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Tools For School: Student Fluency And Perception Of Cell Phones Used For Learning

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TOOLS FOR SCHOOL: STUDENT FLUENCY AND PERCEPTION OF CELL PHONES USED FOR LEARNING

by

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This dissertation, submitted by Mary Beth Humble-Thaden in partial fulfillment of the requirements for the Degree of Doctor of Philosophy from the University of North Dakota, has been read by the Faculty Advisory Committee under whom the work has been done, and is hereby approved.

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Mary Beth Humble-Thaden
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ABSTRACT

Technology is changing the way society interacts, communicates, collaborates, and learns. Improved cell phone capabilities and an ever increasing amount of cell phone applications allow individuals to connect globally and afford almost instantaneous access to information inside and outside the classroom. The majority of students today possesses and uses cell phones and cell phone technology in most every aspect of their daily lives. Most schools enforce current policies banning cell phone use within classrooms during the school day.

The purpose of this study was to investigate current high school junior and senior academic standing students' mobile cell phone technology use, student perception of high school current cell phone usage policies, student perception of cell phones as possible educational learning tools, student perception of attitudes and views of others regarding cell phone use in schools, and to explore potential perceptional differences by gender. Significant perceptional gender differences were uncovered. Females were found to perceive school policy more favorably, whereas males were found to perceive the possibilities of cell phone use within the classroom as a learning tool more favorably.

CHAPTER I

INTRODUCTION

Introduction

Technology encompasses our global society and pervades our daily lives at school, work, and play (Cortada, 2008). How society communicates and collaborates has gradually changed through the use of adaptive, inventive, and ever expanding technologies, thus allowing global interconnection (Agar, 2009; Kaba, N'Da, Meso, & Mbarika, 2009). The amount of worldwide communication, collaboration, and competition has increased through the use of technology (Merriam, Caffarella, & Baumgartner, 2007). Information which used to take days to reach us is now readily accessible in an instant, twenty-four hours a day, seven days a week (Chen, Chang, & Wang, 2008; Kim, Holmes, & Mims, 2005).

The innovation of mobile devices and technology is providing opportunities for users to have un-tethered access to almost instantaneous information available on the go from anywhere at any time (Kim et al., 2005; Kolb, 2006; Taylor, 2010). Many students and adults carry mobile devices which have been described to "be small and powerful enough to be likened to tiny computers in their pockets, purses and backpacks as their primary means of communication" (Prensky, 2005, p. 2). This not only creates and enables many learning opportunities inside the classroom, but also facilitates learning

outside the classroom (Kolb, 2006), changing the ways of teaching and learning (Bessie, 2008).

Increase in Mobile Phone Ownership

Percentages of citizens, young and old, now owning at least one cellular mobile phone device have risen dramatically (Kurniawan, 2008). In the United States, 61% of individuals age 12 and older own a mobile phone, with 44% specifically owning a smart phone (Johnson, Adams, & Cummins, 2012). It is not just within the United States that the increase in mobile phone ownership has occurred. Many citizens in foreign countries report owning more than one cellular device (Li, 2009). In Japan alone, 81 million people use cell phones with 89.5% subscribing to cellular Internet services (Igarashi, Takai, & Yoshida, 2005).

Shinn (2009) reports that "more people are using cell phones than computers to communicate, compile data, and connect to the world" p. 34. Librero, Ramos, Ranga, Trinona, & Lambert (2007) suggest in the not too distant future all the world's students will possess a cell phone. Portability, affordability, and functionality all make these devices desirable (Kim et al., 2005). Marcoux (2009) advises that cell phones are the one technology device most students are likely to have and they are a constant presence in everyday life (Kolb, 2011). Feelings of safety have been reported as one of the number one reasons for ownership (Johnson & Kritsonis, 2007; Obringer & Coffey, 2007; Zickuhr & Smith, 2012).

Smart phones have changed the way people communicate with each other and how people function in their daily lives (Lenhart, 2012; Li, 2009). Smart phones have combined the technologies of the cell phone and the personal digital assistant (PDA) into

one device, integrating functionality with portability (Chen, Chen, & Yen, 2011). According to Wong (2010), Internet connectivity is the main default function of the smart phone and allows the user to take advantage of a wide range of capabilities (Smith, 2011). New applications run on the smart phones, which can do amazing things, are being developed at a phenomenal rate (Johnson et al., 2012). Downloads of cell phone applications have risen sharply in the last couple of years (Love, 2011). Some mobile device applications have implications within the fields of education, entertainment, and health and medicine.

Many free educational applications are available covering a wide range of interests and including a variety of academic courses. Digital games, books, tools, and resources have been created for both learning and enjoyment at minimal cost to the consumer (Johnson et al., 2012; Kharif, 2008; Shinn, 2009). Advances in applications for use in the medical field include those that can read heart rate, monitor glucose levels, and with the help of an attachable microscope even check blood sample slides to look for indications of disease (Pierce, 2011). These advancements make diagnosis and treatment available to patients who need frequent monitoring without time consuming office visits or to individuals in rural areas or third-world countries who lack sufficient local medical care (Pierce, 2011). With the vast amounts of growing critical medical information accessible to medical personnel, increases in timely diagnosis can be obtained and be beneficial for patients (Holzinger, Nischelwitzer, & Meisenberger, 2005).

School Policy

Since almost every student arrives at school with a cell phone, most schools have written policies to protect themselves and their students from improper use (Obringer &

Coffey, 2007). The policies typically do not allow cell phone use on high school campuses during the school day (Obringer & Coffey, 2007). However, with the increased numbers of students owning them, the functionality and portability of the devices, a few schools have decided to revisit their policies and have begun to let them into the classrooms (Johnson et al., 2012, Kharif, 2008). Some educators have discovered the learning possibilities these little devices can provide and school technology coordinators have realized the cost savings impact they have on school technology budgets (Traylor, 2009). As these devices become more embedded as a part of society, they will become an accepted and necessary tool within the classroom (Kim et al., 2005). This will further increase the necessity for proper training in cell phone etiquette to teach students how to use the tool responsibly (Burns & Lohenry, 2010; Johnson & Kritsonis, 2007; Kolb, 2011; Manzo, 2008).

Gender Technology Use and Perceptional Differences

Gender has a historical social past of patterns that are changeable with transformations and pressures coming from within or outside a society (Connell, 2005). Gender identity, according to Butler (2006), is a series of repeated acts or behaviors that are practiced over time and transform to meet explicit social laws and conventions. High school students then, within the context of how they use cellular mobile phones, are performing and practicing their socio-normative gender identity acts in order to survive and be accepted by other classmates. Butler (2006) further goes on to say that there are definite punishments for not performing one's gender correctly according to preconceived norms society has established. High school students, therefore, attempt to

fit in with peers by using technology in the same manner as their peers to avoid attracting unwanted attention.

The ways in which people embrace a particular construction of gender have been shown to influence many different aspects of their lives including points of view, problem-solving skills, perceptions of self and others, digital gaming choices, and cell phone use and application choices (Gilligan, 1982; Haverila, 2012; Iverson & Murphy, 2003).

Cellular mobile phone use is rapidly changing how society communicates (Kaba et al., 2009). Due to the portability and ubiquitous nature of mobile phones, frequency of communication has increased (Igarashi et al., 2005). Preferential cell phone use by male and female students differs from one another (Haverila, 2012). Males tend to be more interested in the technology features of their cell phones and spend more time playing games and searching for information (Haverila, 2012; Jackson et al., 2008). Females prefer cell phone use that involves communication and social interaction such as voice calls and text messaging (Haverila, 2012). And according to Zinkuhr and Smith (2012), "Teens are bigger users of text messaging than adults" (p.21).

Text messages can be sent without requiring a spontaneous response like talking on the telephone requires. This makes text messaging conducive for both the sender and receiver and allows the receiver to respond when it is convenient (Igarashi et al., 2005). According to Igarashi et al. (2005), text messaging is primarily used to communicate among existing relationships and enhance connectivity. He further states females tend to be more interested in personal and emotional communication and divulge more within expanded text messages than males do. Technology which supports increased

interpersonal communication is more frequently used by women (Junco, Merson, & Salter, 2010).

Gender differences in computer technology applications have been studied and are well documented. According to Willoughby (2008), boys and girls who had access to a variety of computer technologies tended to use them for differing purposes and in differing amounts of time. High school males were reported to spend more time on the Internet and engaged in computer games than time spent by high school females (Willoughby, 2008). The overall amount of time engaged in technology by males could influence their perception and possibly increase their comfort level with technology applications within the school setting. Increased comfort levels with technology have been reported to boost confidence, motivation to learn, and levels of engagement (Swan, Van 't Hooft, Kratcoski, & Unger, 2005).

By implementing technology use in the classroom, girls' exposure to technology is increased, thereby possibly increasing their comfort level with or may even spark an interest in the area of technology (Mammes, 2004). Perhaps it may even rouse an interest in further education within technology related fields. Many of the STEM [Science, Technology, Engineering, and Mathematics] fields are underrepresented by females. By using technology in the classroom and exposing both males and females to technology use, interest in technology may be stimulated (Mammes, 2004).

Background of the Study

This study is based on a previously conducted pilot study which sampled incoming university freshman students on their reflective perceptions of high school cell phone policy and possible cell phone use for learning (Humble-Thaden, 2011). Following

the pilot study, it was evident there was a need to sample students currently enrolled in high school to determine perceptional attitudes toward possible use of mobile cellular devices in school for learning. It was further determined with the rapid increase in innovative applications available for use with mobile devices, such as the smart phone, more research was necessary to understand how high school students were using their mobile cell phones.

Statement of Problem

Studies have shown the majority of high school students own and use cell phones for a variety of purposes, but what remained to be shown was whether an interest on the part of students existed to use cell phones as educational learning tools within high school classrooms. Studies have also reported differences between male and female students' perceptions of general technology use, however, only recently have studies specifically singled out technology use of cellular mobile devices, how students were using them, and if gender was an important issue to consider. These perceptive aspects of high school cellular phone use by students needed to be investigated in order to make viable recommendations for possible future educational use.

Purpose of the Study

The purpose of this study was to investigate academic standing junior and senior high school student cell phone fluency, perception of cell phone school policy, perception of others' attitudes regarding cell phone use in schools, and perception of cell phone usage in high school classrooms as a possible educational learning tool. Potential perceptual differences by gender were explored. Gender differences in computer technology applications have been studied and are well documented. What needed to be

determined was whether there were differences in male and female student perceptions of cell phone usage in education and if student interest existed to use cell phones as educational learning tools within the classroom.

Research Questions

1. What mobile cell phone technologies were students using?
2. What were students' perceptions of their school's current cell phone policy?
3. What were students' perceptions of cell phone instructional use as learning tools when initiated by teachers in the classroom?
4. What were students' perceptions of cell phones used as learning tools when initiated by students?
5. What were students' perceptions of other peoples' opinions regarding the use of cell phones in the classroom as learning tools?
6. Were there perceptional differences by gender?

Significance of the Study

Results of this study will provide a better understanding of how students view current school policy regarding cell phone use, how students use cell phones in their everyday lives, and their views regarding possible use of cell phones as learning tools within and outside of school classrooms. Cell phones are an essential part of students' everyday lives (Kolb, 2006; Kurniawan, 2008) and a significant fixture in youth culture (Sorrentino, 2009). Cell phones are being seen as common place possessions of old and young alike. According to the 2012 New Media Consortium Report, "…it is extremely common now for children, at younger and younger ages, to own and comfortably use smartphones" (Johnson et al., 2012, p. 11).

Could something as common place as a cell phone be used to increase motivation to learn? Dewey (1938) suggested, in order to promote learning, educators needed to use activities that were of interest, allowed students to participate, and that actively engaged students. Tools such as the cell phone that students are interested in and are already using may therefore arouse curiosity and increase a desire and initiative to learn. "The intensity of the desire measures the strength of the efforts that will be put forth" (Dewey, 1938, p. 70).

Academic achievement, through the lens of a cognitive approach to motivational theory with the learner as decision maker, is reported to be related to interest, self-efficacy, attributional beliefs, and achievement goal orientation (Mayer, 2008). "Motivation depends on the student's interaction with the specific material to be learned" (Mayer, 2008, p. 522). If students are interested in what they are learning they will invest in it and place value upon it (Pintrich, 2003). Effort and persistence to complete a task is a result of a person's self-efficacy (Bandura, 1977), the personal belief in one's capabilities (Pintrich, 2003). Students who are competent cell phone users could use the cell phone as a motivational tool to enhance their learning. According to Ryan and Deci (2000), increased competency and autonomy lead to enhanced self-motivation.

Data from this study may be used by students, instructors, school administrators, and parents in decision-making regarding cell phone policy and possible implementation for use in schools as learning tools. Results of this study were used to inform stakeholders and formulate recommendations concerning student views and the use of technology and cell phones, in particular, within education.

Delimitations

This study was conducted within three high schools in the Grand Forks Public School District located in Grand Forks, North Dakota. Only junior and senior academic standing students enrolled in second period courses were administered the pencil and paper survey by their assigned classroom teacher. The survey was administered within the remaining few weeks of the 2011-2012 academic school year. The end of a school year generally constitutes one of the busiest times of the year for administrators, instructors, and especially students who are involved in academic and extracurricular activities.

Assumptions

The following assumptions were made in regard to this study:

1. Relying on the previous pilot study, the survey instrument was considered a valid and reliable means to assess students' perceptions regarding cell phone policy and students' perceptions of possible cell phone use as a learning tool.
2. Students who participated in the study were representative of an upper level high school student population, in a rural community.
3. Instructors who administered the paper and pencil survey instrument followed written instructions and research protocol.
4. Respondents understood and answered the survey honestly and accurately.

Definition of Terms

The following terms are defined to provide meaning and understanding in relation to this study:

3G: Third generation cellular data technologies. 3G technologies were introduced in 2001with widespread use occurring in 2007 (Tech Terms, 2012).

4G: Fourth generation cellular data technologies became available in the United States in 2009 (Tech Terms, 2012).

21st Century Learning Skills: Essential skills (critical thinking, problem solving, communication, collaboration, creativity, and innovation) that prepare students for complex life and work environments in today's world. (Partnership for 21st Century Learning, 2009, p.2).

Application (Apps): A software program that runs on a computer or mobile device having a specific application for the user and most commonly referred to as "apps" (Tech Terms, 2012).

Bandwidth: Describes the maximum data transfer rate of a network or Internet connection. It measures how much data can be sent over a specific connection in a given amount of time (Tech Terms, 2012).

Cellular Telephone (Cell Phone): A mobile telephone that uses wireless technology (Net Lingo, n.d).

Google Docs™: A free, web-based word processor, spreadsheet, presentation, form, and data storage service offered by Google© which allows users to create, edit, and share documents online, while collaborating in real-time with other users (Wikipedia, 2012).

Mobile Device: A computer or communications gadget that is untethered and can be carried around with you. Examples include: a cell phone, a pager, a laptop, a smart phone (Net Lingo, n.d.).

Network: A group of connected computers that allows people to share information and equipment (Tech-along, n.d.).

Social Media: Web-based and mobile based technologies which are used to turn communication into interactive dialogue among organizations, communities, and individuals (Wikipedia, 2011).

Social Networking: Websites that allow users to create a personal profile and become part of a virtual community enabling people to share information (Tech Terms, 2012).

Smart Phone: A smartphone is a mobile phone that includes advanced functionality beyond making phone calls and sending text messages and may be capable of running applications (Tech Terms, 2012).

SMS: "Short Message Service." SMS is used to send text messages, typically up to 160 characters in length, to mobile phones (Tech Terms, 2012).

Technology: The application of scientific discoveries to the development and improvement of goods and services that ideally improve the life of humans and their environment. Most common references in schools imply computing or computer-related programs (Tech-along, n.d.).

Text Message (Texting): A brief electronic message (less than 160 characters) sent and received via a wireless network and viewed on any number of mobile or handheld devices (Net Lingo, n.d.).

Organization of the Study

This study has been organized in five chapters. Chapter I provides an introduction to the study, statement of the problem, the purpose of the study, research questions,

significance of the study, delimitations, assumptions, and definitions of terms. Chapter II provides an overview of perceptions and use of mobile technology for learning, perceptions of school policy regarding use in schools, emerging trends, how foreign countries use mobile technology, barriers to educational use, and the importance of mobile technology today. Chapter III presents the methodology and the design of the study. Chapter IV presents the findings of this study through quantitative means. Chapter V presents a summary, conclusion, discussion, limitations, recommendations, and reflections on the study

CHAPTER II

REVIEW OF THE LITERATURE

Introduction

Mobile learning, for example through mobile cellular phone technology, refers to the practice of using portable electronic devices in real-world applications and the accessibility to connect socially to others via the Internet almost anywhere and anytime (Georgiev, Georgieva, & Smrikarov, 2004). While many K-12 schools and universities in the United States claim to focus current curriculum on preparing learners for a 21st century that relies heavily on complex technology to operate successfully, the widespread ban of cell phones and other mobile devices in educational settings across America conflicts greatly with that vision and slows the overall apparent goal. In order to support and enhance the education our schools provide for learners, it is practical, economical, and beneficial to take advantage of mobile cellular phone technology used as a learning tool. A first step must be to alter the negative perceptions of cell phone use in educational settings that is presently held by many educators and administrators. These beliefs are likely the result of a lack of understanding of the technological capabilities of cell phones and the potential uses of cell phones as valuable learning tools that are easily accessible to nearly every student.

K-12 Mobile Device Attitudes and Policies

The majority of young adult learners carry a cellular device, a mobile cell phone, to class each day, however the use of mobile phone technology as a learning tool in the majority of K-12 public schools is non-existent because school policy requires students to either leave cell phones at home, turn them off, or leave them in their lockers during the school day as a means of curbing classroom disruptions from ringing cell phones, among other reasons (Obringer & Coffey, 2007). Discussions resulting from events, such as 9/11and Columbine, have caused some school districts to reconsider their policies regarding the ban of cell phones from school (Johnson & Kritsonis, 2007; St. Gerard, 2006). Even the schools that have revised their policies from completely banning cell phone use altogether to allowing students to use them before or after school do not deem them appropriate for use during classroom hours or for educational purposes (St. Gerard, 2006).

Administrators and instructors often regard student cell phones and cell phone usage, within the K-12 educational setting, as a deterrent to student learning (Johnson & Kritsonis, 2007). One of the most commonly-cited reasons for banning cell phones in K-12 schools and for negative perceptions of cell-phone use in classrooms is worries from administrators and instructors of inappropriate use of student cell phones (St. Gerard, 2006). Obringer and Coffey (2007) and St. Gerard (2006) note that inappropriate use of cell phones during class times in K-12 schools is a major cause of their restricted use by students during the day. In addition, Gilroy (2003) points out that cell phones that ring in class create unwanted distractions, and that sending or receiving text messages are often assumed by instructors to be avenues for student cheating. Also troublesome to

students and instructors alike is the possibility of indecorous photos being taken and posted to the Internet by students in possession of cell phones (Obringer & Coffey, 2007).

College and university instructor attitudes of cell phone use in the classroom are not unlike those held by K-12 instructors. Gilroy (2003) reports that nearly 85% of American college students possess and use cell phones across campuses that generally have not established any college-wide policies or technology protocols. Also, 85% of college professors answered "yes" to a National Education Association poll question which asked whether or not cell phones should be banned in their classrooms. Recovery from unexpected distractions caused by the ringing of cell phones in class may take longer than some other form of disruption, especially if the phone has been personalized by a familiar song used as a ring tone (Shelton, Elliott, Eaves, & Exner, 2009). Cell phone ownership continues to increase. According to Burns and Lohenry (2010), over 94% of college students owned cell phones and although not everyone who carried a cell phone was the cause of classroom distractions, there remains a definite need for educating students on cell phone etiquette. Anderson (2009) reports rather than teaching students responsible and acceptable behavior practices regarding cell phone etiquette it seems the easy way out is just to ban cell phones from the classroom.

Despite this apparent widespread American belief that cellular phones do not have a place in classrooms, there exists a surprisingly abundant amount of literature on the subject of the vast capabilities that mobile devices can provide to educators and the benefits of using cell phones as learning tools in classrooms. This contradiction elicits further questioning about the reasons more instructors have not advocated for mobile devices in the classrooms and why more instructors have not yet begun taking advantage

of the fact that nearly every student has a cell phone that could potentially be used as a learning tool. Students use cell phones everyday and although policies state they should not be used in school, two thirds of teens confess to using them despite the rules (Anderson, 2009). A review of the research regarding the educational capabilities available to instructors and their perceptions of these uses might shed light in determining whether instructors are not yet aware of this fast-growing technology available to them, or if they simply have negative perceptions of mobile technologies that we can begin to try to shift.

Educational Capabilities

Advocates for mobile phone technology used as educational tools stress the real-world applications and connections that can be made in everyday learning (Kolb, 2006). The tools learners use in their daily experiences and interactions are a critical piece of their overall learning process (Merriam et al., 2007). Hashemi and Ghasemi (2011) explain that "New mobile and context-aware technology can enable people to learn by exploring their world, in continual communication with and through technology" (p. 2948). Furthermore, Sharples (2006) emphasizes that mobile learning provides important opportunities to broaden the scope of learning by supporting the learning that takes place outside of the classroom in the social exchanges that occur in everyday life. He further states that by "designing learning differently" and using connections created through mobile venues learning could be supported throughout a lifetime (p.2). These opportunities are significant because a large portion of a person's learning occurs within everyday activities in the home, at work, and around the

community (Merriam et al., 2007). Understanding how technology is being used and the potential mobile devices have in aiding teaching and learning endeavors is a first step.

Mobile wireless technology, originally used mainly to increase the speed and effectiveness of production in the field of business, has been increasing its presence in the field of education since the 1990s (Kim et al., 2005). Cell phones have a number of functions that can be used for educational purposes such as using the camera (now commonplace in the majority of cell phones) to record field trips and improve reports or essays with photos and visuals (Obringer & Coffey, 2007). Mobile devices used in both K-12 and higher education classes have the ability to be integrated into audioblogs, which is a voice message recorded into a cell phone that is then immediately posted to a website or blogsite (Kolb, 2006). Kim et al. (2005) report "the main advantage to using mobile wireless technology is their portability, which enables them to be used for learning outside the classroom" (p. 59). This allows students to access and continue working on school work from both inside and outside the classroom. Using this technology, the National Council of Teachers of English (NCTE) has already begun seeing improvements in literacy among students through collaboration and project-based learning, wireless access to Internet resources, and access to related class notes and assignments from any location in the school (Kim et al., 2005). Cell phones have already seen use as survey tools that can provide quick feedback and can identify weaknesses in learning (Marcoux, 2009).

