research design that could be considered limitations. At the onset of the study, administration at the research site had encouraged me to survey all of the junior and senior students at the high school, approximately 250 students. However, the Institutional Review Board (IRB) at Concordia University-Saint Paul, in an effort to protect participants of a study who were minors, required signed parental consent forms. This limited the sample size of the survey significantly.

The research design also originally included a student journal portion, in which students would record instances in school in which access to a mobile phone would have enhanced their learning. The participants of the small group discussions were all asked to engage in this activity. However, no student completed the activity and I chose to remove the journal portion from my research design. These research design revisions will be discussed in more detail in Chapter Five, where I offer suggestions for further research.

Conclusion

This chapter has offered an overview of the research site, the research design, and data collection and analysis methods. Positionality to the research and my ethical responsibilities throughout the study have been noted. The results of this research will be summarized and an analysis will be provided in Chapter Four. Chapter Five will feature an interpretation of the findings as well as an analysis of how this research might contribute to the field of education.

Chapter Four: Data Collection and Analysis

The data collected for this study drew from two primary sources. These included a survey and a series of small group interviews. The main focus in collecting this data was to provide information that centered on the perspective of students rather than the many studies conducted from the adults' points of view. Through these data collection methods, I was able to generate a unique set of student input on the topic of mobile phones as tools for learning.

In this section, I begin by summarizing the data from the student survey and providing my analysis. This will center on mobile phone ownership and Internet access and reliability, as well as student perceptions of their mobile phone use both inside and outside of school. I then introduce and analyze themes generated from a combination of responses on the survey and discussions during the small group interviews. These themes include: avoiding generalizations, mobile phones as multi-purpose tools, and student-teacher collaboration. Finally, I analyze how these themes support or contrast research on the topic.

Summary and Analysis of Survey Responses

The first part of the survey centered on data regarding cell phone ownership and Internet availability. Participants (n=23) in 11th or 12th grade responded to the survey. Responses were submitted anonymously. The tables shown and described below provide a summary of this data.

Table 1

Student Mobile Phone Ownership

Do You Own or Have Access to a Mobile Phone With Internet Capability?	**Percent of Responses**
Owns or has access to a mobile phone	100%
Does not own or have access to a mobile phone	0%

Table 2

Duration of Cell Phone Ownership

How Long Have You Owned or Had Access to Your Mobile Phone?	**Percent of Responses**
Less than 1 year	0%
1-2 Years	8.7%
3-4 Years	30.4%
5+ Years	60.9%

Table 3

Internet Availability at Home

How Do You Access Internet on Your Mobile Device While You Are at Home?	**Percent of Responses**
Wi-Fi	82.6%
My Phone's Broadband Connection/Data Plan	17.4%
No Access at Home	0%

Table 4

Internet Connection Reliability

How Reliable is Your Internet Connection at Home?	**Percent of Responses**
Very Reliable	43.5%
Reliable	43.5%

Somewhat Reliable	13%
Unreliable	0%
No Internet Availability at Home	0%

The data summarized in the tables above provide some affirming insight into mobile phone ownership and access. In Table 1, 100% of participants responded that they owned or had access to a mobile device. A previous study by the Pew Research Center indicated that 88% of teenagers in 2015 owned a mobile phone, with 75% of teenagers owning some type of smartphone (Lenart, 2015). A follow up study showed that smartphone ownership had increased to 95% of teenagers only a few years later (Pew Research Center, 2018).

The data collected from this study support the notion that the percentage of teenagers who own or have access to a smartphone has and will continue to grow. It is not unreasonable to assume that in the near future, smartphone ownership rates for teenagers will approach 100%. Furthermore, data in Table 2 show that these students are experienced mobile phone users, with over 90% of them owning their devices for three or more years. As a classroom tool, mobile phones are widely accessible for students, with users that are familiar with many of the tools and features offered on the devices.

Additionally, survey responses indicate that students are generally able to access the Internet outside of the school day. Table 3 shows that 100% of respondents are able to access Internet on their mobile devices while at home. Of those students, 87% rate their Internet connection as Reliable or Very Reliable. With this study focusing on students from a rural community, this data is encouraging. Previous studies (FCC, 2016; Reardon, 2018) have suggested that rural citizens could be at a disadvantage when it comes to Internet availability, yet participants in this study seemed to have no difficulty accessing the Internet at home. It should

be noted that this study did not separate responses based on socio-economic status or location of residence (in-town versus out of town), both of which may impact Internet access and reliability.

The second part of the survey explored student perceptions of their personal mobile phone use. This included student reflections of the time they spend on their phones and how that time spent on mobile devices impacts them physically, emotionally, and socially. A summary of these responses will be provided in the tables below.

Table 5

Student Mobile Phone Use

	Hours Per Day Spent on Mobile Device	**Times Per Day That You Pick Up and Look at Your Mobile Phone**
Mean	5.56	139.11
Median	4	75
Maximum	14	849
Minimum	2	4
Range	12	845

As shown in Table 5 above, participants in this study reported using their mobile phones approximately five hours per day. This is consistent with previous studies in which college students reported using their mobile phones between five and ten hours per day (Lepp, Barkley, & Karpinski, 2013; Roberts, Petnji Yaya, & Manolis, 2014). Data also shows that the median number of times students pick up and look at their mobile devices each day is 75 times per day.

This data support two main concerns regarding mobile phone use by students: mobile phone addiction and distractibility. Most students in this study are able to use their phones during passing times or free periods, meaning students are spending approximately three to five

hours outside of school time on their mobile devices. Additionally, assuming a typical student is awake for 16 hours each day, the median student reports picking up his/her phone nearly once every 12 minutes throughout their day. This suggests that the pull of mobile devices on students' attention (Ward et al., 2017) may be difficult to overcome in an academic setting.

In addition to reflecting on their mobile phone use, students also reflected on the impact of their mobile phone use. This data is summarized in Table 6 below.

Table 6

Impact of Mobile Phone Use

	Using a Mobile Phone Improves my Emotional Well-Being	**Using a Mobile Phone Negatively Impacts My Physical Health**	**Using a Mobile Phone is Important For My Social Life**
Strongly Agree	8.7%	4.3%	30.4%
Agree	30.4%	43.5%	34.8%
Undecided	43.5%	39.1%	8.7%
Disagree	17.4%	8.7%	21.7%
Strongly Disagree	0%	4.3%	4.3%

Responses to this part of the survey indicate a wide range of student perceptions regarding the impact of mobile phone use. The most common response when considering the influence of mobile phone use on both emotional well-being and physical health is "Undecided". This leads me to believe that students have had few opportunities to reflect on their mobile phone habits and the role that mobile phones play in their lives. A slight minority of responses view mobile phone use favorably when considering emotional well-being, while a slight minority

view mobile phone use unfavorably when considering the impact on physical health. Over 60% of students acknowledge that mobile phone use is an important component of their social lives.