Two of the increasing number of available Internet supported survey tools, Poll Everywhere and Wiffiti, can be used by instructors to pose questions requiring students to text or type their responses in class via cell phone or a computer connected to the Internet

(Thomas & Orthober, 2011). The anonymous student responses are projected on a screen allowing even the most timid student to become involved and engaged in classroom learning (Roe, 2011). Not only do these tools allow students to voice their opinions, share knowledge, and learn from one another, instructors are able to check for understanding and immediately provide feedback (Thomas & Orthober, 2011). Cell phones used in this manner become a means of providing a communication tool thus creating an avenue through which students and teachers open dialogue for discussion, assessment, and feedback while supplying evidence of student learning and engagement (Roe, 2011; Thomas & Orthober, 2011). Used for assessment, mobile technology in the classroom helps to shift the focus from what is being taught to what students are learning (Roe, 2011).

Thomas and Orthober (2011) report other instructional benefits when instructors used cell phones to text class assignments or reminders to students. The teacher-generated text messages allowed students to arrive in class better prepared, absent students became aware of missed classroom instruction, and a sense of classroom community was built through rapport with students (Thomas & Orthober, 2011). Interaction through the use of mobile devices can increase learning opportunities, scaffold learning, provide support, and it motivates student learning (Chen et al., 2008).

Despite all the creative uses of mobile technology as learning tools and the fact that many educators are apparently aware of at least the basic capabilities of using cell phones to bolster curriculum, Norris and Soloway (2009) explain that teachers, administrators, and school districts in the United States are not ready to move away from the educational foundation rooted in the 19th century. In fact, these researchers insist that

"U.S. K-12 schools are still shackled to the fact-focused, information-transmission pedagogy of that 1892 curriculum" (p. 2). They suggest that "Educators simply need to lighten up and wise up—and use the student-provided technologies to further the educational mission of the school" (p. 3).

On the other hand, those teachers who do recognize the vast potentials of cell phones in their classrooms often have the unfortunate displeasure of experiencing conflict with their administration and the frequently revised cell phone policies that change just about as quickly as technology changes in an effort to protect students. Sieff (2011), contributor to The Washington Post, recently wrote an article detailing the decision of the Virginia Board of Education to vote to encourage school districts statewide to implement policies directing teachers to restrict social-media use in curriculum in an effort to prevent sexual predators from taking advantage of students. The decision to regulate student-teacher interactions on social-networking sites through media such as student cell phones came in part because of the 2010 case of a Virginia high school teacher convicted of molesting a former student with whom he had previously interacted via personal messages on a social-networking site.

It is these types of rare but widely-circulated stories that have made it even more difficult for those teachers who do recognize the value of student cell phones to actually implement them in their classrooms. Further investigation of current literature regarding trends and uses of cellular device technology could help to determine if and how cell phones could be used effectively and appropriately as learning tools within American classrooms in a way that is satisfactory to school administrators, teachers, parents, and students.

Emerging Trends

Kim et al. (2005) reported the increasing implementation of wireless technology within schools providing access to networks without having to go to a computer lab. The wireless devices ranged from computers and personal data assistants (PDA) to cellular mobile phones. The report indicated the importance and ability of communication between home and school provided by the cellular devices (Kim et al., 2005). The potential for use as a teaching and learning tool was touched upon and reflection was urged regarding its potential to optimize student learning and prepare for future technical demands (Kim et al., 2005). The report referenced a study conducted to evaluate teacher perception of PDA's as learning tools and their impact on student learning. Although overall positive perception was reported, no actual survey information was provided. Limitations and suggested further research were non-existent. The conclusion supported current benefits of wireless technology as mobility and ability to access the Internet, with more benefits becoming apparent as more institutions begin to use the technology (Kim et al., 2005).

With the release of *The Horizon Report* in February 2011, mobile devices for use in teaching and learning were reported to be an emerging technology with adoption time slated within the next twelve months (Johnson, Smith, Willis, Levine, & Haywood, 2011). An increasing number of high speed portable mobile devices are being purchased each year and are reported as being the number one choice for accessing networks. According to the report, the mobile devices will soon out number computers. In 2005, Kim et al. (2005) stated, "As mobile wireless communication becomes an integral part of our society, it will become an accepted and necessary part of the

curriculum for students in public schools" (p. 58). An ever increasing number of mobile device applications are being developed, which will allow for more network access and the integration of these devices as teaching and learning tools within the classroom (Johnson et al., 2011). An added benefit is that schools do not need to buy them because the majority of students own their own (Johnson et al., 2011). Anderson and Rainie (2008) reported a consistent theme resonating throughout a survey of technology experts predicting "the cell phone will become the primary Internet connection tool by 2020 and will be the mobile device of choice" (p. 6).

Smart phone sales surpassed laptop computer sales for the first time in 2007, with the total estimated market sales of smart phones to reach between 25 to 30 percent by 2013 (Want, 2009). This was an underestimate in the time needed to reach increased market sales, as key findings in a Pew Research Center report indicated that as of May 2011, eight in ten (83%) of American adults owned a cell phone and of those 35% of American adults owned some form of a smart phone (Smith, 2011) with an increase of smart phone ownership reported to have reached 46% by May, 2012 (Lenhart, 2012). According to Lenhart at the Pew Research Center (2012), approximately three quarters of teens, age 12-17, owned some form of cell phone, with 54% owning a regular phone and one quarter (23%) owning a smart phone. Want (2009) highlights the contrasting functions between these two types of mobile devices: "The fundamental difference between a cell phone and a smart phone is that the application processor becomes a computationally powerful computer in its own right, one that can run general purpose applications" (p. 2).

In concurrence with Want (2009), Wong (2010) also believes there has been "a massive increase in the computational power of mobile processors and considerable improvements in modern mobile operating systems" (p. 40). He further states that the combination of the pervasiveness of the smart phone, with the increase in sophisticated functioning, and the performance levels of the applications, requires upgrades to network infrastructures to support the various types of mobile communication (Wong, 2010). The need for wider band-width and increased data transfer rates increases as the devices improve and the processing requirements grow (Woh, Mahlke, Mudge, & Chakrabarti, 2010; Wong, 2010). The popularity of the smart phone and the improvements made in the mobile devices as they moved from third generation (3G) to fourth generation (4G) increased computational demands of 10 to 1,000 times (Love, 2012; Woh et al., 2010). Included in the demands are a surge in the number and sophistication of cell phone applications (apps) available for download which increase daily (Love, 2011) making today's smart phones much more versatile than a device designed to make just phone calls (Wong, 2010).

Worldwide in 2011, one billion apps were downloaded each month, 103 million wireless tweets were posted each day, and the year's number of texts equaled eight trillion (Love, 2011). Besides the usual ability of a mobile cellular device to send and receive text messages and take still photographs, the 4G wireless mobile device applications allow the smart phone to support the delivery of such items as interactive video conferencing (Woh et al., 2010), 2D bar-code readers, and car remote controls (Wong, 2010), just to mention a few. Mobile device apps, as reported in the *NMC*

Horizon Report: 2012 K-12 Edition (Johnson et al., 2012), have educational potential as an emerging technology in the near-term horizon.

> Mobile devices & apps are increasingly valued as important learning tools in K-12. Once banned from the classroom, mobile devices & apps have become such compelling tools that schools are beginning to rethink standing policies, and some are even beginning to implement "bring your own device" (BYOD) programs. The potential applications of mobiles are vast, and range from graphing complex mathematical equations to storing and sharing notes and e-book annotations. Apps in particular are the fastest growing dimension of the mobile space in the K-12 sector right now, with impacts on virtually every aspect of informal life, and increasingly, potential in almost every academic discipline. Always-connected Internet devices using 3G, 4G, and similar cellular networks, imbedded sensors, cameras, and GPS have inspired hundreds of thousands of applications. With a steady flow of new apps that take advantage of the continual stream of enhancements to these tools, as well as key advances in electronic publishing, and the convergence of search technology and location awareness, mobile devices & apps grow more and more interesting with each passing month. (p. 4)

According to Shinn (2009), "As mobile devices evolve, they will become more versatile, more useful, and more essential" (p. 38). Marcoux (2009) states "Technological advances suggest that the cell phone will be the primary device for many students" (p. 73).

In an online United States national study sampling teenagers'(ages 13-19) attitudes regarding mobile phone usage, students ranked the importance of cell phones second behind clothing in determining their social status (Harris Interactive, 2008). They

also reported having a cell phone was an indicator of personal style and allowed them to stay connected, have a feeling of safety, and provided them with personal entertainment (Harris Interactive, 2008). Societal influence in the forms of social pressure and image has been known to directly influence cell phone possession and use (Kaba et al., 2009). According to Aaron Zabawa, associate middle school principal in Lincoln, Nebraska (as cited in Anderson, 2009), "Increasingly, the cell phone is seen as a critical tool for our daily lives" (p. 2). Cell phones as a major connection tool assist in making social networking connections (Marcoux, 2009) and are changing the culture in which we communicate (Agar, 2009).

As new technologies emerge or change, implications for further research also emerge. Research regarding perception of use is warranted. Many questions arise in regard to student perception, instructor perception, institutional perception, and community perception, just to name a few. Also important to consider are the varying global perceptions on mobile phone technology and the reasons for the United States' overall lag in accepting cellular phones as a leading educational classroom tool in this technologically-dominated 21st century.

Foreign Countries' Use

Although America is often regarded as a leader among nations in a variety of different pursuits, the United States has been slow to embrace the use of mobile devices as student learning tools in classrooms. Several studies of the implementation of mobile devices in foreign classrooms, however, have shown that cell phones as learning tools are not only practical but also perceived as very valuable in educational settings abroad by

students and instructors alike (Herrera-Barista & Gonzalez-Martinez, 2008; Houser, Thornton, & Kluge, 2002; Librero et al., 2007; Prensky, 2005).

Librero et al. (2007) report that two major projects have resulted in positive reactions from both students and trainees about the potential of cell phone techniques and short message service (SMS) features involving sending and receiving text messages for the purpose of formal and non-formal education in the Philippines and Mongolia. The first project, dubbed TXT 700UPOU, began in 2003 and used multimedia and text message, (SMS) technology to broadcast and deliver educational materials to people 'on the go' (p. 234). It was aimed at adult learners and received 9,000 interested students during its first year, though program directors were expecting many more and suspect flawed marketing was to blame for the lower participation than was originally projected. Librero et al. (2007) insist that "Getting users interested in educational cell phone content depends on the creativity of the instructional designers" (p. 236).

The second project discussed by Librero et al. (2007) focused attention on the potential for mobile technology use in non-formal education such as distance education in the Philippines. Researchers first surveyed 123 Alternative Learning Students (ALS) ranging in age from 12 to 48 by giving them a questionnaire used to gauge their attitudes about the potential uses of cell phones in education. A large proportion of the respondents had dropped out of formal education, many citing financial factors as the main cause. Of these students, 80% said they would be interested in the prospect of using their cell phones and the short message services (SMS) function to continue non-formal training at home. Every single respondent had at least one cell phone available to their household, and many more had anywhere from two to four cell phones.

Based on the positive feedback of these respondents on using multimedia like mobile phones, staff of the Philippines' Department of Education developed multimedia learning modules to conduct seminars, training workshops, and experts' panels for health education and hygiene promotion. Additionally, future goals include working to provide English language learning lessons to those individuals who have dropped out of formal education, but who realize that learning English will help them significantly in their job ambitions (Librero et al., 2007).

The Mongolia and the Philippines projects discussed by Librero et al. (2007) show there is sufficient interest and enthusiasm from cell phone users to continue to develop avenues of formal and non-formal education while using mobile technologies as primary learning tools. Non-formal education is especially important for training programs in developing countries used to better the living conditions (Merriam et al., 2007). Librero et al. (2007) conclude that the two projects "aim to develop a wide range of SMS-based materials to harness the educational and social development potential of this ubiquitous new communication tool" (p. 243). These two projects are yet another example of how the creativity involved in providing and delivering the education people desire ultimately determines whether or not such ventures are successful.

Houser et al. (2002), also, discussed the importance of novel instructional design using mobile technology to the overall success of foreign language learning in a number of different countries worldwide. The nine projects involving mobile devices used in education were found spanning Europe, Asia, North America, and South America, and consisted of what the researchers termed "blended educational programs" consisting of a combination of face-to-face interaction, Internet web use, and mobile components. Of

particular interest to the researchers was a project called *Learning on the Move* that discussed the application of mobile phone email in Japanese universities. Since classes met only once per week making foreign language learning especially difficult for instructors to aid their students' learning, and because nearly every Japanese adult learner owns and carries at least one cell phone, mobile phone technology is imperative in Japanese educational culture. The project consisted of daily foreign-language vocabulary lessons emailed to students via mobile phone and found that "cell-phone email produced learning superior to desktop email, mobile web, and paper" (p. 1). Houser et al. (2002) insisted that projects such as the one in Japanese universities illustrated the "unique combination of features in mobile devices – **portability, connectivity, and low cost** - makes them valuable educational tools" (p. 1).

Teachers are not necessarily the only people responsible for introducing technology into the curriculum and recognize a mobile device's value in the classroom. A survey conducted in a Mexican university revealed that students had taken it upon themselves to use their cell phones for a number of specific educational purposes of which their instructors were not aware. Herrera-Barista and Gonzalez-Martinez (2008) conducted a survey of 350 undergraduate students attending the Campus Azcapotzalco of the Autonomous Metropolitan University (UAM-A), 75% of whom were between the ages of 19 and 24, with the goal of identifying how the students used web resources and cell phones in their academics. Students were asked for information about their use of technological tools regarding searching and exchanging information, sharing tasks with fellow students, and interacting and socializing with university peers.

The researchers found that students used cell phones for a variety of specialized functions pertaining to their academic lives including: taking photographs in laboratory practices, exhibitions, museums, pages of books, and in order to remember what was written on a blackboard; keeping information together and transferring files containing tasks and class notes; recording classes and conferences; generating and sharing documents, spreadsheets, and presentations; connecting to the Internet to search for academic information; and sending and receiving text messages concerning school activities. The researchers concluded that although the university has the available resources to support mobile technology in education and its students know how to use the technology for their intended academic purposes, the faculty needs to do a better job of recognizing that "cell phones are tools that students make use of," and that "Therefore, teachers must generate instructional materials and digital documents that encourage the ingenious and innovative use of the ICT [Information and Communication Technologies] in education" (Herrera-Barista and Gonzalez-Martinez, 2008, p. 8).

Possible Barriers to Educational Use

Although our current technology enables a wide set of applications for educational use, and despite literature documenting the success across the globe of mobile phones used as learning tools by learners that include students and teachers alike, there are those who still feel that cellular phones are either incapable of providing all that learners demand or are simply inappropriate devices to be used in the classroom. Barriers to mobile devices used in the classroom include practical, technological, generational, social, and medical considerations. Exploring the possible barriers of mobile devices used as learning tools could give advocates an indication of what

obstacles remain to be overcome for the notion of mobile phone technology used in the classroom to become a reality in the majority of learners' educational practices.

Houser et al. (2002), who researched Japanese university foreign language learners' use of mobile phones in education, point out that high costs of cell phone use in Japan and elsewhere can negatively influence educators' and students' perceptions of cell phones used for educational purposes. Although nearly every Japanese student carries at least one cell phone and most classes in Japanese universities are equipped for cell phones used as learning tools, the cost to run a cell phone in Japan averages about US$700 per year, with wireless Internet ranging anywhere from US$6-$70 per hour. Additionally, the researchers noted that in order for students to get the most out of cell phones as learning tools, they needed to be able to rely on video and audio capabilities. However, phones that are able to stream media to the desired requirements generally cost between US$3-$15 per minute. While some of these high prices may have decreased significantly since this article was written in 2002, cost is still a factor affecting cell phone use worldwide and one obstacle to mobile technology in the classroom that is unlikely to be remedied any time soon.

Not only is cost a concern for the daily use of cell phones within schools in some countries, but also several valid points regarding the practicality of various dimensions of cell phones as learning tools have been pointed out. "Electronic Education Report" (2005) indicated that some individuals wondered whether or not cell phones are capable of supporting the quality of video required to meet modern educational standards. Others felt that a cell phone's small screen size makes text too difficult to read. This particular concern is especially relevant to students with special needs or adult learners, particularly

some nontraditional older students whose progressively deteriorating vision plays a larger role in completing daily tasks successfully. Merriam et al. (2007) explain that "Deterioration in the ability to see and to hear can create problems with the learning process" (p. 302).

Kurniawan (2008) investigated mobile phone use by people 60 years old or older through a combination of qualitative and quantitative analysis methods including Delphi interviews, focus group discussions, and an online survey. Older adults were found to experience difficulty in mobile phone manipulation resulting from display screens being too small to see accurately. This, in addition to reports of frustrations stemming from small button and character sizes, led to complaints of frequently pressing wrong numbers than those intended. Other concerns cited by Kurniawan (2008) included expensive services, too many functions on the cell phone, non-user-friendly menu arrangements, and unclear instructions on how to find and use a function.

Older generations, who did not grow up with the type of technology available since the 1970s, fall out of sight and out of mind by the overshadowing literature concerning the younger students of today that Prensky (2001a) has termed "Digital Natives." This younger generation of students has grown up with technology and multi-tasking, and they are in the habit of processing information quickly. They want to be involved in active learning (Prensky, 2001a). They thrive on interactivity that technology, such as the cell phone when used as a learning tool, can provide (Prensky, 2001b, 2005). But it is important to remember that the older generations are still productive members of society, some of whom represent the top tiers of adult learners and others of whom are highly regarded educators. Their concerns, fears, and

frustrations about mobile technology need to be heard and acknowledged because this group of people is influential in the decision to institute cell phones into classrooms.

The implications of ignoring older individuals' concerns about cell phones translates to several adverse results that only work to hinder and slow the progression of mobile learning in classrooms. The fact of the matter is that there are adult learners over the age of 60 who are not receiving an effective education because of their inability or unwillingness to use cell phone technologies, and there are adult educators over the age of 60 whose lack of understanding and negative perceptions of mobile technology prevent them from instituting it in their classrooms, taking away valuable learning opportunities from students and creative teaching opportunities from themselves.

More researchers need to focus their attention on older adult learners to fill the gap that currently exists in the literature in relation to this population because even though the group of people who did not grow up with mobile technology will shrink in the next few decades, the "Digital Natives" will surely face similar old age-related frustrations concerning deteriorating vision and loss of fine motor control skills currently necessary to use mobile technology effectively (Salajan, Schonwetter, & Cleghorn, 2010).

One of the biggest hurdles to cell phone adoption is resistance by teachers to change teaching practices (Kharif, 2008). Self perception may also be to blame. One's own lack of confidence in the ability to use technology effectively may inhibit its implementation, as well as the perception of ease of use or perception of the actual usefulness of the technology tool to be used for the purpose intended (Chen et al., 2011). A study conducted at Ball State University, considered one of the most wired universities

(as cited in Butler & Sellbom, 2002), revealed common concerns identified by faculty as barriers in the adoption of technology as: unreliability of the technology, lack of time to learn how to use the technology, not knowing whether using technology really mattered or made a difference in teaching and learning, and lack of institutional support through training or problem resolution (Butler & Sellbom, 2002).

Technological limitations are another potential barrier to using mobile devices in classrooms across the country. Cell phones are capable of providing many of the same or similar functions as desktop computers, which are found in nearly every school and on every college campus in the United States. There are three limitations to cell phones, however, that Houser et al. (2002) claim will prevent mobile devices from replacing desktop PCs in schools: bandwidth, running costs, and text input speed. According to these researchers, the bandwidth, or rate of data transfer, is not at the level it needs to be to supplement the high demands of student learning. The running costs of cell phones, at least in some countries, make daily cell phone use in the classrooms infeasible. Finally, Houser et al. (2002) point out that mobile text input speed is still too slow (about 10 words per minute on cell phones compared to 60 on desktop PCs) to provide learners access to more than just the ability to read media on their phones and to answer simple multiple choice questions. Another very real technological concern and potential barrier to using cell phones in classrooms is what Chapman (2011) describes as " 'a very notable shift in focus' by hackers to mobile devices" (p. 1). Mobile phones are increasingly becoming the targets of malicious attacks that aim to steal personal information from cell phones and download or install apps without the user's knowledge (Chapman, 2011).

Medical and health concerns regarding the prolonged use of cell phones remains a concern to some people as well (Electronic Education Report, 2005), which may also be a difficulty to overcome in convincing administrators, parents, and even some students of the benefits of mobile technology. High frequency of mobile phone use among young adult college and university students living in Sweden and between the ages of 20-24 may perpetuate negative mental health symptoms such as stress, depression, and sleep disorders (Thomée, Härenstam, & Hagberg, 2011). Researchers sent questionnaires to a random sample of ten thousand men and ten thousand women of the general population of Sweden born between 1983 and 1987, in October 2007. After excluding people who failed to respond to the questionnaire and the two reminders to participate that were mailed, the total number of subjects was reduced to 4156.

Researchers then conducted a one-year follow-up qualitative interview with 32 of the subjects who agreed to participate further. These individuals were also subjects who had high computer or mobile phone use and reported mental health symptoms. Young adults' perceptions of their own associations between ITC [information and communications technology] and mental health symptoms were taken into account and evaluated in order to produce a model of possible paths for associations between high ITC use and negative mental health symptoms. Findings indicated that there are likely many different factors that should be taken into consideration when making an argument for this type of association, such as personal temperament and characteristics, and addiction or dependency tendencies, but that overuse of mobile phones has been associated with somatic complaints, anxiety, insomnia, depression, psychological distress, and an unhealthy lifestyle. Being over-connected can take its toll on a person's

mental and physical health (Beranuy, Oberst, Carbonell, & Chamarro, 2009; Thomée et al., 2011; Yen et al., 2009).

Additional worries included the possible hazards that might be related to prolonged exposure to electromagnetic fields and the potential for musculoskeletal problems to arise from overusing the hands and fingers in text messaging. Limitations to this study include the fact that nearly twice as many women as men comprised the 4,156 people who responded to the questionnaire mailed to them, which indicates that results are really more an indication of what may be true for women more so than men in Sweden rather than a representative view of the general public's association of high ITC use with negative mental health issues (Thomée et al., 2011). Further research conducted in various countries is necessary to determine whether or not similar results occur globally or are instead in some way culturally-derived.