The final part of the survey asked participants to summarize the experiences they have had using mobile phones as tools for learning. This section also asked students to reflect on the role that mobile phones could play in the learning process, including positive and negative aspects of mobile phone use in schools. Results are summarized in the tables below.

Table 7

Mobile Phone Use for Academic Purposes

	Has a Teacher Allowed You to Use a Mobile Phone for an Academic Activity in the Past Two Weeks?	**Has a Teacher Taught You Specific Strategies For Using Your Mobile Phone as an Academic Tool During the School Year?**
Yes	73.9%	43.5%
No	21.7%	39.1%
I'm Not Sure	4.3%	17.4%

Table 8

How Do Students Use Mobile Phones to Support Learning?

Activity	**Percent of Students Who Report Using a Mobile Phone to Perform the Activity**
Organization	52.2%
Completing or Submitting an Assignment Online	82.6%
Communicating With Classmates About an Assignment	78.3%
Researching a Topic Online	91.3%
Creating a Project	30.4%

Other	13%
I Have Not Used a Mobile Phone For Academic Purposes	0%

The data from Tables 7 and 8 offer several points. First of all, it appears that nearly three-quarters of students are permitted to use their mobile phones for an academic purpose in recent weeks. This shows that teachers in this particular school are becoming more accepting of mobile phones being used as academic tools. However, the data also leads me to believe there is a need for additional teacher training and skill development to directly teach students strategies for effectively using their mobile phones.

Just over 40% of students recall a teacher directly teaching a strategy for using mobile phones as tools for learning. This lack of instruction from teachers results in students using mobile phones for three basic purposes: completing or submitting online assignments or quizzes, communicating with classmates, and looking up information online, which will be discussed in further detail in the coming analysis of the small group discussions. Only 30.4% of students indicated that mobile phones are used as creative tools in completing a project for class. This means that the majority of these students have not used mobile devices as tools to support authentic learning activities, which may increase engagement (Kearney et al., 2012).

Finally, the survey asked students to reflect on the positive and negative aspects of mobile phone use in schools. The results have been summarized in Table 9 below.

Table 9

Student Perceptions of Mobile Phone Use in Schools

	Mobile Phones Could Enhance or Improve My Learning At School	**Mobile Phones Could Enhance or Improve My Learning Outside of School**	**Mobile Phones Would Distract Students From Completing Work at School**	**If Mobile Phones Were Allowed, Students Would Use Them to Cheat**	**Mobile Phones Distract Me While I work on Homework Outside of School**	**Students Should Be Allowed to Use Mobile Phones During Class**
Strongly Agree	21.7%	39.1%	17.4%	13%	4.3%	13%
Agree	52.2%	43.5%	21.7%	17.4%	26.1%	43.5%
Undecided	17.4%	13%	47.8%	52.2%	43.5%	34.8%
Disagree	8.7%	4.3%	4.3%	17.4%	21.7%	8.7%
Strongly Disagree	0%	0%	8.7%	0%	4.3%	0%

The data presented in Table 9 show an overall favorable student view towards allowing mobile phone use during school. 73.9% of respondents agree or strongly agree that mobile phone use would enhance or improve learning in school, while 82.6% believe the same to be true of mobile phone use outside of school. 56.5% of students agreed or strongly agreed that mobile phones should be allowed in class, while only 8.7% of participants disagreed. The negative aspects of mobile phone use appear less clear, as nearly half of the respondents are undecided regarding distractibility and the potential for cheating. These issues were brought up in the small group discussion portion of the research and will be addressed further in the coming section.

This section of the study presented data regarding student experiences and perceptions of both personal and academic mobile phone use. Several key points have been discussed. First,

nearly every student who took the survey owns a smartphone and has reliable Internet access outside of school. Second, mobile phones have a significant pull on students' attention throughout the course of a day, which may present issues with distraction during school hours. Next, student perceptions about the impact of mobile phone use on physical and emotional health seem to be mixed, while most students indicate that mobile phones are an essential component of their social lives. Finally, a majority of the students have used mobile phones for basic academic functions such as organization and communication. However, less than half of the participants have been directly taught strategies for using mobile phones effectively, and less than one-third have used mobile phones for engaging academic activities such as project creation. Students in the survey seemed to recognize the potential for mobile phone use as a tool for learning, but are not clear about negative implications of use such as cheating or distractibility. In the coming section, I will describe and analyze the small group interview and student journal portions of my research and make connections to the student survey as well as previous studies.

Summary and Analysis of Small Group Discussions

In this study, the participants provided a range of unique thoughts and ideas regarding the role of mobile phones in their lives both inside and outside of school. Throughout the data collection process, several recurring themes began to emerge, as well as a handful of contradictory perspectives. In this section, I will explore these themes and perspectives through a collection of similarly grouped ideas, while making note of those contradictory perspectives. The themes I will explore include avoiding generalizations, mobile phones as a multi-purpose tool, and student-teacher collaboration.

Avoiding generalizations.

"Depends on the kid. There are adults I know who don't get off their phones, there are kids I know who never look at their phones. Humans, in general, we are vastly different from each other." –Kyle

It is easy for adults to label this generation of teenagers as brain-dead zombies who stare at their phones all day. Research even tends to support this notion, as several studies indicate that college students spend between five and ten hours each day on a mobile device (Lepp, Barkley, & Karpinski, 2013; Roberts, Petnji Yaya, & Manolis, 2014). However, the participants in this study were quick to point out that teenagers, like all humans, have different and unique preferences, and as such, need to be given opportunities to practice autonomy over mobile phone use.

Perhaps one of the most surprising points brought up during the study centered on a discussion of participants' awareness of their mobile phone use. Participants seemed to indicate that they tend to prefer an alternative engaging activity to spending time on their devices. Braxton is a student who has a job that he enjoys. He informed the group, "I use [my phone] less outside of school. I'm busier, I don't use my phone at work." Kyle agreed, "It's the same with me. I feel like I use technology, especially my phone, more inside of school, because once I get outside of school, I have work or something going on, so I don't really have time to sit and stare at my phone." I followed this discussion up by asking about phone use over summer break, when school is not in session, assuming students would be using their devices more. Ty, a student who is active in several sports explained that he actually used his phone less during the summer because there was more to do. These participant reflections seems to support Prensky's claim that students who are given engaging tasks will be less prone to using devices as a simple

distraction (2010). Students who are given an opportunity to do something engaging will participate, while students who are bored resort to phones as a source of entertainment.

Despite some peoples' perceptions, mobile phone addiction is not limited to teenagers only. Lauren pointed out that mobile phones negatively impact both children and adults alike. She explained, "I think little kids having cell phones is negative. My brother and sister have phones and I don't really get to talk to them as much, because that's all they want to do is be on their phones." To Lauren, the same is true for adults: "Even with my mom too, she's always on Facebook and we don't really spend time together". Though TV shows and movies often display teenagers at home zoning out their families, many of the participants, like Lauren, reported these same behaviors in younger siblings and in parents.

Finally, participants pointed out that teachers and adults should not make generalizations about concerns such as cheating or distractions. Several students expressed a belief that the responsibility of using mobile phones in class should be shifted more to the students. Lauren argued, "Teachers can't hold our hands forever. We gotta be responsible for ourselves, what we do with our time." An anonymous response on the student survey offered a similar viewpoint by explaining, "I think mobile phones can be allowed at school and I do think they can help, but you really have to choose what you are going to use them for and if you are responsible enough to have it with you at all times." In discussing how they envisioned using mobile phones during their future college classes with less supervision, responses once again differed. One student claimed that if he were comfortable with the content, he would be ok with being on his phone during class. Another said that she would pay attention and would not even bring her phone to class.

Like distractibility, students recognize that cheating could take place, but also point out that the small percentage of students who want to cheat seem to find a way to do that no matter what. An anonymous response collected from the survey suggests, "If students want to cheat, they can always find ways to do it. I've heard people get past the secure browser [on a computer]". Students proposed that if mobile phones were used to look up and copy homework answers, those actions would catch up to students when they take their assessments. Jack argues, "If you get to the test, you'll figure out who's learned it and who hasn't".

Throughout the data collection process, the participants offered several counterpoints to generalizations often associated with teenage cell phone use. Although teenagers do tend to use their devices frequently, the group pointed out that they would prefer other engaging activities instead. Likewise, although distractibility and cheating are a concern, the participants recognize that these behaviors would likely occur even without mobile devices. Students need to be taught to self-regulate and given opportunities to practice this, while teachers need to design instruction and assessment that engages students and safeguards against cheating. I will discuss this more in Chapter Five, but now I shift to a discussion of mobile phones used as multi-purpose tools.

Mobile phones as a multi-purpose tool.

Mobile phones offer many features that could potentially make them valuable tools for learning. Previous research has identified several useful features of mobile phones, including student organization, looking up information online, and completing online assignments or assessments (Kolb, 2011; Thamarasseri, 2014). As student access and experience using mobile phones continues to expand, the role of mobile phones as tools for learning will expand as well. As noted from the survey data mentioned previously, a strong majority of students own a smartphone and are experienced users of these devices, with over 60% owning their devices for

five or more years. This experience was evident in the responses and preferences of the participants throughout the interview when discussing mobile phone use as an academic tool. De'Andre points out:

> For the most part, it's just a more convenient version of a computer, so you wouldn't have to go to either the lab or a cart to get a Chromebook to look, I'd rather just pop it up on my phone.

The participants in this study addressed many ways in which a mobile phone replaces or provides easier access to traditional learning tools. They note that most of their classes are organized online through Google Classroom and Google Drive, where they can take quick quizzes, turn in work, and check due dates for assignments, all of which can be done on mobile devices. Reflecting on my experiences as a student fifteen years ago, most of my class materials were kept in folders, notebooks, and planners. My assignments were turned in predominately on physical sheets of paper, either written or word-processed. The overall organization of present day classroom materials has shifted to a digital medium, and several other traditional tools for learning are gradually being replaced as well.

During a discussion of student experiences using mobile phones in schools, the participants noted several ways in which mobile phones have replaced traditional learning tools. One such example includes the availability of basic tools such as calculators. Kyle mentioned, "I have an app on my phone which is literally just like a TI-84 calculator with everything on it, so a lot of times, I don't even bring my calculator to physics unless we have a quiz or something." When I inquired further about the use of the calculators, the students informed me that classroom calculators are available for students to use or rent, but there often are not enough for all students to use, or the ones that available are, according to Marco, "trash, the settings on those are like…"

Curious, I used my mobile phone to look up the price of a graphing calculator and discovered some on Amazon that are selling for over $100. I asked Kyle if there was a cost for downloading his graphing calculator App, and he responded, "Nope. I've found multiple and I've tested a lot of them out just to see which one I like most."

In addition to replacing calculators, the participants also expressed a preference for digital versions of textbooks. When asked how they envisioned the future of mobile phone use as a tool for learning, Marco suggested, "An app with the textbook where you can type in the problem you're on and it goes right to it." Kyle pointed out that his sister, who is in college, gets many of her textbooks digitally.

The group unanimously agreed that they would prefer digital textbooks, and offered several reasons why. Kyle explained, "I never bring my textbooks anywhere. I literally have my textbooks sitting in my locker the entire year. If I need a textbook, I'll grab one from the class." He also pointed out that textbooks are heavy and cumbersome. Jack suggested a situation in which the convenience and instant access of digital textbooks could provide an advantage over paper copies of textbooks:

> If you're in a yellow situation [allowed to use your phone during a study hall] and you get done with all your work and you're sitting there on your phone and you know you have more work, but you'd have to go all the way back down to your locker to grab a textbook, come all the way back, well you have it on your phone. It's the convenience piece.

In addition to replacing folders and notebooks, calculators, and textbooks, some participants suggested that mobile phones could expand access to instruction as well. Marco explained that in a CTE (Career and Technical Education) class, "When we're trying to figure

out how to put something back together, we can go on YouTube and just look it up to see how." He noted that nearly every time he needed to look something up, a video on the topic was available and that video usually helped him complete the task.

Ty expanded on this suggestion by discussing an app that can be downloaded for math in which students can type in or take a picture of the problem and it gives you an answer. The group brought up two types of applications like this called SnapMath and Slader. Though answers are often provided in the back of most math textbooks, apps like Slader offer the added advantage of teaching how to do the problem as well. Kyle argued, "If we are doing problems out of the book, I'd rather use Slader, because it goes a lot more in depth on exactly what every single step you're doing."

While many of the features of mobile phones that the participants brought up can be done through the use of computers or tablets, the group members consistently mentioned ease of access and availability as the difference maker. Whereas students may take several minutes to grab a Chromebook from a classroom cart, log in, connect to the Internet, and complete a task; the same task could be done in seconds with a mobile phone that fits in students' pockets.

In addition to the tools conveniently made available by mobile phones, students have started to recognize the potential for mobile phones to expand the walls of traditional classrooms. When I asked how students envisioned the future for mobile phones in learning, Kyle predicted, "Eventually, we're gonna have an app where it's basically like a group chat with teachers and students, where students can just pose a question and people can reply." The idea of a digital learning space where people all over the world can collaborate is not new. Kyle pointed out that the website Reddit.com has threads where people can pose a question and get explanations from anyone.

The potential to provide these connections from students and teachers all over the world nearly instantly is exciting. Greta Thunberg, through the use of Internet and social media, was able to turn a one person climate change protest in Sweden into a movement that over 4 million people participated in across the globe (Alter, Haynes, & Worland, 2019). I believe students, like Thunberg, could potentially use mobile devices to pursue global perspectives from peers across the world on subjects of common interest, which would be a deeply engaging form of learning.