School policies and educational practices may also be barriers that prohibit students from using cell phones in high schools across the United States (Obringer & Coffey, 2007). A quantitative study conducted through the use of a national survey explored administrators' perceptions of cell phone policies for students and teachers. A draft survey was compiled and feedback was provided by a panel of eleven principals to modify the survey. A pilot study using the revised survey was conducted with fifteen university educators revealing no issues with the instrument. Surveys were then randomly sent to four high school administrators in all 50 states. Results revealed 112 responses spread relatively evenly across all portions of the United States. A quantity of 200 surveys is quite an inadequate amount considering the number of school districts within

the United States. Some states with large populations and many school districts would not have been equally represented by the sample.

Administrator policy regarding cell phones in schools may in fact present the biggest obstacles faced by students for mobile technology use in education; students in grade 6-12 identified school policy as being the number one prevention of the use of technology in school whereas prior to 2003 it was school filters and firewalls (Taylor, 2010). Moreover, as mentioned previously, those teachers who do recognize the benefits of mobile phone use find themselves in an increasing struggle to adhere to policies attempting to keep students safe as a result of rare but widely-distributed news stories documenting the dangers of teacher-student interaction and use of social media tools (Sieff, 2011).

Importance of Mobile Technology Today

"Edison research reports that in the U.S. alone, 61% of Americans age 12 and up own a mobile device, and 44% specifically own a smartphone" (as cited in Johnson et al., 2012, p. 11). Librero et al. (2007) predict that "With falling prices and increasing functionality […] it is virtually certain that not too far in the future all of the world's students will have a cell phone" (p. 231). The impact of technology on society has created a change in the way individuals lead their lives and has increased access to knowledge and information (Merriam et al., 2007). The massive quantity of information immediately available from a variety of sources has increased the necessity to educate students not only how to locate information, but determine what is real and valid (Traylor, 2009).

Learning opportunities exist to incorporate technology tools, such as the cell phone, to help learners develop important 21st century skills to become better prepared for the future (Kolb, 2011; Marcoux, 2009). By incorporating the use of cell phones for learning within classroom teaching strategies, instructors can design instruction that engages learners (Herrera-Barista & Gonzalez-Martinez, 2008), empowers students to need to know (Roe, 2011) and promotes the construction of knowledge (Chelliah & Clarke, 2011). Students want to be actively involved in their own learning and to know that what they are learning has real meaning and is applicable in context to real-world situations (Johnson et al., 2012; Roe, 2011). Johnson et al. (2012) state, "If learners can connect the course material with their own lives and their surrounding communities, then they become more excited to learn and immerse themselves in the subject matter" (p. 8). Supporting students' construction of knowledge by engaging and motivating them through the use of technology tools that help to increase 21st century learning skills will better prepare them for the future (Chelliah & Clarke, 2011).

With the increasing presence of emerging technology invading every aspect of our lives, there is an immediate need to stay abreast of technological advancements. According to Merriam et al. (2007), globalization through the use of technology is increasing the amount of worldwide communication, collaboration, and competition. These changing markets and globalization are requiring students to become more technologically competent and are, therefore, pushing education to move from a teacher-centered knowledge transmission environment to a learner-centered environment (Schneckenberg, Ehlers, & Adelsberger, 2011).

Students need to become active participants in learning (Enriquez, 2010) including learning how to collaborate with others, be creative problem solvers, and innovative thinkers, in order to be prepared for jobs in the future that now do not even exist (Roe, 2011). It is becoming more important to possess technology skills and those individuals who have an opportunity to learn how to cooperate, collaborate, and communicate through the use of technology will become more marketable in the work place environment (Kolb, 2011; Roe, 2011). It is imperative that administrators and educators in schools realize the importance of teaching today's students through the use of technology learning tools not only to better prepare them for the future, but to teach them how to use them properly (Kolb, 2011).

Summary

Despite the increasing availability of educational materials through mobile cellular devices, the potential to engage learners in educational classrooms through the use of electronic devices that most are already using for social purposes, and the ease of Internet access worldwide as a result of the technological capabilities provided by mobile phones, the idea of using cellular phones as a learning tool in American classrooms is frequently met with hesitation and uncertainty on the part of administrators and instructors. Educators, too, have been shown to display various feelings ranging from reluctance to change curriculum rooted in 19th century practices to embracing new 21st century mobile technologies in the classroom. Those instructors who discourage the use of current technological learning tools and refuse to incorporate them within their instructional pedagogy may possibly stifle the creativity of their students. Instructors who

encourage their use through real world applications may begin to prepare learners for the future. These varying attitudes and perceptions of mobile technologies have prompted K-12 schools to implement policies restricting the use of cell phones during school hours; however colleges and universities across the United States generally continue to operate without such guidelines.

Educational capabilities afforded by mobile device use in the classroom were explored. Current trends show that cell phones are a pervasive part of the lives of young and old alike around the world and, globally, educational institutions are slowly beginning to recognize their potential both in and out of the classroom in formal and non-formal learning. Relevant literature on the topic of using mobile technology in American classrooms as a learning tool was critically reviewed and the U.S. was found to be lagging behind several other countries that have already begun to implement mobile devices in teaching and learning practices.

Potential barriers faced by those advocating the use of mobile devices as learning tools in both K-12 and higher education classrooms was explored. Many types of barriers were cited, including practical, technological, generational, social, and medical considerations. As a result of increasing availability and instructional capabilities of these devices, it has been suggested that instructors and administrators in the United States may need to reevaluate their perceptions and teaching strategies to incorporate and include this emerging technology as a viable learning tool within the classroom.

CHAPTER III

RESEARCH METHODS

Introduction

The purpose of this study was to investigate high school students' current mobile cell phone technology use, student perception of high school current cell phone usage policies, student perception of cell phones as possible educational learning tools, student perception of attitudes and views of others regarding cell phone use in schools, and to explore potential perceptional differences by gender. Chapter III describes the research methodology and procedures used in the study, including a brief history of the pilot project, design of the research plan, participant selection and sample size, survey instrument, administration of the survey, and data analysis. This chapter concludes with a summary and an overview of the validity and reliability of the study.

Research Methodology

Limited research was available regarding student perception of cell phone use in schools for learning. Despite the cell phone's enormous resource potential, students' perceptional views of their high school's current cell phone usage policies, use of cell phones within the school setting, or use as an educational learning tool was, therefore, unknown. Before school systems determine recommendations for changes in current school policy or adopt cell phone technology as learning tools, students' perception needed to be investigated. A pilot study was conducted sampling college freshman prior

to this study. The scope of this study included junior and senior academic standing high school students enrolled within three area high schools. Quantitative data were collected, tabulated in a Microsoft® Excel spreadsheet, imported and analyzed using the predictive analytics software SPSS® version 20.

Pilot Study

An Institutional Review Board approved pilot study was conducted sampling 142 freshman college students regarding their reflective perceptions of high school cell phone policy and reflective perceptions of possible cell phone use as learning tools within their previous high school classrooms. The purpose of the study was to determine if students owned cell phones during high school, how they used them, their perceptions in regard to school cell phone policy, and perceptions of possible use as a learning tool in school. The study indicated the majority of students possessed cell phones during high school. Significant perceptional differences were reported by gender in regard to possible cell phone use as a learning tool in high school (Humble-Thaden, 2011).

The twelve item paper and pencil survey was developed using a three construct framework (*perception of cell phone policy, perception of teacher initiated use, and perception of student initiated use)*comprising four questions each. It was determined that construct one *(policy)* contained a question non-related to the construct. The survey instrument was, therefore, redesigned for this study.

Included on the pilot survey were additional demographic and cell phone usage check-list type items including, grade level, gender, age (20 and under or over 20 years of age), high school cell phone status (have or do not have), and types of high school cell phone application usage. Since the completion of the pilot study, there has been a rapid

increase in cell phone capabilities and application development along with a steady increase in mobile phone ownership (Chen et al., 2011; Love, 2012; Woh et al., 2010; Wong, 2010). Necessary revisions to the checklist section of the survey were completed for this study due to rapidly changing cell phone platforms.

Research Design

This quantitative research study was designed based on the previously conducted pilot study. The survey instrument was redesigned using a four construct framework rather than three as had been used in the previous study. The non-related *policy* question was discarded and a new question was written within the construct for this study. The four constructs categorizing the survey instrument questions pertaining to students' perception are as follows: perception of current school cell phone *policy*; perception of classroom cell phone *teacher initiated use*; perception of cell phone *student initiated use*; and perception of *other peoples' views* of cell phones used for learning. Each construct contained four questions. See Figure 1.

Participants and Sample Population

A sample of convenience was used for this study. The population studied was academic standing junior and senior high school students currently enrolled in second period academic courses within one of three Grand Forks Public School District high schools; Central High School, Community High School, and Red River High School.

Criteria for Selection

Using the April, 2012 Grand Forks Public Schools Enrollment Report, it was determined a large enough sample population was enrolled as junior and senior students within the three high schools. Enrollment report totals are listed in Table 1.

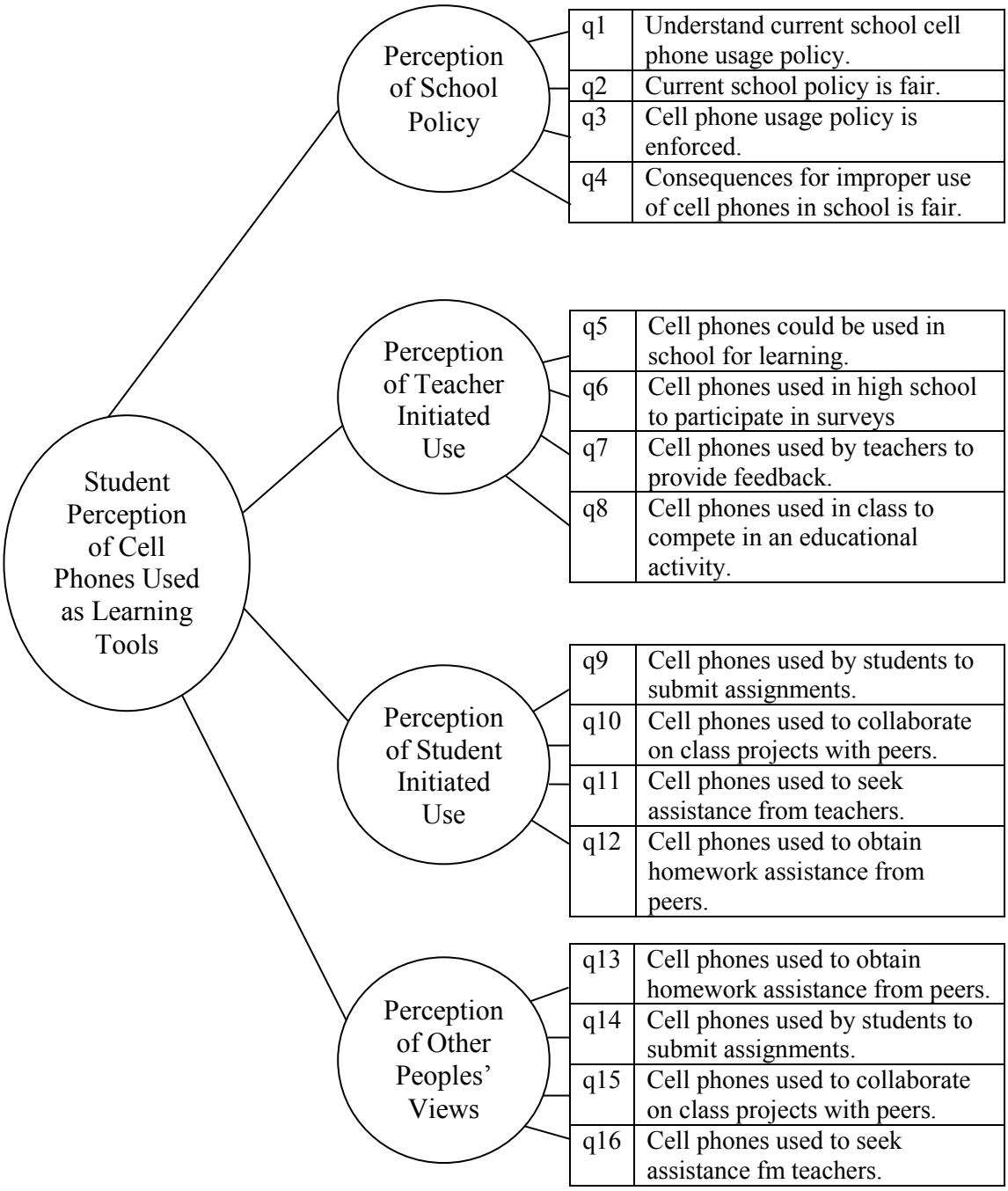

Figure 1. Survey Constructs.

Table 1. April 2012 District Enrollment Report.

School	Grade		Total (N = 992)
	Juniors (n=503)	Seniors (n=489)	
Central HS	193	197	390
Community HS	28	33	61
Red River HS	268	273	541

Approximately 1,000 junior and senior academic standing students were enrolled within the three Grand Forks Public High Schools in April 2012. Forty students out of 992 students had a free period scheduled during second hour and were not included in the sample. The remaining 952 students who were enrolled within second period courses were available as the sample of convenience. The second class period of the day was determined to be the best available time to administer the survey due to the fact there were extra minutes added to that particular class period each day to allow for daily announcements. The second period timeframe made it more conducive for instructors to conduct the survey with minimal disruption and without taking away precious instructional minutes from a typical class period.

Survey Instrument

Due to logistics and the concentrated amount of students available to survey within assigned second period classrooms in all three high schools, a determination was made to use a pencil and paper survey rather than a technologically based survey for this study. A two-sided pencil and paper survey was created for this study (Appendix A). Side one contained demographic check-list type items including: gender, age, academic grade

level, future educational goals, and current cell phone possession and feature usage. Side two included sixteen survey questions using a six-point Likert-type self-rating scale with the neutral response omitted to report degrees of agreement and disagreement in perceptions regarding educational cell phone school policy and perceptions of possible cell phone use in school for learning. Participants selected one of the following responses for each question: strongly disagree 1; disagree 2; slightly disagree 3; slightly agree 4; agree 5; strongly agree 6. Principal investigator contact information was provided at the bottom of the page for further questions or inquiries regarding the study.

The survey for this study was designed by developing individual questions within the dimension and framework of each construct. Four constructs containing four questions each categorizing students' perceptions of the following: *policy; use as a learning tool; student initiated use; and other peoples' views* were created.

Construct one containing questions 1 – 4 regarding students' perceptions of current school cell phone *policy* are as follows:

1. In my opinion, I understand my high school's current cell phone usage policy.
2. I feel my high school's current usage policy is fair.
3. In my high school, I feel the cell phone usage policy is enforced.
4. I feel the consequences for improper use of my cell phone during school hours are fair.

Construct two containing questions 5 - 8 regarding students' perceptions of cell phone *use as a learning tool* are as follows:

5. I think cell phones could be used in my high school classes as a tool for learning.

6. I think cell phones could be used in high school by students to participate in surveys.
7. In my opinion, cell phones could be used in high school by teachers to provide feedback to students.
8. In my opinion, cell phones could be used by students in high school classrooms to compete in an educational activity.

Construct three containing questions 9 - 12 regarding students' perceptions of *student initiated use* of cell phones as a learning tool are as follows:

9. In my opinion, cell phones could be used in high school by students to obtain homework assistance from peers.
10. I think that cell phones could be used in high school by students to submit assignments to teachers.
11. In my opinion, cell phones could be used in high school by students to collaborate with other students on class projects.
12. In my opinion, cell phones could be used in high school by students to seek teacher assistance on assignments.

Construct four containing questions 13 - 16 regarding students' perceptions of *other peoples' views* of possible cell phone use in schools as a learning tool are as follows:

13. I feel my parents would approve of cell phone use within high school classes for learning.
14. In my opinion, I believe my classmates would be in favor of using cell phones in the classroom as a learning tool.

15. I feel high school teachers would favor the use of cell phones in class when used as a tool for learning.
16. I think school administrators would support the use of cell phones within the classroom when used for learning.

Procedure

Institutional Review Board approval was sought and obtained following creation of the survey instrument, determination of the sample population, and the desired quantity of participants identified (Appendix B). Pursuant to the Grand Forks School District's policy 2130 in regard to conducting research, a request to conduct research within the district was submitted and approved (Appendix C, Appendix D). Following determination of the large quantity of survey respondents, both the Institutional Review Board and the Grand Public School District waiver of consent and assent were waived. A letter of permission to conduct research was requested and obtained from the Assistant Superintendent of Schools (Appendix E). Letters of cooperation were obtained from the three high school administrators to conduct this research within the Grand Forks Public School District at Central High School, Community High School, and Red River High School (Appendix F, Appendix G, Appendix H).

Once permission was granted in writing, the principal investigator requested the number of students enrolled in each second period junior and senior academic course within the three high schools from the school district's data coordinator. A spreadsheet containing a listing of instructor names and quantity of students enrolled in each second period academic course was emailed to the principle investigator. No identifiable student information was requested or received. Using the spreadsheet data, a determination was

made as to the required number of surveys needed for this study. Labeled manila envelopes were prepared for each second period instructor containing the appropriate number of surveys and instructions for survey administration, completion, and collection (Appendix I).

Prepared envelopes were distributed to each of the three participating high schools and placed within instructor mailboxes. Under the supervision of second period instructors, student participants were given a written paper survey at the beginning of second period courses to voluntarily complete. Participants self-reported non-identifiable information. No compensation was provided to participating students. Second period teachers instructed, distributed, and collected completed surveys. Completed surveys were placed into sealable manila envelopes and returned to the high school office for pick-up by the principle investigator.

Data Analysis

Using the survey instrument code sheet, quantitative data was entered into a Microsoft® Excel spreadsheet (Appendix J). Predictive Analytics Software Statistics 20 (PASW®) was used to import and analyze the quantitative spreadsheet data. A factor analysis was conducted to determine the alignment and interrelationships among the four questions comprising each of the four constructs. Further data analysis consisted of an independent samples *t* test and an ANOVA. Cronbach's alpha was used to determine reliability of the scales and measure internal consistency. The significance level was set as .05. (The probability of a Type I error was maintained at .05 for all analyses.)

CHAPTER IV

RESULTS AND ANALYSIS

Overview

The purpose of this study was to investigate current Grand Forks Public School District high school junior and senior academic standing students' mobile cell phone technology use, student perception of high school current cell phone usage policies, student perception of cell phones as possible educational learning tools, student perception of attitudes and views of others regarding possible cell phone use in schools, and to explore potential perceptional differences by gender.

Chapter IV contains descriptive demographic participant characteristics: gender, academic grade level, school attended, current cell phone status; have or do not have, type of cell phone; smart phone or not, current types of cell phone application usage, and future academic plans and goals of the participants. Descriptive statistics were computed to determine frequencies, means, and standard deviations for each of the survey questions. Further quantitative analysis consisted of a factor analysis to determine alignment of the four questions comprising each of the four constructs. Cronbach's alpha was used to determine internal consistency reliability of summated scale scores within each of the four constructs. Independent samples *t* tests (two-tailed) were computed for the two values within each independent variable group consisting of gender (male or female), smart phone (possess or do not possess), or academic standing (junior or senior)

to determine if significant differences existed between each variable group. A one-way analysis of variance was conducted, as a means of comparing variances across groups. The groups included the three high schools and educational goals. Levene's test for equality is automatically calculated with an analysis of variance. Bonferroni pos hoc test was conducted as a second and also more stringent comparison. A two-way analysis of variance (two by two) was conducted comparing differences between the variables of gender (male and female) and academic standing (junior and senior). The significance level was set at .05. (The probability of a Type I error was maintained at .05 for all analyses.)

The following research questions guided the study:

1. What mobile cell phone technologies were students using?
2. What were students' perceptions of their school's current cell phone policy?
3. What were students' perceptions of cell phone instructional use as learning tools when initiated by teachers in the classroom?
4. What were students' perceptions of cell phones used as learning tools when initiated by students?
5. What were students' perceptions of other peoples' opinions regarding the use of cell phones in the classroom as learning tools?
6. Were there perceptional differences by gender?

Participants

The overall survey response rate was 83.4 %, with 794 surveys returned out of a possible 952 from participants enrolled as junior and senior students within second period academic courses. Percentage breakdown by school of the 794 returned responses were

as follows: Central High School 322 (40.6%); Community High School 37 (4.6%); and Red River High School 435 (54.8%). See Figure 2.

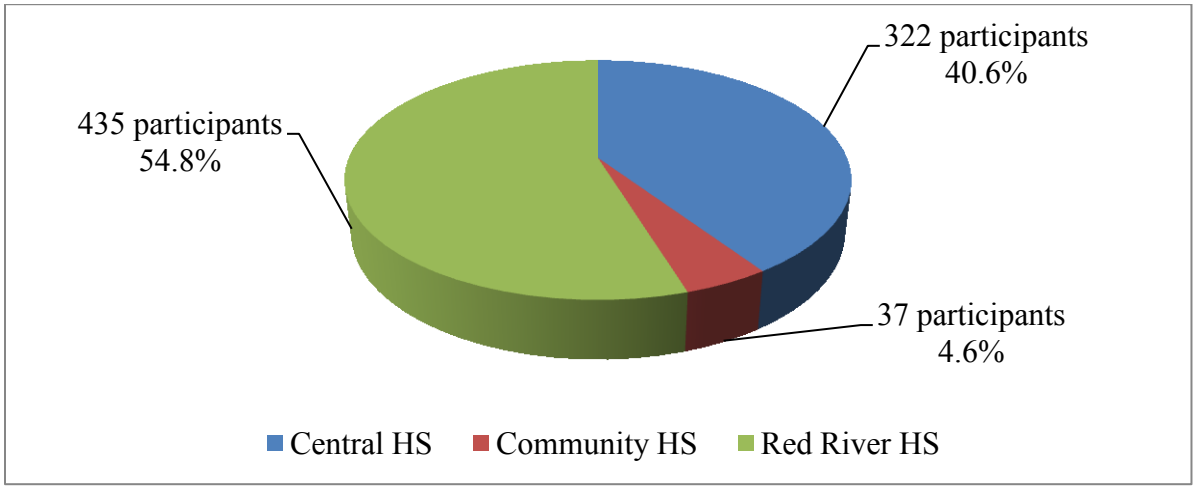

Figure 2. Total Participants by School.

The study included 407 male participants (51.3%) and 387 female participants (48.7%). Breakdown of participants' gender and academic standing by school is presented in Table 2.

Table 2. Gender and Academic Standing by School.