Despite a myriad of potential benefits, participants still pointed out several limitations or disadvantages to academic mobile phone use. Cheating is a topic that has been brought up in several studies (Obringer & Coffey, 2007; Woda, 2019; Tindell & Bohlander, 2012; Thomas & O'Bannon, 2013) and was the negative aspect of mobile phone use that generated the most discussion. When prompted to examine disadvantages of allowing cell phones in class, Ty began by explaining, "Cheating. You could use your phone like texting somebody across the classroom for answers if they're really smart… and you could look at [their answers] and copy it down on your test." I followed his point up by asking students if they thought people could get away with cheating in a small high school classroom as opposed to the large college lecture halls primarily described in the studies mentioned above. Kyle responded:

> Definitely. Of course. It's really easy to just sneak your phone out of your pocket and have it down on your lap and keep your head pointed towards your paper and then you go on your phone and Google something.

Distractibility was also a concern mentioned by some participants. In the survey described previously in Chapter Four, participants reported looking at their phones a median of 75 times per day and spending an average of nearly 5.5 hours per day using their devices. Marco

explained, “I guess every time I pull out a phone and I see a text from somebody, I have to read it before I do something. Communication and social interaction was often described by participants in the study as the primary function of their mobile phone use. 65.2% of respondents share they spend most of their time on mobile phones texting or calling friends, while 82.6% acknowledge social media use as their primary form of engagement. Personal experience, coupled with data from this study, suggests that if students were granted unchecked access to mobile phone use during class, it would be hard to overlook the possibility for increased student distractibility.

Finally, there are some features of computers that mobile phones are not easily able to replicate. De’Andre pointed out that typing essays on a computer is easier than trying to type a paper on a mobile phone. For now, that may be true, but technological advances may eventually make typing obsolete as well. During a study hall this past week, I observed one of my sixth grade students using a voice-to-text feature on his Chromebook to summarize a news article without needing to type the document himself. Perhaps his generation, through the expansion of mobile technology, will never need to physically type a paper in college.

As discussed in this section, the tools and functionality of mobile phones continue to grow and develop, offering students a significant number of advantages over traditional learning materials and even computers and tablets. Mobile phones provide cheaper alternatives to traditional learning tools such as textbooks or calculators. They expand access to education through online tutorials and academic resource applications. However, issues such as cheating and distractibility are still a concern.

Student-teacher collaboration.

"I feel like most everything, like the apps and social media and all that, kids just figure it out by themselves or they have friends that help them out, because we're more exposed to it everyday, so we're more used to it, we know how to work it, so we find those things and find those ways to get what we need" –Te'a.

Several components of the study suggest that students are often times early innovators of technology use in the classroom. In the survey described above, 73.9% of students report using a mobile phone during class to complete an academic task, yet only 43.5% of students report learning a mobile phone strategy directly from a teacher. The participants gave the example of early controversy surrounding Slader, the app that allows students to take a picture of a math problem and generates a step-by-step solution set. "When Slader just started coming out, we just started learning about it, the teachers didn't like it… now, they're all ok with it" –Marco. The teacher perspective here makes sense. On the surface, this looks like an app that would provide opportunities for students to cheat. However, as teachers gained exposure and familiarity to the app, perspectives began to shift. "Like Mr. B now says [for us to] use Slader, so on and so forth, as a way to learn instead of just cheating" –Jack.

The participants also recognized the importance of teacher autonomy in implementing mobile phone use in their classrooms. I asked the group if they believed that a school needed a consistent cell phone policy across the board. Every response indicated that teachers should personally choose how cell phones are used in their classrooms. Jack explained:

> It's more on a class basis. Like if I'm in Mr. B's [class] where I have my calculator, have my supplies, and he's there helping us, then being on my phone isn't necessarily a need. Instead, if you're in shop with Mr. C, he's helping someone else, and you're sitting there

trying to fix a tire rod and you don't know how, it's easy to hop on your phone and find out.

Working with mobile devices on a need by need basis as opposed to a blanket policy may provide additional opportunities for teacher and student collaboration, while removing pressure for teachers who do not support mobile phone use in classrooms. Still, as discussed previously, not every student is going to comply with classroom rules for mobile phone use. To combat misuse, the group came up with several suggestions for teachers. One suggestion was to simply not allow phones to be used during assessments. If students had used an app like Slader to copy down answers to math problems throughout a unit, it would become glaringly obvious once the student took the assessment. Others hinted at a three-strike rule for classroom misuse, or a minimum grade requirement for being allowed to use phones during a study hall. Te'a described a teacher who had a red, yellow, green system which indicated to the student a certain level of acceptable mobile phone use during class that day. These systems would provide opportunities for teachers and students to open a discussion about effective mobile phone use, while offering both teachers and students an appropriate level of autonomy.

Conclusion

This chapter has provided a summary and analysis of research collected through a student survey and small group discussions. The student survey provided insight into mobile phone ownership, Internet availability, student social and academic use, and student perceptions. The small group discussions expanded on the preliminary survey data, by examining student experiences with using mobile devices as academic tools, including both positive and negative aspects. In the next chapter, I will provide recommendations for practice based off of the research from this study as well as recommendations for future studies.

Chapter Five: Recommendations and Conclusion

Mobile phone use in schools is a topic that will continue to generate debates between all stakeholders as student ownership rates and device functionality rise. Although there are a variety of potentially useful applications of mobile phone use in classrooms, a majority of the research on the topic focuses on the negative aspects of student mobile phone use. Additionally, most research features college students in urban settings as participants, and is primarily conducted through survey data or observation, limiting the perspective of high school students. Expanding on previous research, this study examined the potential of mobile phones as tools for learning from the perspective of 11th and 12th grade high school students in a rural community. Using a mixed method research design, I sought to answer the following research questions:

1. How are 11th and 12th grade students in a rural Minnesota school district using mobile technology?
    a. What are rates of ownership of smartphones in a rural setting and how accessible is Internet connection for these mobile phones?
    b. How do students use mobile phones both academically and non-academically?
2. What are student perceptions regarding their personal cell phone use?
    a. What predictions do students have regarding the amount of time they spend on their mobile phones?
    b. In what ways do students believe their cell phone use impacts academic activities (study halls, homework, project completion, etc.)?
3. In what ways could mobile technology support learning?
    a. How have students used mobile phones in an academic setting?

b. What, if any, training have students received on productive cell phone use for academic purposes?

c. How would these students suggest teachers use cell phones as a tool for learning?

Although a large body of scholarly work has examined components of these research questions, a limited number of studies have focused directly on high school student perspectives, especially those of rural high school students. Through this study, the participants were able to provide a combination of quantitative and qualitative data that will hopefully add to the discussion of mobile phone use in schools. In this chapter, I will offer a summary of the findings, address implications for educational practice, and provide recommendations for future research.

Summary of the Current Study

Through a mixed methods research design, the study attempted to pursue answers to the research questions posed in the previous section. Data for questions one and two was collected using a student survey. The results of the survey indicated that 11th and 12th grade rural high school students have high rates of smartphone ownership and access to the Internet at home. The survey also helped to provide insight into student self-perception of phone use both inside and outside of school.