	Central HS		Community HS		Red River HS	
	Junior n	Senior n	Junior n	Senior n	Junior n	Senior n
Male	93	79	14	2	113	105
Female	74	75	16	5	115	102

Central High School participants included 173 males, 93 academic standing juniors and 79 academic standing seniors (one male participant's academic standing was unknown); 150 females, 74 academic standing juniors and 75 academic standing seniors.

The overall response rate for Central High School was 86.6%, with 322 surveys returned out a possible total of 372 surveys.

Community High School participants included 16 males, 14 academic standing juniors and 2 academic standing seniors; 21 females, 16 academic standing juniors and 5 academic standing seniors. The overall response rate for Community High School was 60.7%, with 37 surveys returned out of a possible total of 61surveys (further explanation will be given in Chapter V).

Red River High School participants included 218 males, 113 academic standing juniors and 105 academic standing seniors; 217 females, 115 academic standing juniors and 102 academic standing seniors. The overall response rate for Red River was 83.8%, with 435 surveys returned out of a possible total of 519 surveys.

Cell Phone Ownership and Application Use

Total cell phone survey participants reported cell phone ownership as follows: 20 participants (3%) reported no possession of a cell phone and 774 participants (97%) reported owning a cell phone. See Figure 3.

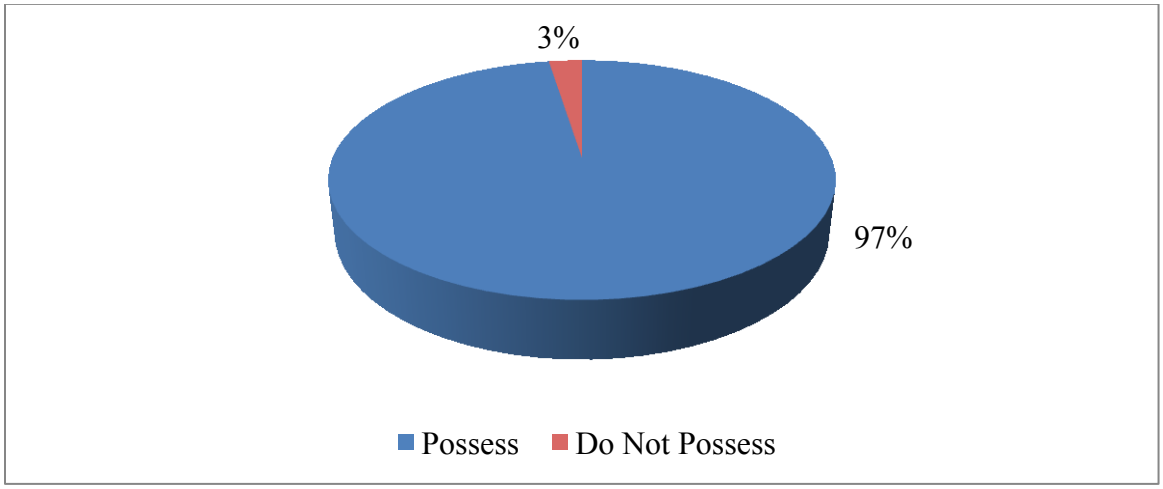

Figure 3. Total Cell Phone Ownership.

Of the 774 cell phone owners, 487 participants (63%) reported owning a smart phone with the remaining 287 participants (37%) reported owning a cell phone not categorized as a smart phone. See Figure 4.

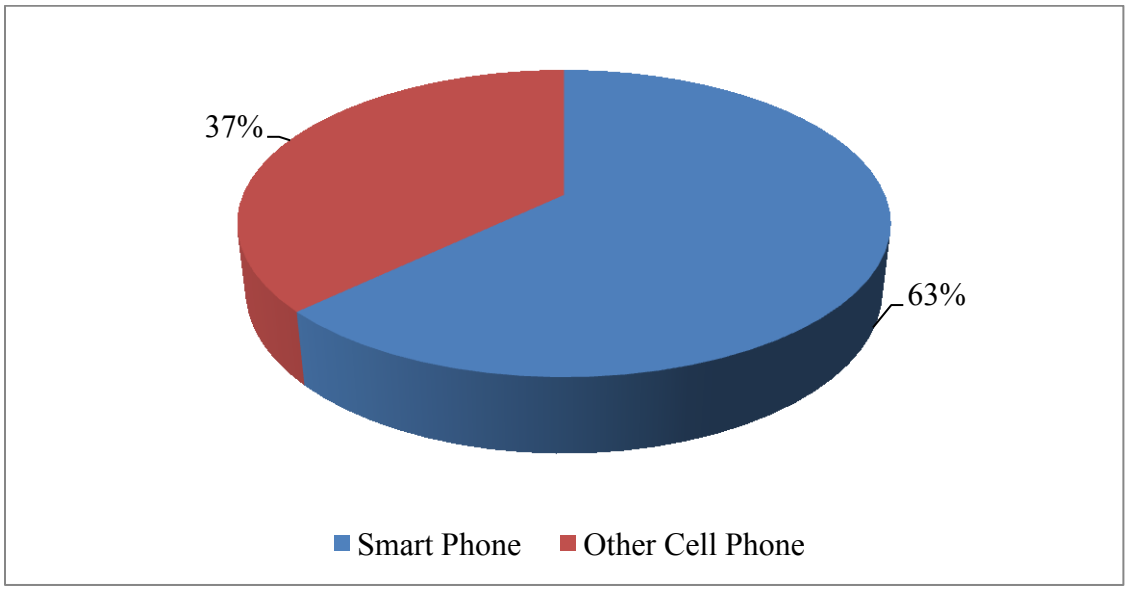

Figure 4. Smart Phone Ownership.

Participants reported calling and texting as the two main uses of their cell phones; 769 (99%) and 759 (98%) respectively. After calling and texting, the following top cell phone applications used by participants owning some form of a cell phone were reported as follows: photos (699, 90%); clock (681, 88%); alarm clock (629, 81%); calendar (603, 78%); calculator (557, 72%); light (538, 70%); music (460, 59%); games (439, 57%); weather (430, 56%); and tied were social media and e-mail (407, 53%). Figure 5 indicates frequency totals for the top ranked cell phone applications used and reported by all survey participants.

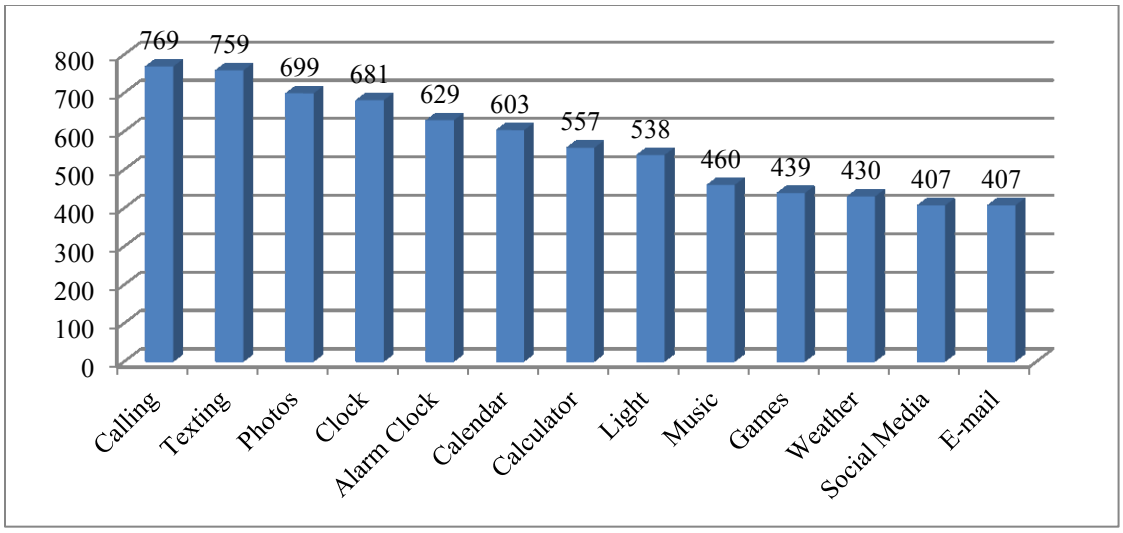

Figure 5. Top Cell Phone Application Frequencies.

Survey Questions

Using a six point Likert-type scale with a neutral response omitted, a mean score below 3.5 reported some form of overall disagreement, whereas a mean score above 3.5 reported some form of overall agreement. As shown in Table 3, the majority of the sixteen survey questions reported a higher average percentage of some form of agreement than some form of disagreement. Question four asked survey participants if they felt the consequences for improper use of their cell phone during school hours was fair and reported a mean score of 3.5, which is right between some form of slight disagreement and some form of slight agreement. The only exception to the majority of questions reporting a higher average of some form of agreement was question sixteen, with a mean score of 3.4, which is in the range of slight disagreement. This question was situated within the construct pertaining to the participants' perception of others' views of the use of cell phones in schools for learning and it asked participants if they thought school

Table 3. Average Scores for Survey Questions.

Average Scores for Survey Questions (1=Strongly Disagree, 6=Strongly Agree)		N	M	SD
Perception of School Policy				
q1.	In my opinion, I understand my high school's current cell phone usage policy.	791	4.7	1.4
q2.	I feel my high school's current cell phone usage policy is fair**.**	791	3.7	1.5
q3.	In my high school**,** I feel the cell phone usage policy is enforced.	784	4.4	1.2
q4.	I feel the consequences for improper use of my cell phone during school hours are fair.	787	3.5	1.5
Perception as Learning Tool				
q5.	I think cell phones could be used in my high school classes as a tool for learning.	791	4.5	1.4
q6.	I think cell phones could be used in high school by students to participate in surveys.	793	4.2	1.5
q7.	In my opinion, cell phones could be used in high school by teachers to provide feedback to students.	792	4.1	1.5
q8.	In my opinion, cell phones could be used by students in high school classrooms to compete in an educational activity.	791	4.2	1.5
Perception of Student Initiated Use				
q9.	In my opinion, cell phones could be used in high school by students to obtain homework assistance from peers.	789	4.5	1.3
q10.	I think that cell phones could be used in high school by students to submit assignments to teachers.	788	4.2	1.5
q11.	In my opinion, cell phones could be used in high school by students to collaborate with other students on class projects.	789	4.7	1.3
q12.	In my opinion, cell phones could be used in high school by students to seek teacher assistance on assignments.	789	4.3	1.4
Perception of Other Peoples' Views				
q13.	I feel my parents would approve of cell phone use within high school classes for learning.	787	4.4	1.5
q14.	In my opinion, I believe my classmates would be in favor of using cell phones in the classroom as a learning tool.	790	5.1	1.1
q15.	I feel high school teachers would favor the use of cell phones in class when used as a tool for learning.	791	3.8	1.5
q16.	I think school administrators would support the use of cell phones within the classroom when used for learning.	791	3.4	1.7

administrators would support the use of cell phones within the classroom when used for learning.

Survey Question One: In my opinion, I understand my high school's current cell phone usage policy, reported a mean of 4.7 and 82.7% of some form of agreement. Figure 6 shows a plot of the percentage of agreement and disagreement.

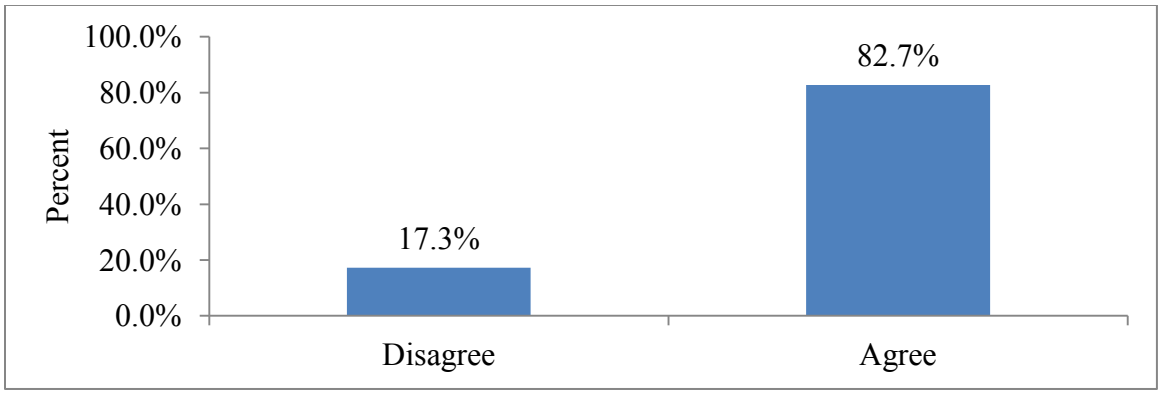

Figure 6. Question One: Percentage of Agreement and Disagreement.

Further breakdown of the response to question one is shown in Figure 7. As shown in the figure, the majority of participants responded within the agree range to strongly agree range (77.9%).

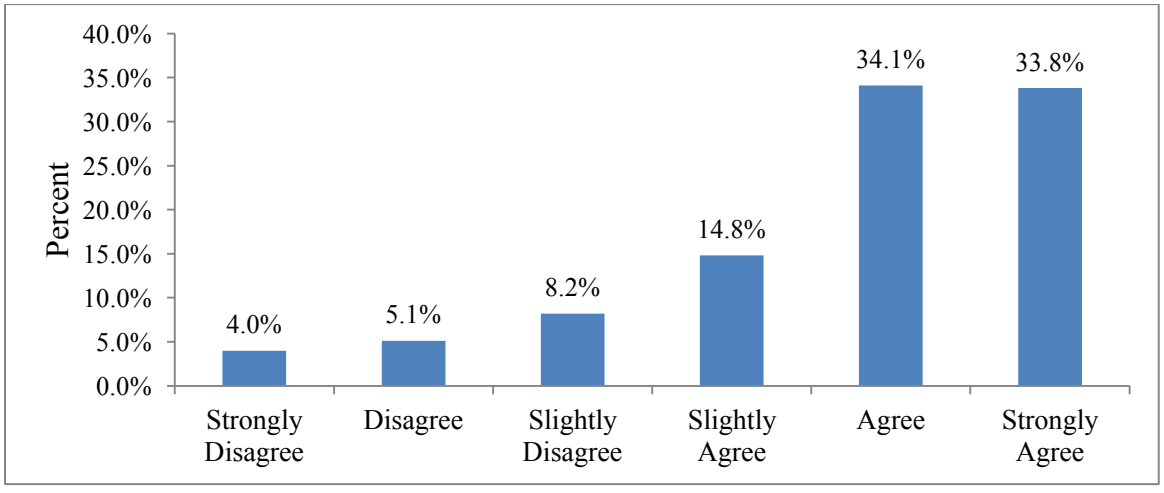

Figure 7. Question One: Overall Scale of Response Percentages.

Survey Question Two: I feel my high school's current cell phone usage policy is fair, reported a mean of 3.7. Figure 8 shows 57.6% of participants reported some form of agreement and the remaining 42.4% reported some form of disagreement.

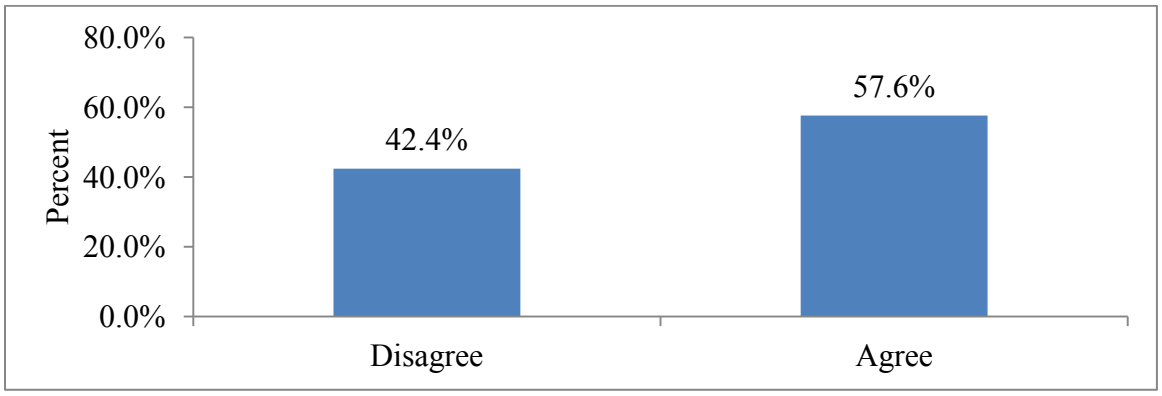

Figure 8. Question Two: Percentage of Agreement and Disagreement.

Figure 9 shows a further breakdown of the overall scale of response percentages. The largest percentage (24.6%) of responses from participants fell within the agree range, with the slightly agree category reporting the second highest percentage at 21.6%. The smallest percentage (11.4%) of responses reported were in the strongly agree category.

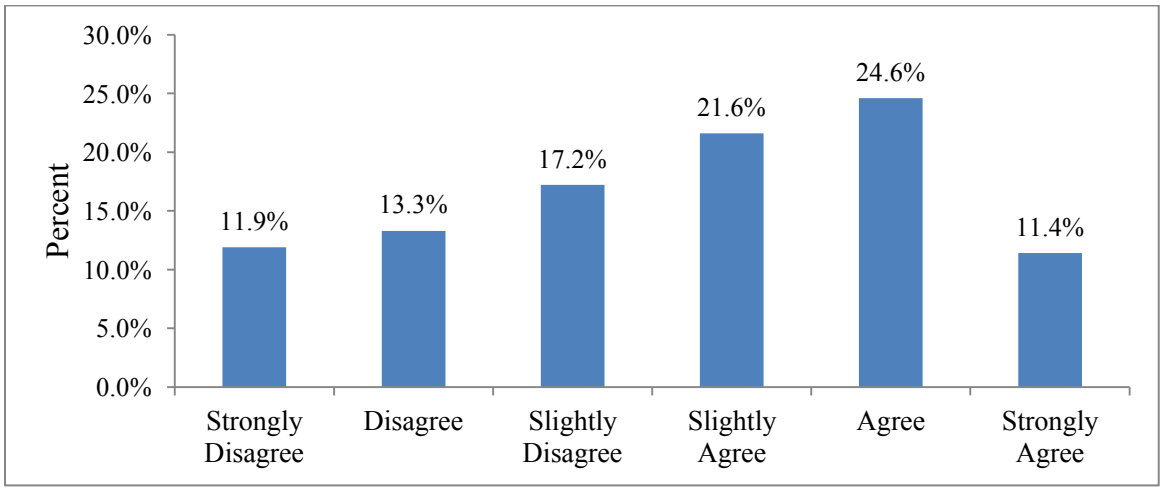

Figure 9. Question Two: Overall Scale of Response Percentages.

Survey Question Three: In my high school, I feel the cell phone usage policy is enforced, reported a mean of 4.4 and 80.1% of some form of agreement. Figure 10 shows a plot of the percentage of agreement and disagreement.

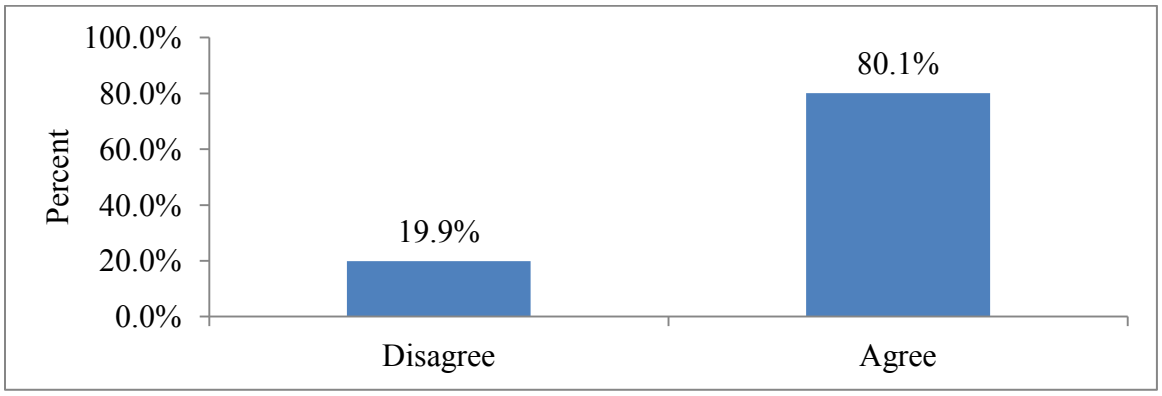

Figure 10. Question Three: Percentage of Agreement and Disagreement.

Further breakdown of the response to question three is shown in Figure 11. Over one half of the responses within the overall percentage of some form of agreement (80.1%) responded within the agree range (40.5%). The slightly agree range reported 24.0% and the strongly agree range reported 15.6% of the responses.

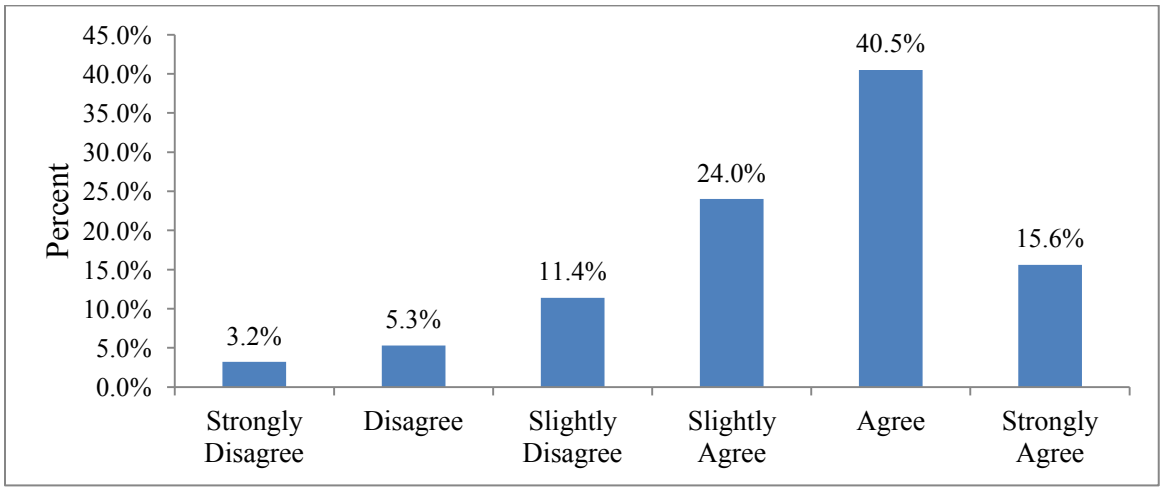

Figure 11. Question Three: Overall Scale of Response Percentages.

Survey Question Four: I feel the consequences for improper use of my cell phone during school hours are fair, reported a mean of 3.5. Figure 12 shows 52.9% of some form of agreement.

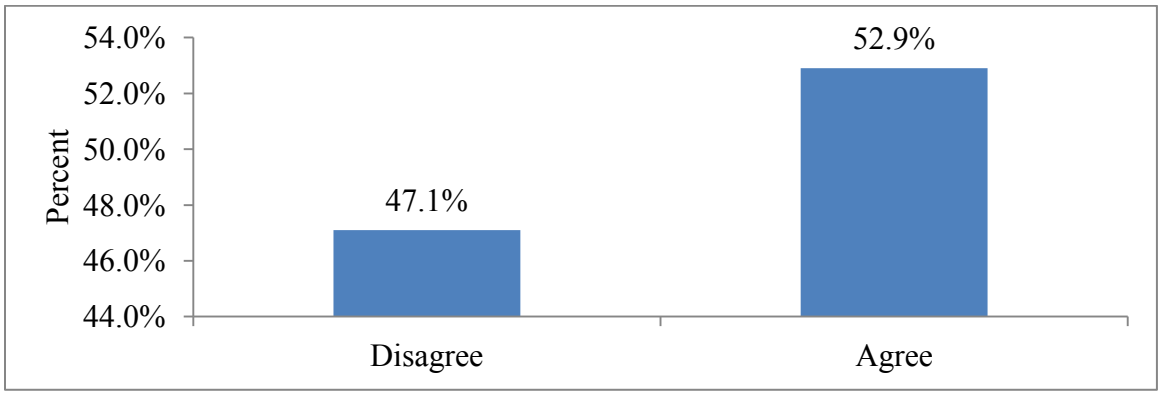

Figure 12. Question Four: Percentage of Agreement and Disagreement.

Figure 13 shows a further breakdown of the overall scale of response percentages for question four. The highest percentage of responses fell within the slightly disagree to the agree range as follows: slightly disagree, 19.8%; slightly agree, 22.8%; and agree, 23.4%.

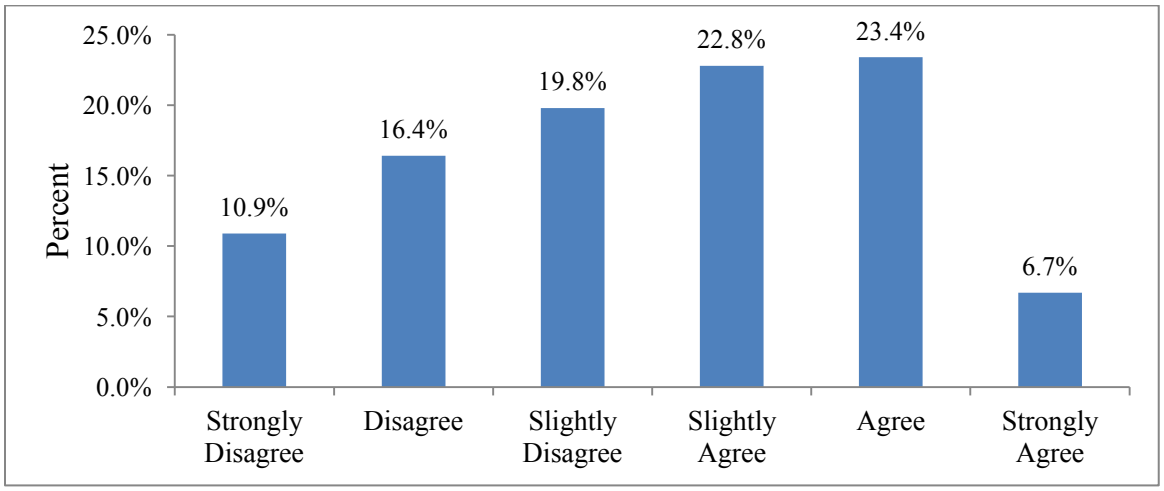

Figure 13. Question Four: Overall Scale of Response Percentages.

Survey Question Five: I think cell phones could be used in my high school classes as a tool for learning, reported a mean of 4.5. Figure 14 shows 77.9% of some form of agreement.

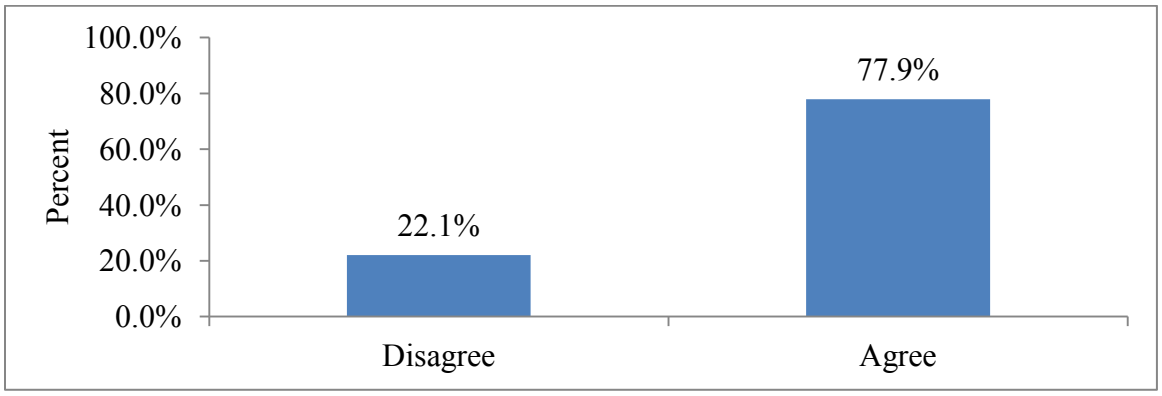

Figure 14. Question Five: Percentage of Agreement and Disagreement.

Figure 15 shows a further breakdown of the overall scale of response percentages for question five. The strongly agree response reported the highest percentage among all responses at 30.1%, with the agree and slightly agree category of responses following with 27.1% and 20.7%, respectively. Over three-fourths of the participants recorded responses that were in agreement that cell phones could be used within their classrooms as tools for learning by responding within one of the categories of agreement leaving only 22.1% who responded within one of the categories of disagreement.

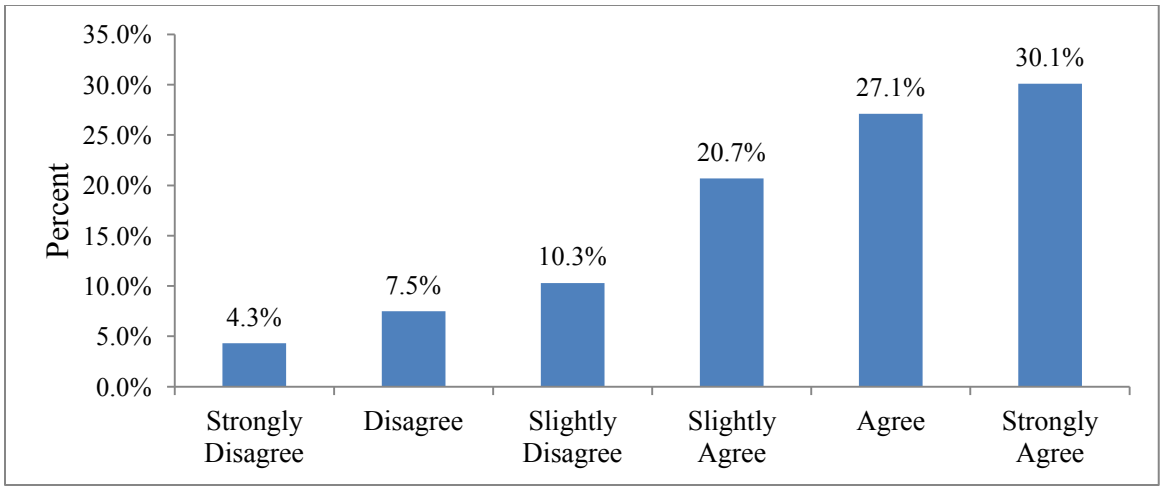

Figure 15. Question Five: Overall Scale of Response Percentages.

Survey Question Six: I think cell phones could be used in high school by students to participate in surveys, reported a mean of 4.2. Figure 16 shows 71.9% of some form of agreement.

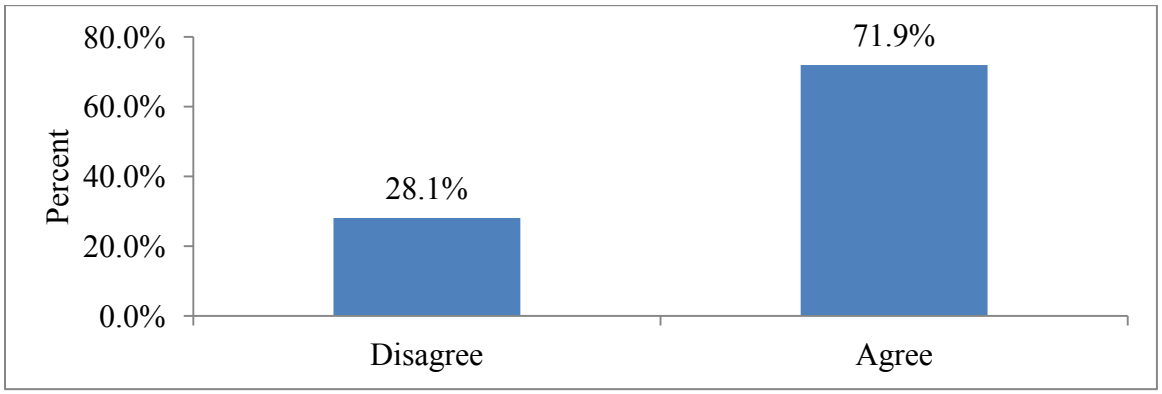

Figure 16. Question Six: Percentage of Agreement and Disagreement.

Figure 17 shows a further breakdown of the overall scale of response percentages for question six. Over one half of the participants reported they felt cell phones could be used in school by students to participate in surveys.

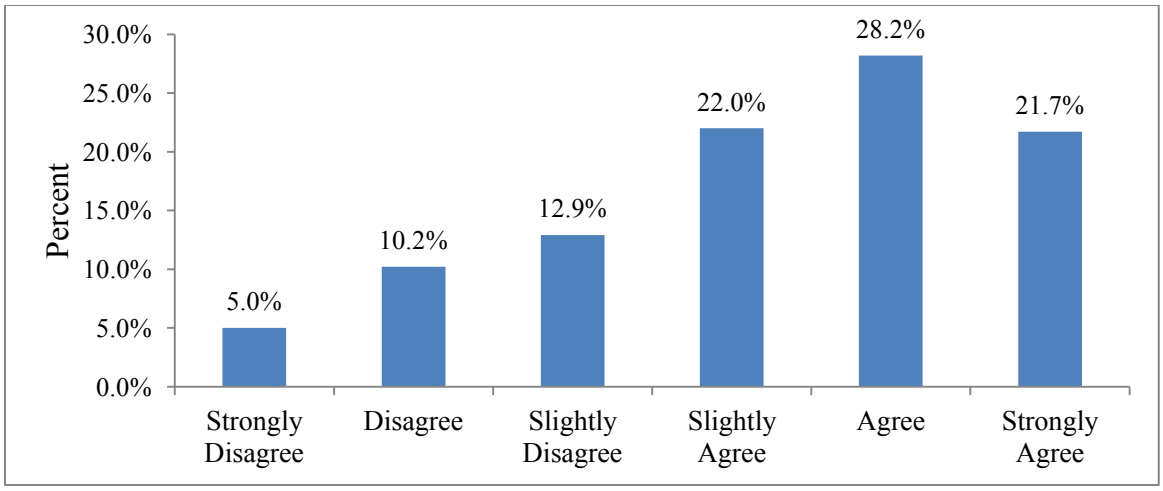

Figure 17. Question Six: Overall Scale of Response Percentages.

Survey Question Seven: In my opinion, cell phones could be used in high school by teachers to provide feedback to students, reported a mean of 4.1. Figure 18 shows 66.5% of some form of agreement. The majority of participants thought teachers could provide feedback to students using cell phones.

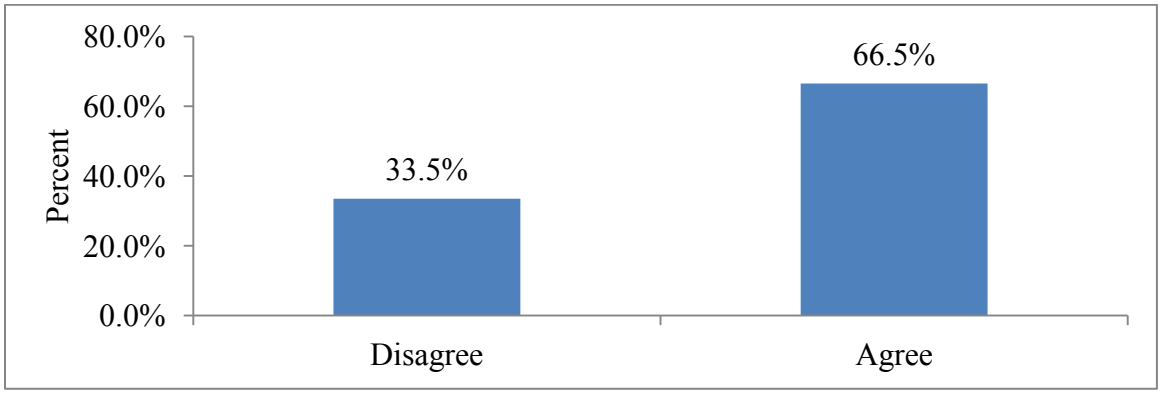

Figure 18. Question Seven: Percentage of Agreement and Disagreement.

Figure 19 shows a further breakdown of the overall scale of response percentages for question seven. The largest percentage, with one fourth of the responses (25.1%), was reported in the agree category and the smallest percentage of responses (6.2%) was within the strongly disagree category.

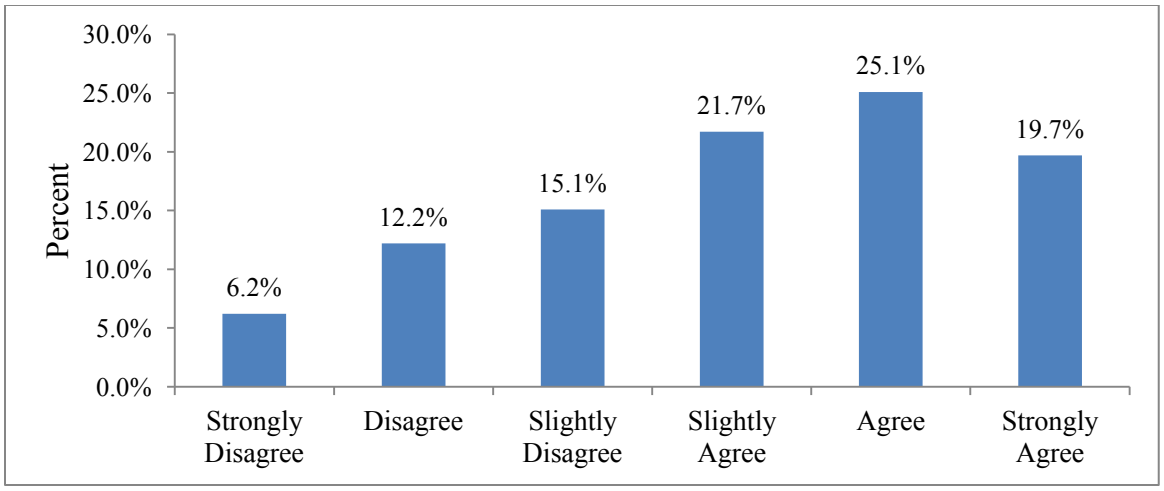

Figure 19. Question Seven: Overall Scale of Response Percentages.

Survey Question Eight: In my opinion, cell phones could be used by students in high school classrooms to compete in an educational activity, reported a mean of 4.2. Figure 20 shows 70.2% of some form of agreement.

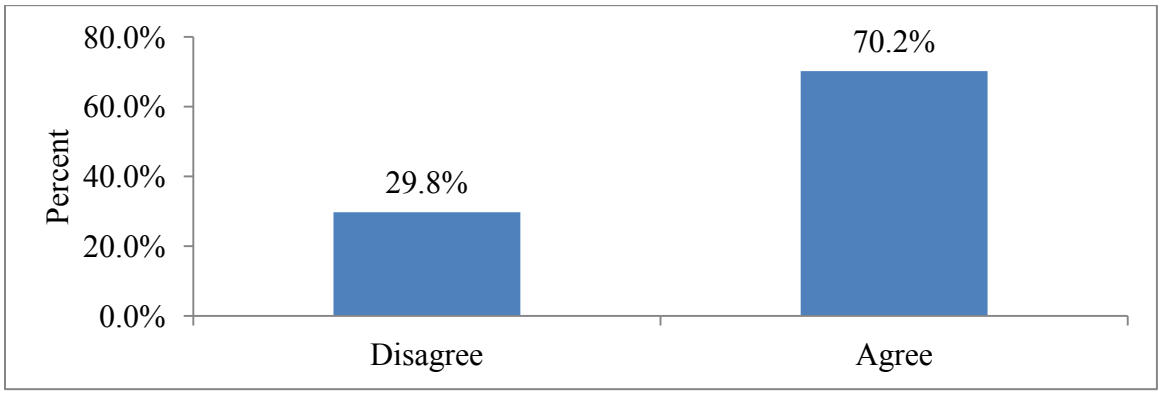

Figure 20. Question Eight: Percentage of Agreement and Disagreement.

Figure 21 shows a further breakdown of the overall scale of response percentages for question eight, with the top responses by participants occurring in the agree (26.3%), slightly agree (22.8%), and strongly agree (21.3%) categories.

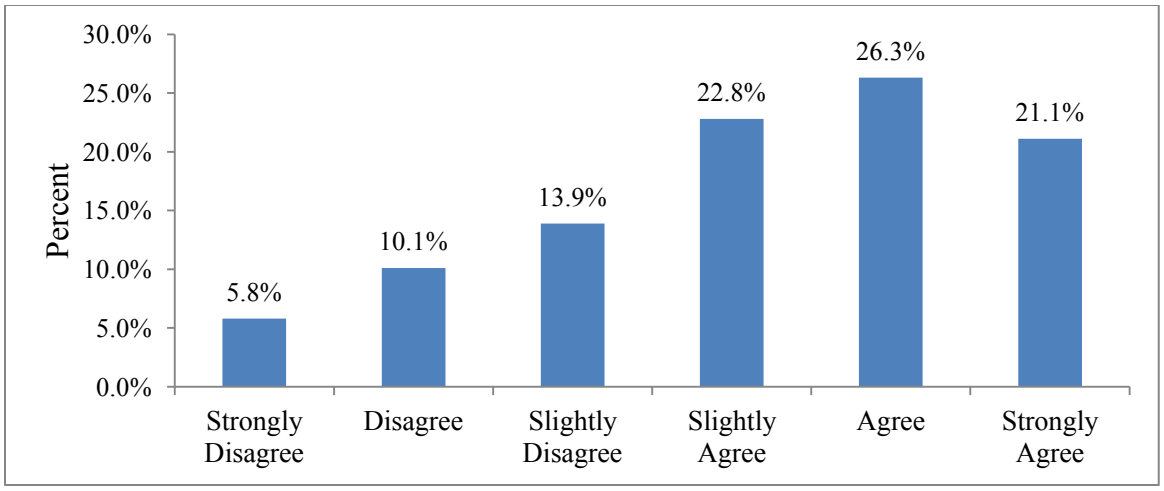

Figure 21. Question Eight: Overall Scale of Response Percentages.

Survey Question Nine: In my opinion, cell phones could be used in high school by students to obtain homework assistance from peers, reported a mean of 4.5. Figure 22 shows 80.5% of some form of agreement and a much smaller percentage of some form of disagreement (19.5%).

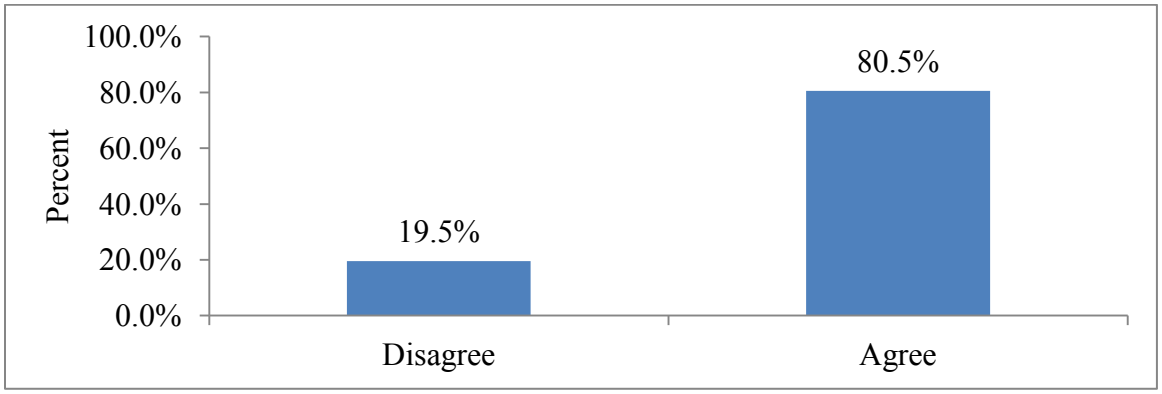

Figure 22. Question Nine: Percentage of Agreement and Disagreement.

Figure 23 shows a further breakdown of the overall scale of response percentages with over three-fourths of the recorded participant responses occurring within some form of agreement. Approximately one third (32.9%) of participants responded within the category of agree.