The small group interviews sought to answer the third research question, with an emphasis on student experiences and insights. Based on a combination of responses from the survey and themes generated from the student interviews, several conclusions can be drawn from this study.

First, findings suggest that mobile phones can be a very useful tool. For the participants in this study, mobile phones have begun to replace a wide range of educational tools. These devices are able to complete nearly all of the tasks that a computer can, with the exception of typing a lengthy document (for now). They can access information on the Internet, course content is being posted through platforms such as Google Classroom, students are able to use them for communication and organization, and students are even beginning to show a preference for digital textbooks. All of these features are accessible in a matter of seconds and available in the pockets of the users. A strong majority of students own smartphone devices, have several years of experience using them, and can access the Internet both at home and at school. These findings support and expand upon previous research (Kolb, 2011; Thamarasseri, 2014) that highlighted the usefulness of mobile devices as learning tools, and as capabilities continue to develop, even more features to support learning will likely become available.

Next, participants addressed the issue of generalizations of students and their mobile phone use. These students pointed out that kids have unique interests and preferences, and expressed a desire for autonomy over their mobile phone usage. Although a common point of view from adults' perspectives is that kids are addicted to their mobile devices, the participants' responses offered a contradiction. Students in this study indicated that mobile phone use seems to be born out of boredom, and that given an interesting or engaging alternative, the students would not use their mobile phones as much.

Students do recognize that there are negative aspects to allowing mobile phone use in an academic setting. The participants addressed issues of academic dishonesty and student distraction as primary concerns. However, the students pointed out that people who are distracted or use mobile devices to cheat are likely to exhibit those behaviors with or without

mobile devices. Furthermore, the participants hypothesized that the number of students who would engage in destructive mobile phone practices would be rather small, and that the majority of kids would be able to use their devices appropriately. The participants suggest that measures could be put into place by teachers to address the limited number of problem students, while allowing autonomy to the responsible majority.

Finally, the responses from the interview suggest a desire for students to collaborate with teachers to create an atmosphere for effective mobile phone use. Citing the example of the math help app, Slader, the participants point out that mobile tools like this are discovered by kids first, then presented to teachers, then adapted for classroom use or discarded. If students discover a useful feature of a mobile phone, teachers would benefit from learning about it and may even implement it into their instruction. However, students in this study did point out that teachers should be allowed to choose their level of mobile phone implementation. They recognize that mobile phones might be useful and helpful in some classes, but distracting and harmful in others. As a result, the participants advocated for teacher autonomy regarding classroom mobile phone use, which will be discussed in an upcoming section about policy creation.

Implications for Educational Practice

In this section, I will offer recommendations for teachers, administrators, and policymakers regarding effective strategies for mobile phone implementation in schools based on the present study.

Access and use of mobile devices.

At the time of writing, Minnesota has joined states throughout the country in shifting to a distance learning platform due to the closure of schools caused by the Coronavirus Pandemic (Bierschbach, 2020). This has made the issue of digital connectivity and access to devices all the

more urgent. A recent report from the Federal Communications Commission stated that over 21,000,000 Americans do not have access to reliable, high-speed Internet at home (Romm, 2020). My research indicates that, at least in this rural Minnesota town, the digital divide is beginning to close.

In a span of three years, smartphone ownership by teenagers increased from 75% in 2015 to 95% in 2018 (Pew Research Center). In this study, 100% of respondents (n=23) indicated that they owned or had access to a smartphone, and 100% of respondents reported having access to the Internet on those devices, 87% rating their Internet connection as "reliable" or "very reliable". My findings regarding the prevalence of students' access to mobile devices with Internet capability were recently affirmed when I conducted a district mandated phone survey with my sixth grade homeroom students' parents in response to the Coronavirus school closure. In these surveys, all twenty-one families (three families did not participate) reported having Internet connection and devices at home, many of which were smartphones. School wide, approximately 7% of students reported lack of Internet access, and it is likely that some of those students are members of the same family.

As access to devices and Internet connectivity expands, learning opportunities for students, especially for low socio-economic families, may expand as well. Chiverton (2017) published a research article citing several examples of mobile phones being used to provide educational opportunities to under-served populations of students throughout the world. In my study, participants discussed additional opportunities created by smartphone use, most notably the idea of using graphing calculator apps. To take upper level math courses, students need a graphing calculator. For many families, paying $100 or more for a graphing calculator may be a significant financial burden. Instead, students can download a graphing calculator for free on

their smartphones. Tools like this could potentially grant equal access to all students who own or have access to a smartphone, regardless of socio-economic status.

The data from this study indicates that there is a need to go beyond simply asking whether students are connected, and instead begin to focus on how to effectively use these tools. With widespread ownership and extensive experience using these devices, teenagers could potentially use their smartphones to assist and improve in their learning both inside and outside of school. However, mobile phones use in schools may also be detrimental, with students experiencing negative effects such as academic dishonesty, student distractions, and inappropriate digital interactions.

School leaders need to work with teachers and students to find the opportunities for advancing learning through mobile devices. An opportunity does exist for high schools to create pilot projects in which students are accessing their mobile devices for learning. The findings from such projects can create new learning options for students and teachers. While this may not be successful in all courses, the study has found several areas of learning can be enhanced through expanded use of mobile devices in a guided setting. An important element of such pilot projects would be to ensure all students have access to mobile devices to prevent a technology access and learning gap from occurring.

Effective classroom implementation of mobile phone use.

In a discussion of implementing computer technology in class, Prensky explains, "given nothing interesting to do on the powerful machines in front of them, students will use them as they wish" (2010, p. 103). Distractibility is a valid concern for students using mobile devices in an academic setting, and it is very difficult for academic activities to compete with the games and social media that mobile phones also provide for students. However, teachers will

eventually have to find a way to design instruction that engages students to a point of limited distraction. This will require going beyond simply replacing paper materials with digital materials.

Students in today's world seem to strive for social connections, as evidenced by the millions of students worldwide who came together to raise awareness of climate change through exchanges on social media (Alter, Haynes, & Worland, 2019) and mobile devices offer limitless opportunities for these connections. This was also evident in my discussions with the participants during the study's data collection. Students could demonstrate their learning in a variety of ways on mobile devices that could create global connections and interactions. I recognize many examples examples exist, which include participating in online forums and discussions about global topics, publishing podcasts, or creating YouTube content related to an academic topic. Activities like these would meet students' demand for engagement and satisfy their desire to expand social connections as well as expand their learning opportunities.

While this may be a big change in teaching practices, demonstrating to teachers the possible learning opportunities accessible via mobile devices can shift these practices. The recent shift to online learning in Minnesota is also enhancing this shift in practices. An approach for implementing mobile phone use in the classroom would be to start teaching students simple, yet effective, ways to use their mobile phones. In a couple instances, participants in the study discussed searching the Internet for instructional videos during their shop and auto classes or using applications to help them solve math problems. The same idea can be applied for any academic subject. Teachers should directly show students how to effectively search for content online, and not just assume that kids know how to do that.

Additionally, the study demonstrates the value of teachers investing more time instructing students how to identify reliable online content, especially in a world of increasing digital misinformation. According to the study's survey, nearly half of students had not used their mobile phones for organizational purposes. Teachers could show their students how to record due dates and reminders in their phones, helping students to build organizational skills in an increasingly digital world. Simple strategies like these would help students both in school and outside of school, and would allow for expanded access to academic resources through the use of their mobile devices.

Teacher training.

According to the survey, only 43.5% of respondents specifically recall a teacher demonstrating strategies for students to use mobile phones as an academic tool. Additionally, most of the participants in the small group discussion suggested that students, not teachers, are often the innovators of mobile phone use, such as the implementation of helpful applications like Slader. This indicates a significant gap in teacher understanding of mobile phone capabilities. Students are often more experienced mobile phone users than their teachers. To help close this gap, administrators need to provide opportunity for teacher training programs centered on mobile phone strategies and implementation.

This training can come in many forms, several of which would not require paying a specialist or consultant. One simple suggestion might be to devote professional development time for teachers to work collaboratively to share and research ideas for mobile phone implementation. Administrators could give teachers a platform to engage in discussion about potential advantages and disadvantages of mobile phone use, or share ideas that have worked and have not worked in their own classrooms regarding mobile phone use. This discussion may

inspire colleagues to adapt those ideas to their own classrooms. Teachers could also publish their suggestions or mobile phone lesson designs online through collaborative professional outlets such as Edutopia.com, which may expand the discussion to colleagues throughout the world, resulting in even more idea generating.

Another resource might be collaboration with the students themselves. As discussed in Chapter Four, students have come up with several tools, functions, and features on mobile phones that could assist in classroom instruction. Perhaps a panel of students with ideas about mobile phone implementation could speak to the staff and offer suggestions. On a smaller scale, classroom teachers could work together with students to establish mobile phone use norms and policies. This collaboration between teachers, students, and administrators could potentially create more buy in from both staff and students alike.

Policy formation.

The participants in this study recognize that mobile phone use in schools is a difficult issue for teachers and staff to address. They realize that although there are benefits to use, there are also drawbacks. As such, the students advocate for teacher autonomy regarding implementation of cell phone use. Mobile phone use may be more beneficial for certain classes, and the participants suggest that they should be used on a need-by-need basis. Additionally, teachers who are not comfortable with the technology would not likely be effective in implementation. The students suggest that policy makers avoid implementing district wide policies regarding classroom cell phone use, leaving those decisions up to the teachers. Although some may choose not to allow mobile technology in the classroom, with training and exposure, it is possible that teachers become more comfortable implementing mobile devices into classroom instruction, and student use would be more frequent and effective.

Impact of the Coronavirus Pandemic.

While the study was completed prior to the impact of the Coronavirus Pandemic on Minnesota schools, I would be remiss to not recognize the sudden pivot required by everyone involved in the education field as schools were required to move their learning to an online approach. This required learning pivot stresses the importance of school leaders to pursue learning and connectivity options. This may include expanding online training, including mobile devices, for all teachers and students and creating effective policies for online learning, including mobile devices. Prior to the start of the upcoming school year, school leaders should complete a thorough review of their schools' online learning experience and develop plans based on the findings, which will improve teaching, learning, and opportunities for all students.

Recommendations for Future Research

First and foremost, this research would benefit by increasing the sample size and expanding the locations of the participants to gain a more valid set of survey data from students living in rural communities. Throughout this research process, I learned that it is very difficult, as a researcher with limited resources, to collect data on students who are minors. Expanding this research would require collaboration between administrators and parents in school districts throughout the state, but it would provide valuable information for those districts regarding students' mobile phone ownership, access, and use. Additional questions could be added to the survey to gain clarity of differences regarding mobile phone use and access for students with diverse socio-economic backgrounds or from students living in more remote, rural settings.

In addition to expanding the size and location of the participant pool, I would also suggest expanding the study to include 9th and 10th grade students. The Pew Research Center survey (2018) indicated that 95% of teenagers owned some type of smartphone. This implies

that smartphone ownership for 9th and 10th grade students may be very similar to 11th and 12th grade students. If this study was expanded for future research to include students in grades nine through twelve, this could provide an opportunity for high schools to create effective and consistent mobile phone use curriculum and implement mobile phone use in a planned and intentional manner school wide.

Secondly, additional research to explore perceived mobile phone use compared to actual mobile phone use would be beneficial. Nearly all the data from scholarly research, including this study, relies on students' self-reported mobile phone use to describe the amount of time that students spend on their devices. In the small group discussion, I asked participants about their awareness of their mobile phone use. De'Andre said, "I'm giving it more thought now, but I think it's still more than I think I do… It doesn't feel like a lot, but it probably is." I believe De'Andre is right, students seem to underestimate their mobile phone use, just as Duncan et al. pointed out in their 2012 study. Mobile applications that track a user's screen time and phone pickups, such as Moment, are readily available and would provide interesting insight into perceived versus actual mobile phone use. If students, teachers, and parents had this data, it may offer more opportunities for discussion and reflection about mobile phone addiction.

Finally, I would suggest that future research expands this discussion by engaging in collaborative discussion between teachers, administrators, and students alike. Although my study offered students' a voice in the issue, I believe it would be interesting to observe how teachers and administrators respond to student ideas regarding mobile phone implementation. Likewise, I would be curious to see how students would respond to teacher and administrator concerns regarding cell phone use. In my original project design, I intended to have students journal as they attended class throughout the week and reflect on instances in which cell phones

may have made the learning experience easier or created deeper learning. An activity like this would offer even more specific insight into the topic. Additionally, a case study in which a group of students, teachers, and administrators work together to develop strategies for classroom cell phone use would be fascinating.

Conclusion

The Coronavirus Pandemic has rapidly brought mobile learning to the forefront of discussion in the field of education. As the digital divide begins to close, the conversation will need to shift from an emphasis on device access and connectivity to an exploration of implementation and effectiveness of mobile devices in learning. Mobile phones have the potential to offer limitless opportunities for students to create, engage, seek knowledge, and collaborate not only locally, but also globally. They are widely owned by students who are experienced users of the devices. These mobile devices are compact, easily accessible, and offer the opportunity for kids to expand their learning beyond the walls of a school.

There are setbacks to mobile phone use, and not all teachers have a positive outlook for allowing mobile phones to be used as learning tools. However, with professional development training, discussion with colleagues, and collaboration with students, it may be possible that teachers begin to see, and eventually apply, some of the beneficial features of smartphones. As the capability of these devices continues to expand and the world continues to form closer digital connections, mobile devices will be a central figure in the way students access, analyze and publish information. Teachers and administrators are faced with difficult decisions each year as mobile phone ownership continues to rise. As the model of education begins to shift, open and honest conversations about the role of mobile phones in learning need to take place. I hope that

this research, which centered directly on student perspective, serves as a catalyst for that discussion.