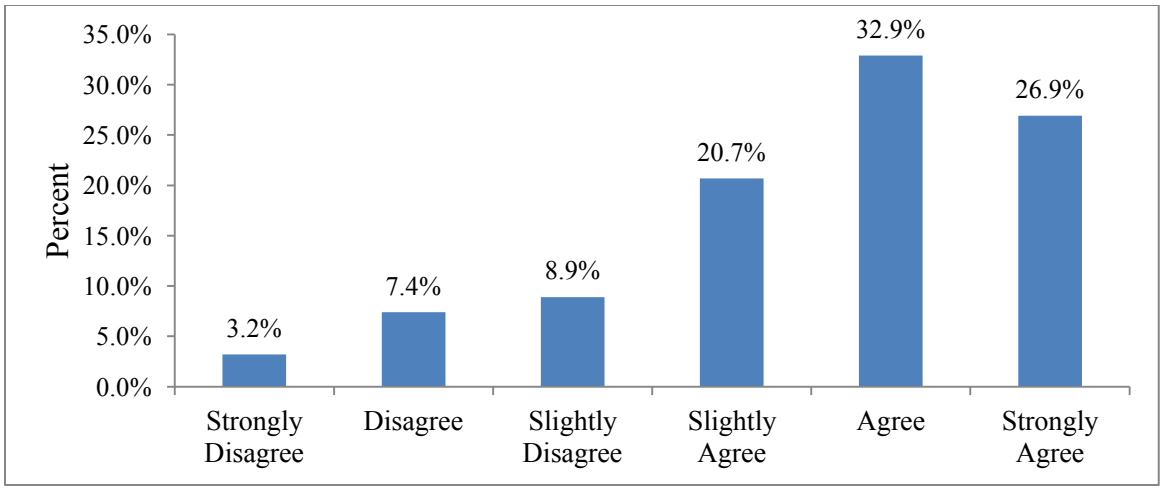

Figure 23. Question Nine: Overall Scale of Response Percentages.

Survey Question Ten: I think that cell phones could be used in high school by students to submit assignments to teachers, reported a mean of 4.2. Figure 24 shows 71.4% of some form of agreement.

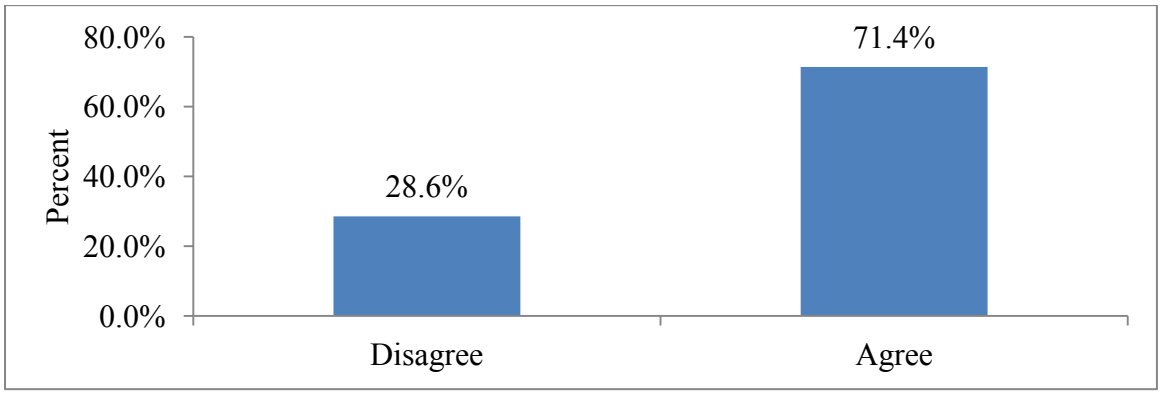

Figure 24. Question Ten: Percentage of Agreement and Disagreement.

Figure 25 shows a further breakdown of the overall scale of response percentages. Slightly over one-fourth (28.6%) of participants recorded responses within some form of disagreement. Close to three-fourths (71.4%) of participants recorded responses within some form of agreement, with over one-forth (27.9%) of those occurring within the category of agree.

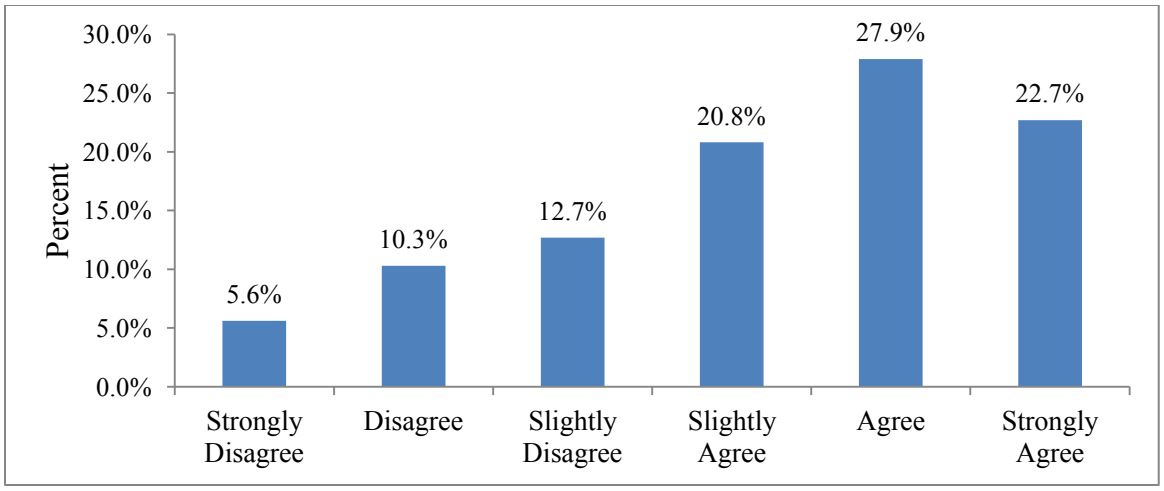

Figure 25. Question Ten: Overall Scale of Response Percentages.

Survey Question Eleven: In my opinion, cell phones could be used in high school by students to collaborate with other students on class projects, reported a mean of 4.7. Figure 26 shows 84.2% of some form of agreement.

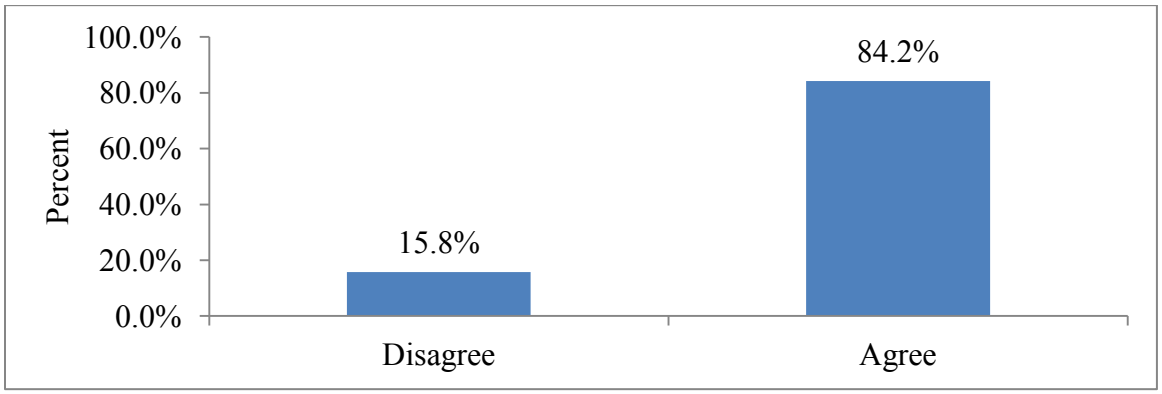

Figure 26. Question Eleven: Percentage of Agreement and Disagreement.

Figure 27 shows a further breakdown of the overall scale of response percentages. Over one-third of the total participant responses occurred within the agree range.

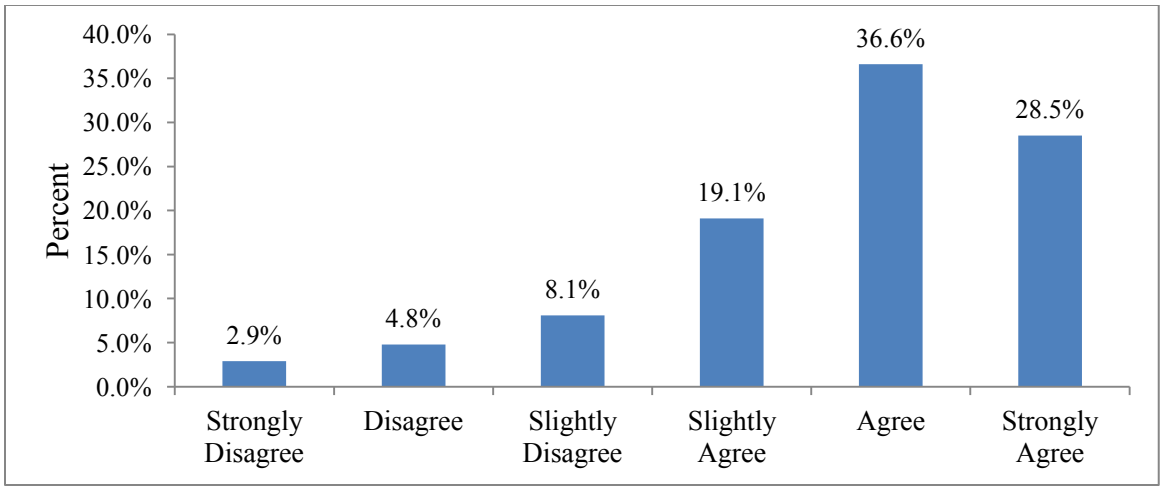

Figure 27. Question Eleven: Overall Scale of Response Percentages.

Survey Question Twelve: In my opinion, cell phones could be used in high school by students to seek teacher assistance on assignments, reported a mean of 4.3. Figure 28 shows 75.0% of some form of agreement.

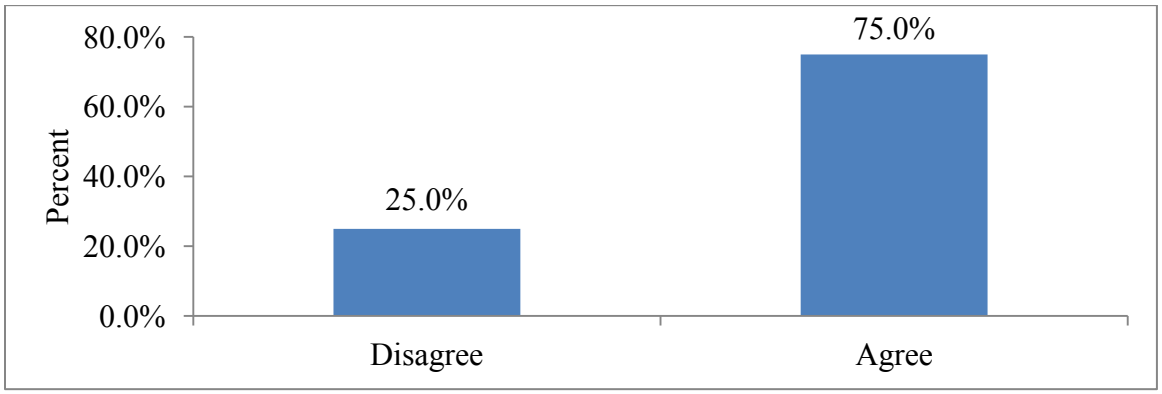

Figure 28. Question Twelve: Percentage of Agreement and Disagreement.

Figure 29 shows a further breakdown of the overall scale of response percentages. Three-fourths of participant responses occurred within the range of some form of agreement, with agree reporting 29.3%, strongly agree 23.2%, and slightly agree 22.5% of overall responses.

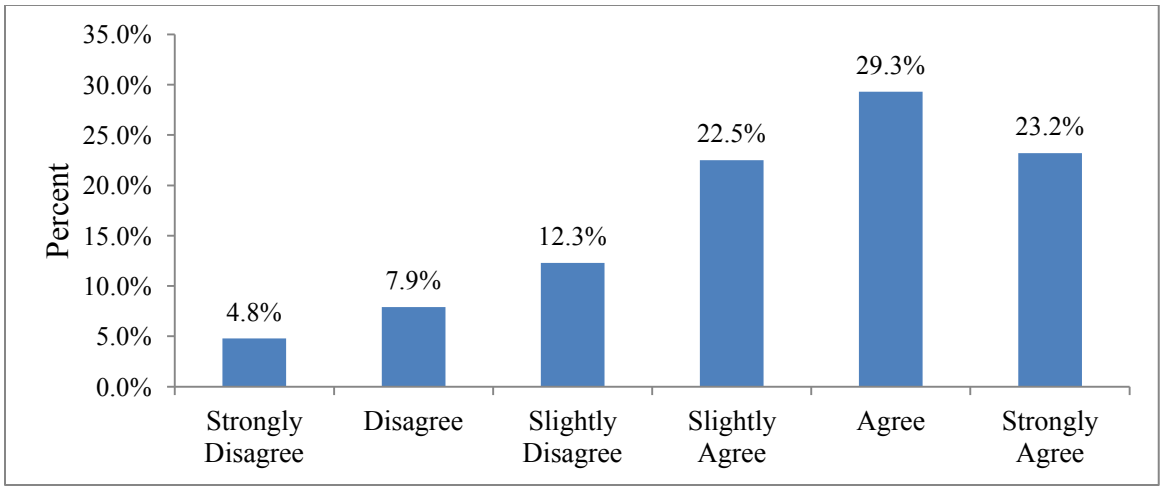

Figure 29. Question Twelve: Overall Scale of Response Percentages.

Survey Question Thirteen: I feel my parents would approve of cell phone use within high school classes for learning, reported a mean of 4.4. Figure 30 shows approximately three-fourths (74.2%) of some form of agreement.

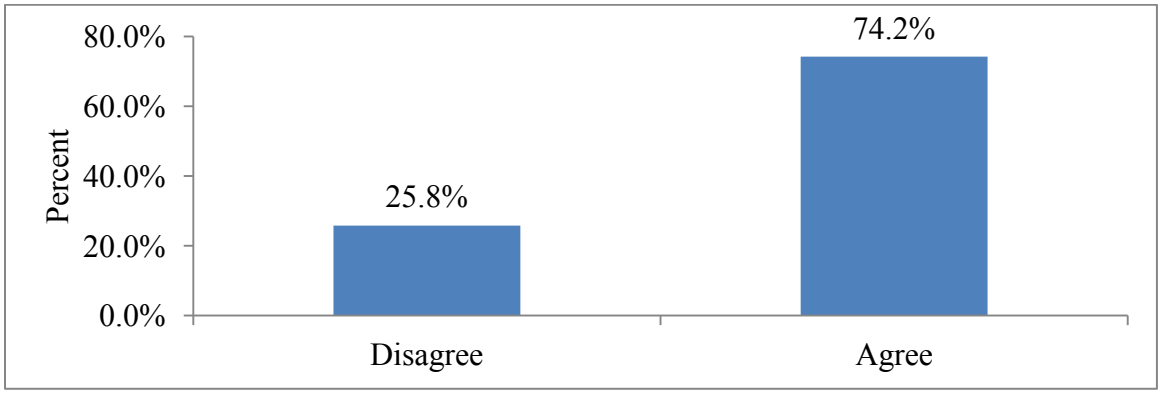

Figure 30. Question Thirteen: Percentage of Agreement and Disagreement.

Figure 31 shows a further breakdown of the overall scale of response percentages. The scale of agree reported the highest percentage of responses with 29.5%.

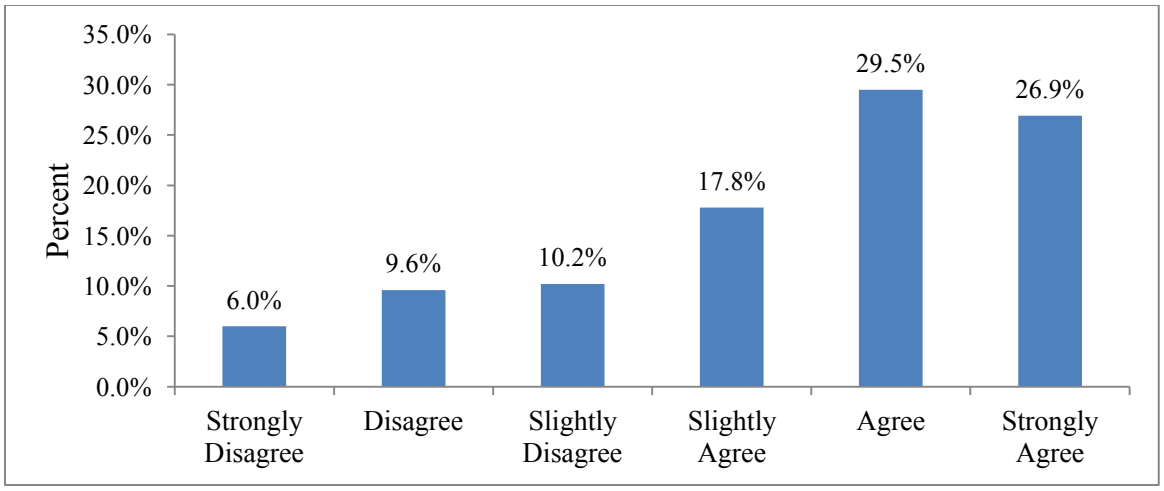

Figure 31. Question Thirteen: Overall Scale of Response Percentages.

Survey Question Fourteen: In my opinion, I believe my classmates would be in favor of using cell phones in the classroom as a learning tool, reported a mean of 5.1. This particular question reported the highest mean and the largest percentage of some form of agreement than any other survey question. Figure 32 shows 91.6% of some form of agreement.

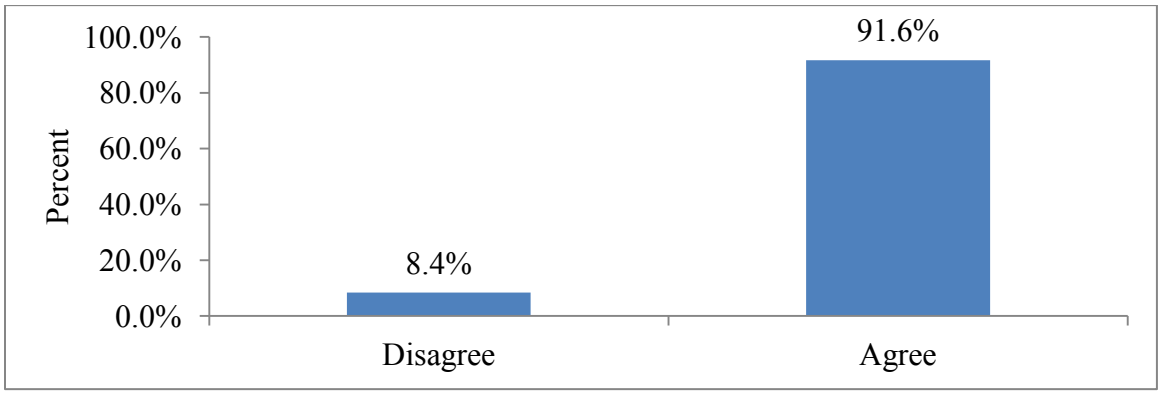

Figure 32. Question Fourteen: Percentage of Agreement and Disagreement.

Figure 33 shows a further breakdown of the overall scale of response percentages with the category of strongly agree reporting close to one-half of all participant responses.

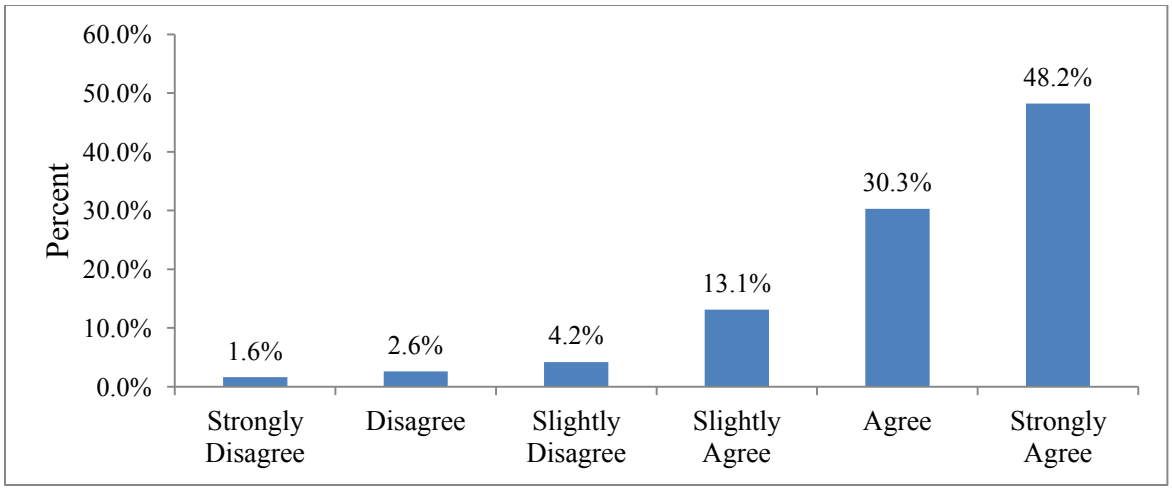

Figure 33. Question Fourteen: Overall Scale of Response Percentages.

Survey Question Fifteen: I feel high school teachers would favor the use of cell phones in class when used as a tool for learning, reported a mean of 3.8. Figure 34 shows 58.5% of some form of agreement.

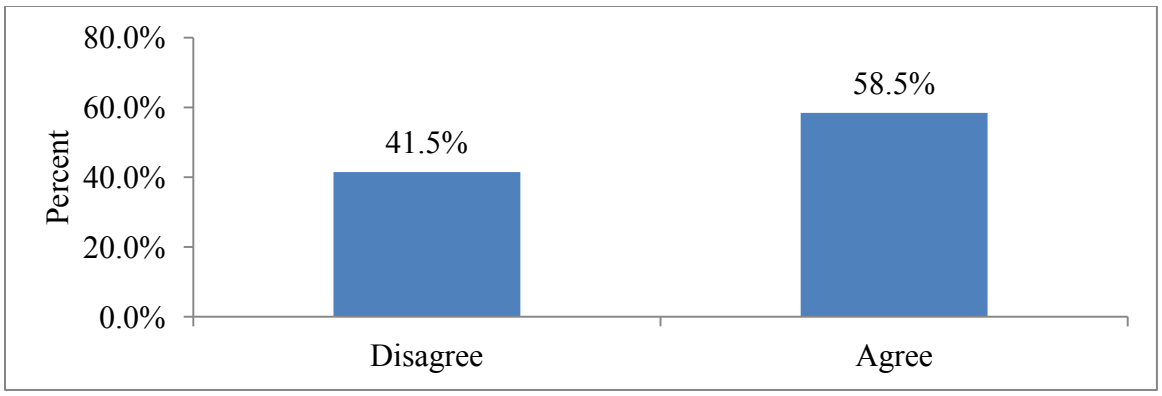

Figure 34. Question Fifteen: Percentage of Agreement and Disagreement.