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Appendix 1- Parental Consent Forms

Parental Notification and Consent Form Regarding Participation in a Research Study[12]

Researcher: Tyler Brackey
Faculty Advisor: Dr. Ric Dressen, Concordia University- St. Paul, MN
Administrators: Alex Schmidt and Jake Tietje
Study Title: *Student Perceptions Regarding Mobile Phone Use as Tools For Learning*

Dear Parents and Guardians,

I am an Ed.D candidate at Concordia Saint Paul University. I am conducting a research study of high school students in a rural setting to gain insight into students' mobile phone use both inside and outside of school as well as to gain student perspective on mobile phone use inhibiting or potentially enhancing the learning process. The administration and faculty at FSHS is familiar with this study and has given me permission, in accordance with district policy, to conduct this research at the school. FSHS staff is also facilitating this communication to tell you about the study and give you an opportunity to decide if you want your child to participate.

If you allow your child to participate, the study will require the student to complete a brief informational survey (20 questions) asking about general mobile phone use and experiences using mobile phones for academic use. The research will take place during the students' SOAR time, and they will not be required to miss core subject instructional time to participate. Student grades and/or class standing will not be impacted in any way if a child does not participate in the study. All information will be collected securely, and identities of students as well as the research site will remain anonymous in the study's findings.

Although there is no direct benefit for your child as a result of participating in the study, the information that your child provides could be beneficial to future high school students. This research may help teachers and practitioners of education gain insight into important decisions regarding mobile phone use in schools. This data could potentially contribute to important educational practices for future generations of students and teachers.

I am happy to answer any questions you have about the study. You can contact me by emailing tbrackey@fairmont.k12.mn.us, or by calling (507) 238-4487. If you wish to share a concern or complaint, please contact the Institutional Review Board (IRB) at Concordia-Saint Paul by emailing irb@csp.edu or calling (651) 641-8723.

If you are willing to allow your child to participate in this survey research, please sign and date the form on the back and have your child return it to his/her advisory teacher by January 10th, 2020.

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[12] This form was adopted from research templates provided by Cornell University. For more information, visit https://researchservices.cornell.edu/forms/irb-consent-form-templates

Thank You!

Tyler Brackey
Doctorate Candidate
Concordia University, St. Paul, MN

If you do not wish for your child to participate in the study, no further action is necessary. If you do give permission for your child to take part in the study, sign and return this form to your child's advisory teacher by January 10th, 2020.

Researcher: Tyler Brackey
Faculty Advisor: Dr. Ric Dressen, Concordia University- St. Paul, MN
Administrators: Alex Schmidt and Jake Tietje
Study Title: *Student Perceptions Regarding Mobile Phone Use as Tools For Learning*

I give permission for my child to participate in the study described above.

_____
Print Child's Name

_____	_____	_____
Parent/Guardian's Signature	**Print Parent/Guardian's Name**	**Date**

Parental Notification and Consent Form Regarding Participation in a Research Study[13]

Researcher: Tyler Brackey
Faculty Advisor: Dr. Ric Dressen, Concordia University- St. Paul, MN
Administrators: Alex Schmidt and Jake Tietje
Study Title: *Student Perceptions Regarding Mobile Phone Use as Tools For Learning*

Dear Parents and Guardians,

I am an Ed.D candidate at Concordia Saint Paul University. I am conducting a research study of high school students in a rural setting to gain insight into students' mobile phone use both inside and outside of school as well as to gain student perspective on mobile phone use inhibiting or potentially enhancing the learning process. The administration and faculty at FSHS is familiar with this study and has given me permission, in accordance to district policy, to conduct this research at the school. FSHS staff is also facilitating this communication to tell you about the study and give you an opportunity to decide if you want your child to participate.

If you allow your child to participate, he or she will be part of a series of three class discussions, approximately 30 minutes in length, about mobile phone use and student experiences using mobile phones for learning. These discussions will take place during the months of January and February 2020. Student responses will be recorded with a camera. Additionally, students will participate in a brief journaling activity in which they document mobile phone use for academic purposes, or propose suggestions in which mobile phones may have assisted or enhanced the learning. This will last approximately one week and will be done primarily at school.

The informational gathering research will take place during the students' advisory time, and they will not be required to miss core subject instructional time to participate. Student grades and/or class standing will not be impacted in any way if a child does not participate in the study. All information will be collected securely, and identities of students as well as the research site will remain anonymous in the study's findings.

The benefit of your child's participation in this study is two-fold. First, your child may gain a better understanding of the research process through my instruction and discussion, which may lead to skill development, research experience, or additional opportunities in college or careers after high school. Second, the results from this research may help teachers and practitioners of education gain insight into important decisions regarding mobile phone use in schools. These students could potentially contribute to important educational practices for future generations of students and teachers.

[13] This form was adopted from research templates provided by Cornell University. For more information, visit https://researchservices.cornell.edu/forms/irb-consent-form-templates

I am happy to answer any questions you have about the study. You can contact me by emailing tbrackey@fairmont.k12.mn.us, or by calling (507) 238-4487. If you wish to share a concern or complaint, please contact the Institutional Review Board (IRB) at Concordia-Saint Paul by emailing irb@csp.edu or calling (651) 641-8723.

If you do not want your child to participate, no further action is necessary. If you **do give permission** for your child to participate, please fill out and sign the form below and return it to your child's advisory teacher. Please return the form by January 10th, 2020.

Thank You!

Tyler Brackey
Doctorate Candidate
Concordia University, St. Paul, MN

If you do not give permission for your child to participate, no further action is necessary. If you **are willing** to permit your child to take part in the study, sign and return this form to your child's advisory teacher by January 10th, 2020.

Researcher: Tyler Brackey
Faculty Advisor: Dr. Ric Dressen, Concordia University- St. Paul, MN
Administrators: Alex Schmidt and Jake Tietje
Study Title: *Student Perceptions Regarding Mobile Phone Use as Tools For Learning*

I give permission for my child to participate in the study described above.

_____
Print Child's Name

_____ _____ _____
Parent/Guardian's Signature **Print Parent/Guardian's Name** **Date**

Appendix 2- Student Survey

Student Mobile Phone Survey

* Required

Description of the Research Study:

All,

As junior and senior high school students, you are invited to contribute to a research study that is analyzing student mobile phone use and student experiences and perceptions regarding mobile phones as tools to enhance or inhibit learning. While participation in this study may not benefit you personally, the findings in this study may help to inform educators, administrators, and policy-makers about the possible implementation of mobile phones into the learning process for future classes of students.

Participation in this study is voluntary. Information from the survey will be submitted anonymously, and no personal information will be collected. The data from this survey will be stored in a password-protected Xcel file accessible only by the researcher. The survey should take 10-20 minutes to complete, and classroom teachers will support you if you need help understanding a question. If you decide to participate in this study and change your mind, you have the right to drop out at any time.

If you have additional questions about this research study, send an email to brackeyt@csp.edu

1. **Do you agree to the terms of the study described above? By clicking "Yes", you consent that you are willing to answer the questions in this survey.**
   Mark only one oval.
   - ◯ Yes
   - ◯ No *After the last question in this section, stop filling out this form.*

Mobile Phone Ownership and Internet Availability

2. **Do you own or have access to a mobile phone with Internet capability?** *
   Mark only one oval.
   - ◯ Yes
   - ◯ No

3. **How long have you owned or had access to a mobile phone?** *
   Mark only one oval.
   - ◯ Less than 1 year
   - ◯ 1-2 years
   - ◯ 3-4 years
   - ◯ 5 or more years
   - ◯ I do not own or have access to a mobile phone

4. **Are you able to connect to wifi or broadband for Internet access on your mobile phone while at home?** *
   Mark only one oval.
   - ◯ Yes
   - ◯ No
   - ◯ I don't own or have access to a mobile phone

5. **How do you access the Internet while using your mobile phone at home?** *
Mark only one oval.

- ◯ Wi-Fi
- ◯ My Phone's Broadband Connection/Data Plan
- ◯ I'm not sure
- ◯ I don't own or have access to a mobile phone

6. **While using your mobile phone, how reliable is your Internet connection at home?**
Mark only one oval.

- ◯ Very Reliable- It almost always works, I can access anything I need online
- ◯ Reliable-It works most of the time, I can access most of what I need online
- ◯ Not Sure
- ◯ Somewhat Reliable- It works most of the time, but my connection is inconsistent
- ◯ Unreliable- It does not work most times, there are many things online that I cannot access
- ◯ I am not able to connect to the Internet while at home

7. **Where do you primarily access Internet when you are not at the school?** *
Mark only one oval.

- ◯ Home
- ◯ Friend's or relative's house
- ◯ Public Library
- ◯ Businesses or Restaurants
- ◯ Other

Personal Mobile Phone Use

8. **I spend the most time on my mobile phone...** *
Select your top two choices
Check all that apply.

- ☐ Texting/Calling People
- ☐ Using Social Media (Snapchat, Instagram, Twitter, Tik-Tok, YouTube, etc)
- ☐ Playing Games
- ☐ Browsing the Internet
- ☐ Taking or editing pictures or videos
- ☐ Other
- ☐ I don't own or have access to a mobile phone

9. **How many hours per day do you think you use your mobile phone?** *

_____

10. **How many times per day do you think you pick up and look at your phone?** *

_____

Likert Scale Descriptions

Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
(1)	(2)	(3)	(4)	(5)

11. **Using a mobile phone improves my emotional well-being** *
Mark only one oval.

1	2	3	4	5
◯	◯	◯	◯	◯

Likert Scale Descriptions

Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
(1)	(2)	(3)	(4)	(5)

12. **Using a mobile phone NEGATIVELY impacts my physical health** *
Mark only one oval.

1	2	3	4	5
◯	◯	◯	◯	◯

Likert Scale Descriptions

Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
(1)	(2)	(3)	(4)	(5)

13. **Using a mobile phone is important for my social life** *
Mark only one oval.

1	2	3	4	5
◯	◯	◯	◯	◯

Mobile Phones as Tools for Learning

14. **Has a teacher or staff member at your school allowed mobile phone use for an ACADEMIC ACTIVITY within the past two weeks?** *
Mark only one oval.

- ◯ Yes
- ◯ No
- ◯ I'm not sure

15. **Has a teacher or staff member at your school taught you strategies for using your mobile phone as a tool to improve learning during the present school year?** *

Mark only one oval.

- ◯ Yes
- ◯ No
- ◯ I'm not sure

16. **Have you used a mobile phone for any of the following academic activities in the past two weeks?** *

Select all that apply
Check all that apply.

- ☐ Organization (exp: recording due dates in a calendar)
- ☐ Completing or submitting an assignment, quiz, or test for class
- ☐ Communicating with classmates regarding assignments or class information
- ☐ Researching a topic on the internet
- ☐ Creating a project for a class
- ☐ Other
- ☐ I have not used a mobile phone for any of these/I do not own or have access to a mobile phone

Likert Scale Descriptions

Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
(1)	(2)	(3)	(4)	(5)

17. **I believe that mobile phones could be used to enhance or improve my learning at school** *

Mark only one oval.

1	2	3	4	5
◯	◯	◯	◯	◯

Likert Scale Descriptions

Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
(1)	(2)	(3)	(4)	(5)

18. **I believe that mobile phones could be used to enhance or improve my learning outside of school** *

Mark only one oval.

1	2	3	4	5
◯	◯	◯	◯	◯

Likert Scale Descriptions

Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
(1)	(2)	(3)	(4)	(5)

19. **If mobile phones were allowed during school, they would distract students from completing their work.** *
Mark only one oval.

1 2 3 4 5

Likert Scale Descriptions

Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
(1)	(2)	(3)	(4)	(5)

20. **If mobile phones were allowed during school, students would use them to cheat.** *
Mark only one oval.

1 2 3 4 5

Likert Scale Descriptions

Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
(1)	(2)	(3)	(4)	(5)

21. **Students should be allowed to use mobile phones during class at school.** *
Mark only one oval.

1 2 3 4 5

Likert Scale Descriptions

Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
(1)	(2)	(3)	(4)	(5)

22. **Mobile phones are a distraction for me while I try to complete homework outside of school**
Mark only one oval.

1	2	3	4	5
◯	◯	◯	◯	◯

23. **What else would you like me to know about high school students and mobile phone use (inside or outside of school) that I did not already ask you?**

Appendix 3- Semi-Structured Interview Questions

Part 1- Analysis of Students' cell phone use habits

1. What role, if any, do cell phones play in your lives?
2. Why is mobile phone use important or not important to you? Why do you use them?
3. How do mobile phones impact you socially? If you do not own a mobile phone, what impact does that have on your social life?
4. In what ways, if any, have cell phones negatively impacted you or someone you know?
5. What awareness, if any, do you have about the amount of time you spend on your phone?
6. Some of your parents and teachers may claim that kids are addicted to their mobile phones. How would you respond to that claim?
7. I have observed kids (and adults) staring at their phones while hanging out with other people socially. Do you believe this is problematic? Why or why not?

Part 2- Mobile Phones as tools for learning

1. What experiences do you have using mobile phones in an academic setting (school, homework, etc.)?
2. In what ways, if any, have teachers, parents, or other adults directly taught you strategies for using your mobile phones as academic tools?
3. Do you believe cell phones should be allowed in school, why or why not?
    a. What benefits could they offer?
    b. What problems might arise as a result of allowing mobile phone use during school?
4. What recommendations would you give to a teacher who is considering implementing mobile phone use into his/her class instruction?

5. What do you envision for the future of mobile phone use as a tool for learning?

Appendix 4: IRB Approval

Stephen Ross

ture, Chair Human Subjects Review Committee *Date*