Figure 35 shows a further breakdown of the overall scale of response percentages. The response scale shows a steady increase in responses from strongly agree through agree with a slight decrease of responses recorded within the strongly agree category.

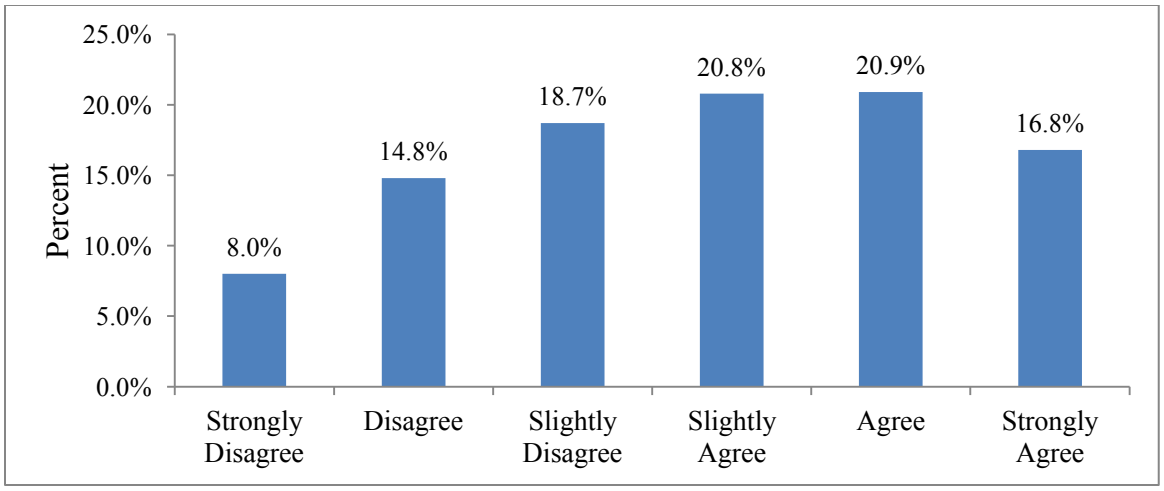

Figure 35. Question Fifteen: Overall Scale of Response Percentages.

Survey Question Sixteen: I think school administrators would support the use of cell phones within the classroom when used for learning, reported a mean of 3.4. This question reported the lowest mean and the highest percentage of some form of disagreement of all the survey questions. Figure 36 shows 52.6% of some form of disagreement.

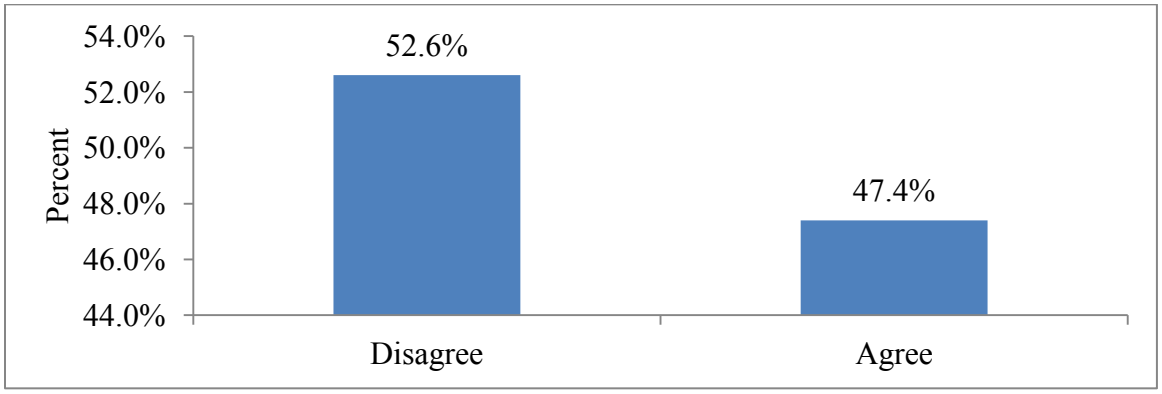

Figure 36. Question Sixteen: Percentage of Agreement and Disagreement.

Figure 37 shows a further breakdown of the overall scale of response percentages with over one-half of participants recording responses within the categories of some form of disagreement.

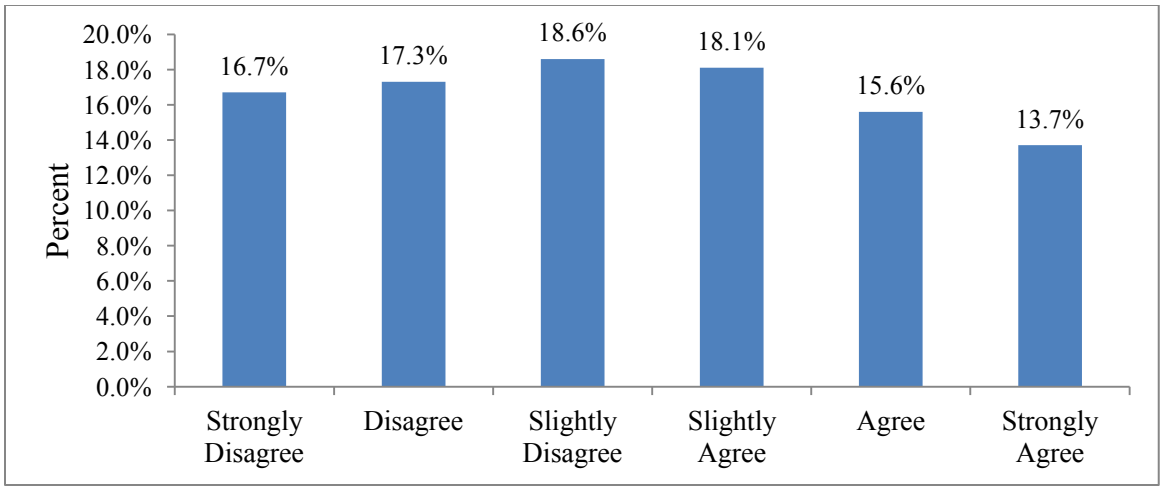

Figure 37. Question Sixteen: Overall Scale of Response Percentages.

Component Analysis

Exploratory Factor Analysis

An exploratory factor analysis was conducted to determine if any underlying structure existed for measures on the 16-item survey questions. Four criteria were used to determine the appropriate number of components to retain: eigenvalue, variance, scree plot, and residuals. The principal axis method was used to extract components, followed by a varimax (orthogonal) rotation. Three components were retained following rotation, questions one, two, three, and four were loaded into component one, accounting for 12.27% of the variance, questions five through fourteen comprised the second component, accounting for 37.09%, and questions fifteen and sixteen comprised the third component accounting for 14.12%. See Table 4.

Cronbach's Alpha and Gender Comparison

The original four components were retained and further analyzed for reliability. Cronbach's alpha was used to assess the internal consistency reliability of each

Table 4. Component Loadings.

	Loading
Component 1	
Q1	.731
Q2	.777
Q3	.320
Q4	.770
Component 2	
Q5	.717
Q6	.694
Q7	.746
Q8	*.781*
Q9	.799
Q10	.774
Q11	.828
Q12	.796
Q13	.605
Q14	.664
Component 3	
Q15	.828
Q16	.867

constructs' scores to obtain a summated scale score. Independent samples *t* tests were used to compare groups.

Questions one, two, three, and four comprising the cell phone policy construct were averaged as a measure of internal consistency and a test of reliability. The Cronbach's alpha for these questions was .59. A further analysis was conducted by reverse coding question three and averaging questions one, two, four, and reverse coded question three resulting in a Cronbach's alpha of .51. It was determined that the responses in question three were unreliable and the question was removed from the construct. Cronbach's alpha with question three excluded resulted in a higher reliability value of .70. The mean for all participants was 4.0; in addition, the mean for males was 3.9 (*sd* = 1.12) and the mean for females was 4.1 (*sd* = 1.12). The mean difference between males and females was - 0.2. An independent samples *t* test (two-tailed) comparing the mean scores of the male and female participants found a significant difference between the means of the two groups $t\ (792) = -\ 2.991$, $p < .05$.

To analyze the construct two, perception as a learning tool, questions five, six, seven, and eight were averaged. The Cronbach's alpha for these questions was .91. The mean for all participants was 4.2; in addition, the mean for males was 4.3 (*sd* = 1.26) and the mean for females was 4.1 (*sd* = 1.30). The mean difference between males and females was 0.2. An independent samples *t* test (two-tailed) comparing the mean scores of the male and female participants found a significant difference between the means of the two groups $t(792) = 2.204$, $p < .05$.

To analyze construct three, student initiated use, questions nine, ten, eleven, and twelve were averaged. The Cronbach's alpha for these questions was .88. The mean for

all participants was 4.4; in addition, the mean for males was 4.5 (*sd* = 1.15) and the mean for females was 4.3 (*sd* = 1.21). The mean difference between males and females was 0.2. An independent samples *t* test (two-tailed) comparing the mean scores of the male and female participants found a significant difference between the means of the two groups $t(790) = 2.389$, $p < .05$.

To analyze construct four, other peoples' views, questions thirteen, fourteen, fifteen, and sixteen were averaged. The Cronbach's alpha for these questions was .79. The mean for all participants was 4.2; in addition, the mean for males was 4.3 (*sd* = 1.14) and the mean for females was 4.1 (*sd* = 1.16). The mean difference between males and females was 0.2. An independent samples *t* test (two-tailed) comparing the mean scores of the male and female participants found a significant difference between the means of the two groups $t(791) = 2.768$, $p < .05$.

Females indicated slightly more agreement than males on the first construct in regard to their perception of current cell phone policy. Males indicated slightly more agreement on each of the remaining three constructs: perception as learning tools, perception of student initiated use, and perception of other peoples' views. All four constructs indicated a mean response in the range between agree or slightly agree. The third construct consisting of perception of student initiated cell phone use as a learning tool indicated the highest satisfaction levels with mean responses for both males and females at or above 4.3, indicating the degree of agreement as being closer to the slightly agree range. A plot of gender means is shown in Figure 38.

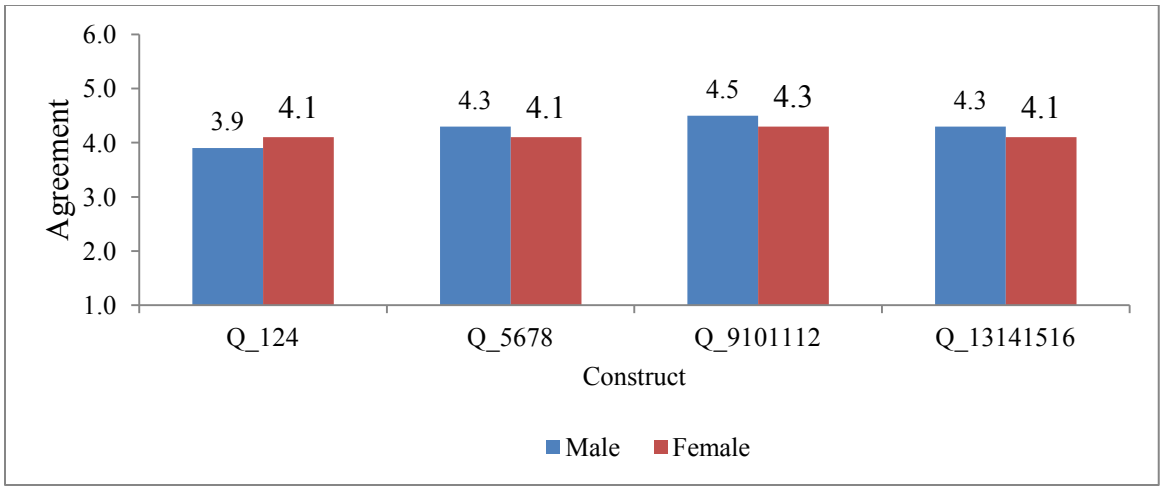

Figure 38. Mean Gender Satisfaction.

Table 5 shows the statistical comparisons between male and female perceptions per construct with each reporting an approximate effect size *d* of $\pm$ .2, indicating the strength of the relationship.

Type of Cell Phone Ownership Comparison

An independent samples *t* test (two-tailed) with the Levene test for equal variances was conducted to compare participants who owned smart phones with participants who owned another type of cell phone not categorized as a smart phone. Table 6 shows the comparison of mean scores of the participants who possessed a smart phone with those who possessed another type of cell phone within each of the four constructs. Mean differences were found to be statistically significant in each construct: perception of school policy, perception of teacher initiated learning tool, perception of student initiated learning tool, and perception of other peoples' views of cell phones used as a learning tool.

Table 5. Comparison of Male and Female Perceptions Per Construct.

Variable	n	M	SD	*t*	*df*	*p*	*d*
Construct One: Perception of School Policy				-2.99	792	.003	-.2
Males	407	3.9	1.17				
Females	387	4.1	1.12				
Construct Two: Perception of Teacher Initiated Tool				2.20	792	.028	.2
Males	407	4.3	1.26				
Females	387	4.1	1.30				
Construct Three: Perception of Student Initiated Tool				2.39	790	.017	.2
Males	405	4.5	1.15				
Females	387	4.3	1.21				
Construct Four: Perception of Other Peoples' Views				2.77	791	.006	.2
Males	406	4.3	1.14				
Females	387	4.1	1.16				

Within the construct of school policy, smart phone owners reported a mean of 3.8 and owners of a cell phone not categorized as a smart phone reported a higher mean response of 4.2. The mean difference between smart phone owners and owners of another type of cell phone was -.4. This was found to be statistically significant, t (670.6) = -3.971, $p < .05$.

Analysis of the construct of perception of teacher initiated use of cell phones for learning produced a mean difference of .6. Smart phone owners reported a mean of 4.5

Table 6. Comparison of Smart Phone and Other Cell Phone Possession.

Variable	n	M	SD	*t*	*df*	*p*	*d*
Construct One: Perception of School Policy				-3.97[a]	670.6[a]	.000	-.3
Possess a Smart Phone	487	3.8	1.19				
Possess Other Type Cell Phone	287	4.2	1.03				
Construct Two: Perception of Teacher Initiated Tool				6.07[a]	535.8[a]	.000	.5
Possess a Smart Phone	487	4.5	1.17				
Possess Other Type Cell Phone	287	3.9	1.35				
Construct Three: Perception of Student Initiated Tool				5.35[a]	536.5[a]	.000	.4
Possess a Smart Phone	486	4.6	1.09				
Possess Other Type Cell Phone	286	4.2	1.24				
Construct Four: Perception of Other Peoples' Views				5.27	771	.000	.4
Possess a Smart Phone	487	4.3	1.09				
Possess Other Type Phone	286	3.9	1.18				

[a]The *t* and *df* were adjusted because variances were not equal.

and owners of cell phones other than smart phones reported a mean of 3.9. This was found to be statistically significant, t (535.8) = 6.07, $p < .05$.

The mean for smart phone owners within the third construct, perception of student initiated cell phone use, was 4.6, as compared to owners of cell phones other than cell phones with a mean of 4.2. The mean difference was .4. This was found to be statistically significant, t (536.5) = 5.35, $p < .05$.

The fourth construct, perception of other peoples' views, reported the mean of smart phone owners as 4.3 and the mean of owners of cell phones other than smart phones as 3.9, for a mean difference of .4. This was found to be statistically significant, t (771) = 5.27, $p < .05$. Figure 39 shows the plot of mean comparisons for cell phone owners and owners of cell phones other than smart phones by construct.

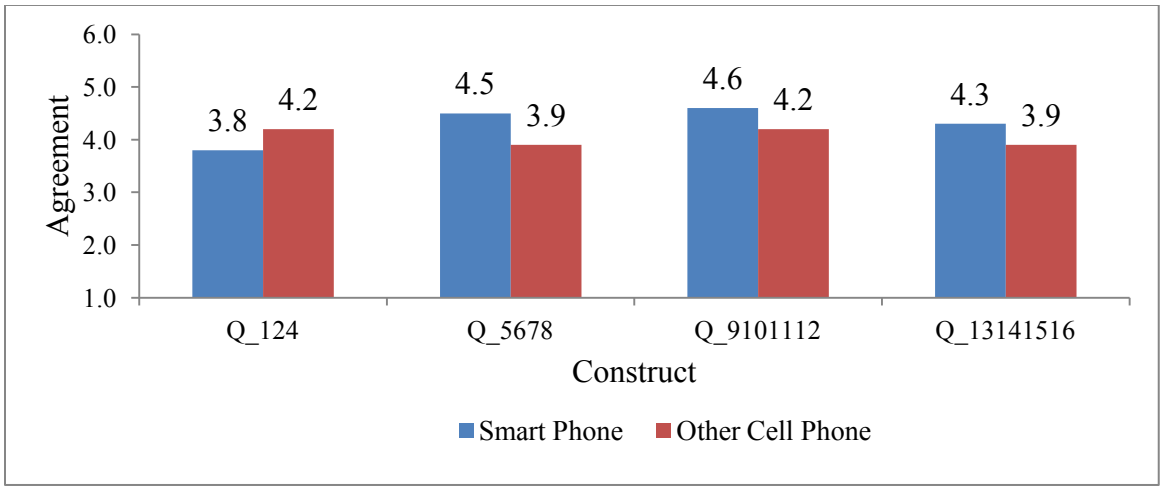

Figure 39. Smart Phone and Other Cell Phone Ownership Mean Satisfaction.

Academic Standing Comparison

An independent samples t test (two-tailed) with the Levene test for equal variances was conducted to compare academic standing junior participants with academic standing senior participants. Table 7 shows the comparison of mean scores of academic standing junior and academic standing senior participants.

Construct One: Perception of School Policy reported the mean for juniors as 3.9 and seniors 4.0, with a mean difference of - .1. This was found not to be statistically significant, t (791) = -.57, $p > .05$.

Table 7. Comparison of Junior and Senior Participants.

Variable	N	M	SD	*t*	*df*	*p*	*d*
Construct One: Perception of School Policy				-.57	791	.568	-.04
Juniors	424	3.9	1.11				
Seniors	369	4.0	1.20				
Construct Two: Perception of Teacher Initiated Use as a Learning Tool				1.22	791	.222	.09
Juniors	424	4.3	1.27				
Seniors	369	4.2	1.29				
Construct Three: Perception of Student Initiated Use as a Learning Tool				1.16	789	.247	.08
Juniors	423	4.5	1.17				
Seniors	368	4.4	1.20				
Construct Four: Perception of Other Peoples' Views of Use as a Learning Tool				2.02	790	.043	.14
Juniors	423	4.2	1.17				
Seniors	369	4.1	1.13				

Construct Two: Perception of Teacher Initiated Use as a Learning Tool reported a mean for juniors as 4.3 and seniors 4.2, with a mean difference of .1. This was found to not be statistically significant, t (791) = 1.22, $p > .05$.

Construct Three: Perception of Student Initiated Use as a Learning Tool reported a mean for juniors as 4.5 and seniors 4.4, with a mean difference of .1. This was found to not be statistically significant, t (789) = 1.16, $p > .05$.

Construct Four: Perception of Other Peoples' Views of Use as a Learning Tool reported a mean for juniors as 4.2 and seniors 4.1, with a mean difference of .1. This was found to be statistically significant, t (790) = 2.02, $p < .05$. The effect size, d, was approximately .14.

All means had a higher percentage of some form of agreement than some form of disagreement with the lowest mean occurring with juniors within the perception of school policy construct with a mean of 3.9. The highest percentage of some form of agreement also occurred with juniors within the perception of teacher initiated use as a learning tool construct with a mean of 4.5. Figure 40 shows a plot of comparisons for participants of junior and senior academic standing by construct.

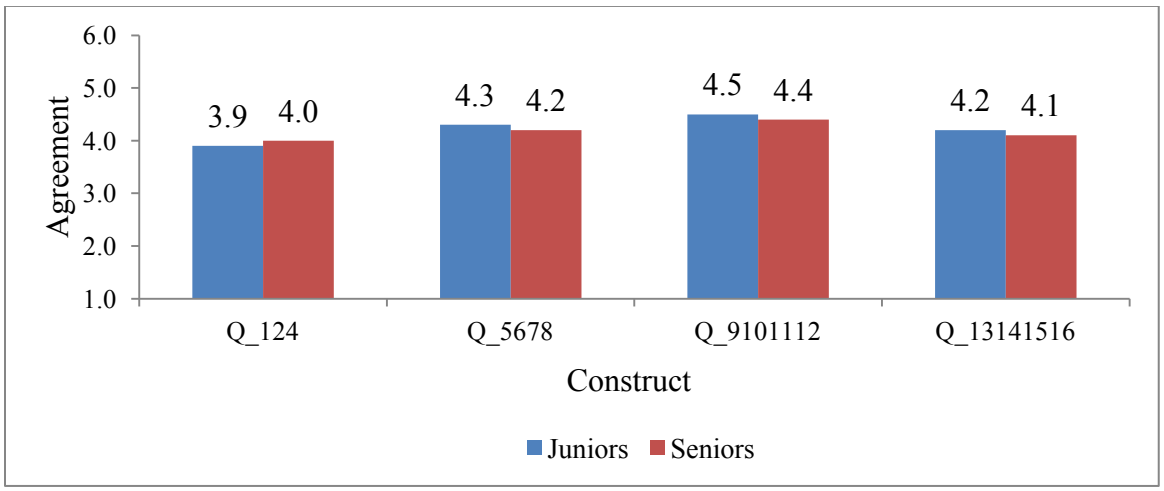

Figure 40. Mean Academic Standing Satisfaction.

Analysis of Variance

A one-way analysis of variance (ANOVA), also called a univariate analysis of variance or a single factor analysis was conducted to evaluate the significance of mean differences on the dependent variable between two or more groups. In this case, mean differences in responses to the survey question constructs were examined between

schools and also between future educational goals. In addition, a Bonferroni post hoc test was conducted as a follow-up test with each analysis of variance to test for pairwise comparisons. The Bonferroni post hoc test is reported to be valid for equal and unequal sample sizes and modifies the significance level to account for more than one comparison (Bryman & Cramer, 1999).

A two-way analysis of variance was conducted to determine relationships and differences between the variables of cell phone ownership (possess a smart phone and possess another type of cell phone) and gender (male and female). A second two-way analysis of variance was conducted between gender (male and female) and academic standing (junior and senior).

School Comparison

An analysis of variance was conducted to determine if there was a significant difference in means between the three high schools within each of the four constructs: perception of school policy, perception of teacher initiated tool for learning, perception of student initiated tool for learning, and perception of others' views of cell phones used in school for learning. A summary of means and standard deviations are presented in Table 8.

Table 8 shows the mean for the construct of policy for Central High School was 3.54, Community High School was 4.28, and Red River High School was 4.26. Bonferroni post hoc test indicated that a statistical difference was found between Central High School and Community High School and between Central High School and Red River High School within the construct on perception of current high school policy, $F\,(2, 791) = 41.73$, $p < .05$. The mean difference between Central High School and

Table 8. Means and Standard Deviations Comparing Three High Schools.

	Policy			Teacher Initiated			Student Initiated			Others' Views		
School	N	M	SD	n	M	SD	n	M	SD	n	M	SD
Central HS	322	3.54	1.14	322	4.30	1.25	322	4.47	1.16	322	4.20	1.10
Community HS	37	4.28	.94	37	4.48	1.11	37	4.20	1.25	37	4.15	1.10
Red River HS	435	4.26	1.08	435	4.17	1.31	433	4.44	1.19	434	4.15	1.20
Total	794	3.97	1.15	794	4.24	1.28	792	4.44	1.18	793	4.17	1.15

Community High School was -.74. The mean difference between Central High School and Red River High School was -.72. No statistical significance was found between Community High School and Red River High School. No statistical significance was found within any of the other three constructs: teacher initiated use, F (2, 791) = 1.60, p =.203; student initiated use, F (2, 789) = .88, p = .416; and other peoples' views, F (2, 790) = .16, p = .854. The results are presented in Table 9.

Future Educational Goals

An analysis of variance was conducted to determine if there was a significant difference in means between responses to future educational goals within each of the four constructs: perception of school policy, perception of teacher initiated tool for learning, perception of student initiated tool for learning, and perception of others' views of cell phones used in school for learning. A summary of means and standard deviations are presented in Table 10.

No statistical differences were found within any of the four constructs when comparing future educational goals as indicated by survey participants' responses. The

Table 9. One-Way Analysis of Variance Summary Table Comparing Three High Schools on Perceptional Constructs.

Source	*df*	SS	*MS*	*F*	*p*
Policy					
Between Groups	2	99.34	49.67	41.73	.000
Within Groups	791	947.35	1.20		
Total	793	1046.69			
Teacher Initiated					
Between Groups	2	5.25	2.63	1.599	.203
Within Groups	791	1298.83	1.64		
Total	793	1304.08			
Student Initiated					
Between Groups	2	2.45	1.23	.879	.416
Within Groups	789	1101.58	1.40		
Total	791	1104.03			
Others' Views					
Between Groups	2	.42	.21	.158	.854
Within Groups	790	1052.67	1.33		
Total	792	1053.09			

construct results are as follows and are presented in Table 11: policy, F (4, 783) = 2.27, p = .061; teacher initiated use, F (4, 783) = 1.15, p = .331; student initiated use, F (4, 781) = .55, p = .701; and other peoples' views, F (4, 782) = .551, p = .698.

Table 10. Means and Standard Deviations Comparing Future Educational Goals.

	Policy			Teacher Initiated			Student Initiated			Others' Views		
Future Goals	N	M	SD	N	M	SD	n	M	SD	n	M	SD
High School Diploma	47	3.80	1.28	47	4.28	1.36	47	4.37	1.41	47	4.09	1.38
Associate Degree	112	3.76	1.19	112	4.42	1.12	112	4.53	1.13	112	4.30	1.16
Bachelor's Degree	365	3.95	1.09	365	4.25	1.27	364	4.47	1.14	364	4.18	1.08
Master's Degree	161	4.04	1.19	161	4.21	1.33	161	4.39	1.22	161	4.14	1.22
PhD or JD	103	4.18	1.33	103	4.05	1.36	102	4.33	1.25	103	4.09	1.19
Total	788	3.96	1.14	788	4.24	1.28	786	4.44	1.19	787	4.17	1.15

Two-Way Analysis of Variance

Gender and Type of Cell Phone Ownership

A two-way analysis of variance was conducted to determine the amount of interaction between gender (male and female) and cell phone ownership (smart phone or other type of cell phone). Table 12 shows there was not a statistical interaction between gender and type of cell phone ownership within any of the four constructs: perception of cell phone policy, F (1, 770) = .289, p = .591; teacher initiated use as a learning tool, F (1, 770) = 1.054, p = .305; student initiated use as a learning tool, F (1, 768) = 1.216, p = .270; or other peoples' views, F (1, 769) = .689, p = .404; of cell phones used in school as a learning tool.

Table 11. One-Way Analysis of Variance Summary Table Comparing Future Educational Goals on Perceptional Constructs.

Source	*df*	SS	*MS*	*F*	*p*
Policy					
Between Groups	4	11.77	2.94	2.265	.061
Within Groups	783	1017.18	1.30		
Total	787	1028.95			
Teacher Initiated					
Between Groups	4	7.59	1.90	1.151	.331
Within Groups	783	1289.75	1.65		
Total	787	1297.34			
Student Initiated					
Between Groups	4	3.08	.77	.548	.701
Within Groups	781	1099.27	1.41		
Total	785	1102.36			
Others' Views					
Between Groups	4	2.94	.74	.551	.698
Within Groups	782	1044.57	1.34		
Total	786	1047.51			

Gender and Academic Standing

A two-way analysis of variance was conducted to determine the amount of interaction between gender (male and female) and academic standing (junior or senior). Table 13 shows there was not a statistical interaction between gender and type of cell

Table 12. Perceptional Constructs as a Function of Gender and Type of Cell Phone Possession.

Variable and Source	*df*	*MS*	*F*	*P*
Policy				
Smart Phone	1	19.59	15.421*	.000
Gender	1	12.58	9.906*	.002
Smartph*Gender	1	.37	.289	.591
Error	770	1.27		
Teacher Initiated				
Smart Phone	1	61.30	40.235*	.000
Gender	1	7.52	4.938*	.027
Smartph*Gender	1	1.61	1.054	.305
Error	770	1.52		
Student Initiated				
Smart Phone	1	40.54	31.229*	.000
Gender	1	6.91	5.326*	.021
Smartph*Gender	1	1.58	1.216	.270
Error	768	1.30		
Others' Views				
Smart Phone	1	35.58	28.495*	.000
Gender	1	9.23	7.396*	.007
Smartph*Gender	1	.87	.698	.404
Error	769	1.25		

*$p < .05$

phone owned within any of the four constructs: perception of cell phone policy, F (1, 769) = .698, p = .404; teacher initiated use as a learning tool, F (1, 789) = .480, p = .488; student initiated use, F (1, 787) = .299, p = .585; or other peoples' views of cell phones used in school as a learning tool, F (1, 788) = .585, p = .444.

Table 13. Perceptional Constructs as a Function of Gender and Academic Standing.

Variable and Source	*df*	*MS*	*F*	*P*
Policy				
Gender	1	11.37	8.674*	.003
AcdStd	1	.37	9.906	.596
Gender*AcdStd	1	.09	.066	.798
Error	789	1.31		
Teacher Initiated				
Gender	1	8.16	4.981*	.026
AcdStd	1	2.42	1.474	.225
Gender*AcdStd	1	.79	.480	.488
Error	789	1.64		
Student Initiated				
Gender	1	8.06	5.799*	.016
AcdStd	1	1.82	1.308	.253
Gender*AcdStd	1	.42	.299	.585
Error	787	1.39		
Others' Views				
Gender	1	10.19	7.746*	.006
AcdStd	1	5.36	4.071*	.044
Gender*AcdStd	1	.77	.585	.444
Error	788	1.25		

*$p < .05$

CHAPTER V

DISCUSSION

Summary

The data for this research study was collected using a paper and pencil survey administered to a convenience sample of junior and senior academic standing students within three high schools in one upper Midwest school district. The purpose of the study was to determine type of student cell phone possession, cell phone application use, and to determine if there were differences in student perceptions of current school cell phone policy, teacher initiated use of cell phones as a learning tool, student initiated use of cell phones as a learning tool, and student perceptions of other peoples' views toward the use of cell phones in school as a learning tool. Differences were investigated in regard to gender, academic standing, school attended, type of cell phone possessed, and future educational goals.

Significant gender differences were reported in all four construct areas of perception: policy, teacher initiated use, student initiated use, and other peoples' views of cell phones used in school for learning. Females indicated slightly more agreement than males in regard to their perception of current cell phone policy. Males indicated slightly more agreement in regard to perception of teacher initiated use as learning tools, perception of student initiated use, and perception of other peoples' views.

A significant difference in means was reported between participants who owned a smart phone and participants who owned some other type of cell phone in regard to school policy. Participants who owned some other form of cell phone reported a higher mean than those owning a smart phone. Significant differences were reported between possessors of smart phones and possessors of other types of phones in the remaining three constructs: perception of teacher initiated use, perception of student initiated use, and perception of other peoples' views of cell phone used for learning with smart phone users reporting higher means than users of other types of cell phones.

A significant difference in academic standing was also reported in regard to students' perception of other peoples' views of the possible use of cell phones in schools for learning. Junior academic standing participants indicated slightly more agreement than did senior academic standing participants.

School comparison revealed significant differences within the perception of policy construct between Central High School and Community High School and also between Central High School and Red River High School. At the time of this study, differences occurred in each school's written cell phone policy. In September of 2011, Red River began allowing students to use their cell phones in the common lunchroom area throughout the school day. Both Central and Community High Schools only allowed cell phones to be used within the entrance to the school throughout normal school hours. The differences in cell phone usage policies in the three schools may have contributed to rendering question three as unreliable within construct one. Question three stated: I feel the consequences for improper use of my cell phone during school hours are fair, was

therefore removed from construct one. No statistical difference was found between Community High School and Red River High School within the policy construct.

Participants and Response Rate

The convenience sample of participants included 503 academic standing juniors and 489 academic standing seniors, of whom 407 were males and 387 were females. Total response rate was 83.4% or 794 out of a possible 952. Community High School's response rate (60.7%) was the lowest of the three schools with 37 out of 61 possible participants responding to the survey. This low response rate may have been due to the inclusion of sixteen students enrolled within the transitional program which is separate from Community High School. The district counts these students in enrollment numbers for Community High School. In reality they are a separate classification from traditional high school students and should have been excluded from available participant totals. A second possible explanation for the low response rate may have been due to the alternative nature of Community High School which allows students to work individually and at their own pace. Since this research study took place close to the end of the school year, some of the possible participants may have already completed their course work and were no longer attending classes.

Cell Phone Ownership and Application Use

The majority of participants owned some form of a cell phone and only 3% (20) reported no possession of a cell phone. Of the 774 cell phone owners, 487 owned a smart phone and 287 owned some other form of a cell phone.

Research question one: What mobile cell phone technologies were students using?

The top cell phone applications reported by participants were calling and texting followed by photos, clock, alarm clock, calendar, calculator, light, music, games, weather, social media, and e-mail. With the number of participants reporting application usage, more participants owned a smart phone than were reported. A definition of a smart phone listed on the survey would have provided additional information necessary for participants to choose the appropriate category of cell phone ownership.

Survey Questions

The majority of the sixteen survey questions reported a higher average percentage of some form of agreement. Question fourteen: In my opinion, I believe my classmates would be in favor of using cell phones in the classroom as a learning tool, reported the highest average of some form of agreement with a mean of 5.1. Questions one and eleven both reported a mean of 4.7. Question one was in regard to perception of student's high school current cell phone usage policy and question eleven was in regard to the perception of student initiated cell phone use to collaborate with other students on class projects.

When asked if participants thought administrators would support the use of cell phones in the classroom when used for learning, they responded to question sixteen with the lowest mean (3.4) and the highest percentage of some form of disagreement. Most administrators are seen by students as enforcers of school policy. The second lowest mean (3.5) was in response to question four: I feel the consequences for improper use of my cell phone during school hours are fair. All schools reported detention as the first offense to violating the school cell phone policy. The second offense required detention and a phone call home to the offender's parents; in addition, the third offense required the

student's parent to come to the school to retrieve the cell phone. Perhaps many students may feel a policy to be somewhat unfair any time a parent needs to become involved in school discipline issues.

Constructs With Statistical Significance and Research Questions

Four constructs comprising four questions each were as follows: perception of current high school cell phone usage policy, perception of teacher initiated use of cell phones for learning, perception of student initiated use of cell phones for learning, and perception of other peoples' views of cell phones used in the classroom as a tool for learning. The four constructs retained the original four questions with the exception of construct one, perception of current high school cell phone usage policy. Question three was excluded from the construct due to unreliable responses. As stated above, the difference in school policies may have contributed to the variety of responses in regard to the perception of school cell phone policy enforcement within each of the participant's schools.

With question three removed from construct one, Cronbach's alpha resulted in a value of .70. Cronbach's alpha for construct two, three, and four was reported as .91, .88, and .79, respectively. According to Morgan, Leech, Gloeckner, and Barrett (2004), Cronbach's alpha is a measure of reliability and in order to provide support for internal consistency an alpha score of .70 or greater is necessary. All four constructs reported an alpha of .70 or above.

Research Questions

Perceptions of School's Current Cell Phone Policy

Construct one comprised three questions relating to school policy. When comparing the differences in gender, females indicated slightly more agreement than males. The mean for males was 3.9 (*sd* = 1.12) and the mean for females was 4.1 (*sd* = 1.12). The mean difference between males and females was - 0.2. An independent samples *t* test (two-tailed) comparing the mean scores of the male and female participants found a significant difference between the means of the two groups t (792) = - 2.991, $p < .05$.

When comparing smart phone owners with owners of a cell phone not categorized as a smart phone, within the construct of school policy, smart phone owners reported a mean of 3.8 and owners of a cell phone not categorized as a smart phone reported a higher mean response of 4.2. The mean difference between smart phone owners and owners of another type of cell phone was -.4. This was found to be statistically significant, t (670.6) = -3.971, $p < .05$. Students are attached to their cell phones as a critical tool for communication, socialization, and as a definition of youth culture (Anderson, 2009; Sorrentino, 2009).

School comparison by means of an analysis of variance produced a significant difference in means between the three high schools. A Bonferroni post hoc test indicated that a statistical difference was found between Central High School and Community High School and between Central High School and Red River High School within the construct on perception of current high school policy, F (2, 791) = 41.73, $p < .05$. The mean difference between Central High School and Community High School was -.74.

The mean difference between Central High School and Red River High School was -. 72. No statistical significance was found between Community High School and Red River High School. Differences in school policies may account for the discrepancy in statistical significance or non-significance. Due to the fact that Central High School reported statistical differences between the other two schools, it suggests student perception of strict or consistent rule enforcement may be a contributing factor.

Perceptions of Cell Phones Used as Learning Tools Initiated by Teachers

Construct two, perception as a learning tool initiated by teachers, was comprised of questions five, six, seven, and eight. The mean for all participants was 4.2; in addition, the mean for males was 4.3 (sd = 1.26) and the mean for females was 4.1 (sd = 1.30). The mean difference between males and females was 0.2. An independent samples t test (two-tailed) comparing the mean scores of the male and female participants found a significant difference between the means of the two groups t (792) = 2.204, $p < .05$. This finding indicates that males were more in agreement with teacher initiated use of cell phones in the classroom for learning. Studies have indicated that males in general are more comfortable with the use of technology, receive greater encouragement to use technology, and have a more positive attitude toward its use (Mammes, 2004; Marshall, 2008).

When comparing participants who possessed a smart phone with those participants who possessed a cell phone not categorized as a smart phone, the analysis of the construct of perception of teacher initiated use of cell phones for learning produced a mean difference of .6. Smart phone owners reported a mean of 4.5 and owners of cell phones other than smart phones reported a mean of 3.9. This was found to be statistically

significant, t (535.8) = 6.07, $p < .05$. Those individuals who owned a smart phone were more in agreement and perceived that teachers could use cell phones within the classroom for learning. Smart phone users would be more likely to find more applicable uses for learning within the classroom due to the vast number and variety of available applications accessible for download.

Perceptions of Cell Phones Used as Learning Tools Initiated by Students

Construct three contained questions nine, ten, eleven, and twelve regarding the perception of cell phones as learning tools when initiated by students. The mean for all participants was 4.4; in addition, the mean for males was 4.5 (sd = 1.15) and the mean for females was 4.3 (sd = 1.21). The mean difference between males and females was 0.2. An independent samples t test (two-tailed) comparing the mean scores of the male and female participants found a significant difference between the means of the two groups t (790) = 2.389, $p < .05$. Once again, males tend to be more comfortable using technology and therefore may more favorably perceive its use in the classroom as a learning tool.

Statistical significance was found when comparing owners of smart phones with owners of cell phones categorized other than a smart phone. The mean for smart phone owners was 4.6, as compared to owners of cell phones categorized as other than smart phones with a mean of 4.2. The mean difference was .4. This was found to be statistically significant, t (536.5) = 5.35, $p < .05$. Smart phone owners may be more likely to find more opportunities to use their cell phones for learning.

Perceptions of Other Peoples' Views of Cell Phones Used as Learning Tools

To analyze construct four, other peoples' views, questions thirteen, fourteen, fifteen, and sixteen were averaged. The mean for all participants was 4.2; in addition, the

mean for males was 4.3 (*sd* = 1.14) and the mean for females was 4.1 (*sd* = 1.16). The mean difference between males and females was 0.2. An independent samples *t* test (two-tailed) comparing the mean scores of the male and female participants found a significant difference between the means of the two groups $t\ (791) = 2.768$, $p < .05$. Since males may be more comfortable using technology, they may perceive that others will also find technology use favorable.

An analysis of the questions pertaining to the perception of other peoples' views when comparing smart phone owners with owners of cell phones categorized other than a smart phone reported a mean difference of .4. The mean of smart phone owners was 4.3 and the mean of owners of cell phones other than smart phones was 3.9. This was found to be statistically significant, $t\ (771) = 5.27$, $p < .05$. As users of smart phones and applicable technology, the participants may feel that other people may view the use of technology for learning in a positive manner.

A comparison of academic standing junior participants with academic standing senior participants produced findings that were reported to be statistically significant, $t\ (790) = 2.02$, $p < .05$. The effect size, *d,* was approximately .14. The mean for juniors was 4.2 and seniors 4.1, with a mean difference of .1. Juniors' perceptions of other peoples' views of the use of cell phones as learning tools was reported to be slightly more in favor than the seniors' perceptions.

Perceptional Differences by Gender

Gender differences were found to be statistically significant and were addressed under previous construct headings above. Females were found to be more in agreement within construct one: policy, and males were found to be more in agreement in the

remaining three constructs: teacher initiated use, student initiated use, and other peoples' views of cell phones as learning tools.

Gender (male and female) and cell phone ownership (smart phone or other type of cell phone) were analyzed using a two-way analysis of variance (2 x 2) to determine the amount, if any, of interaction between the variables. Significant statistical interaction was not found between gender and type of cell phone possessed.

Gender (male and female) and academic standing (junior or senior) were also analyzed using a two-way analysis of variance (2 x 2) to determine the amount of interaction between variables. Significant statistical interaction was not found between gender and academic standing.

Future Educational Goals

An analysis of variance was conducted to determine if there was a significant difference in means between responses to future educational goals within each of the four constructs: perception of school policy, perception of teacher initiated tool for learning, perception of student initiated tool for learning, and perception of others' views of cell phones used in school for learning. No statistical differences were found within any of the four constructs when comparing future educational goals as indicated by survey participants' responses.

Limitations

Limitations of this research include three high schools located within the same school district and within the same upper Midwestern rural community. This study encompasses a homogenous group of individuals with an age range of high school academic standing junior and senior students and does not specifically include

perceptions of different ethnicities, nor does it show how culture affects perception of cell phone use as learning tools as studied in foreign countries. The results of the study represent the perceptions of American high school students possessing their own cell phones and do not shed any light on foreign students in foreign countries, where research on technology use in education is more abundant (Campbell, 2007).

Conclusions and Recommendations

Results of this study provided an understanding of how students view current school policy regarding cell phone use, how students use cell phones in their everyday lives, and their views regarding possible use of cell phones as learning tools within and outside of school classrooms. From this study it became clear that cell phones are an essential part of students' everyday lives. Cell phones allow students to be more socially connected and more engaged in learning (Bauer, 2012). Although gender differences exist, exposure to technology within the classroom may increase the level of comfort, confidence, and motivation to learn for all students.

As new technologies emerge or change, implications for further research also emerge. Research regarding perception of use is warranted. Many questions arise in regard to student perception, instructor perception, administrator perception, parent perception, institutional perception, and community perception, just to name a few of the technological and educational stakeholders. Also important to consider are the varying global perceptions regarding the use of cell phone technology and the reasons for the United States' overall lag in accepting cellular phones as a leading educational classroom tool in this technologically-dominated 21st century (Campbell, 2007).

Both male and female students need to be better prepared for the competitive global market and 21st century jobs that currently do not even exist. All learners need to be prepared for the workforce through the use of real world tools, critical thinking, cooperation, and collaboration. The learning that occurs inside the schools needs to be connected to what is occurring outside of the school. Using technology within the classroom will teach students how to investigate and find relevant and meaningful information and transfer learning rather than concentrating on recalling or reciting facts.

The cell phone that students carry to school every day has the potential and capability to transform education. The cell phone is a tool that could be used to increase motivation to learn if only students were allowed to take them out of hiding. Rather than banning the cell phone from classrooms students need to be trained to use them appropriately. Educators also need training to learn how to incorporate mobile cell phone technology as a learning tool within the classroom to enhance student centered learning and to use the tool for testing and assessment of student learning. By using tools that already are of interest to students within their instruction, educators may further motivate, promote, and actively engage student learning. Tools such as the cell phone that students are interested in and are already using may therefore arouse curiosity and increase a desire and initiative to learn.

"Study without desire spoils the memory, and it retains nothing that it takes in."

—Leonardo da Vinci

APPENDICES

Appendix A
Survey Instrument – Checklist and Questions

Student High School Cell Phone Usage Survey

Please take a moment to complete the survey below. Participation is completely voluntary. The purpose of this survey is to assess student opinions of cell phone usage in high school education. I greatly appreciate your time and willingness to participate.

1. Cell Phone Status

___ I have a cell phone
___ I do not have a cell phone (skip to # 4)

2. My Cell Phone is a Smart Phone

___ Yes
___ No

3. I Currently Use My Cell Phone for:

Check all that apply.

___ Calling
___ Texting
___ Photos
___ Videos
___ Internet Searches
___ Calculating
___ Calendar
___ Clock
___ Alarm Clock
___ Planner
___ Games
___ Light
___ Music
___ Radio
___ TV
___ Weather
___ GPS
___ Shopping
___ Social Media
___ Email
___ Reading
___ Banking
___ Video Chat
___ Google Docs
___ Stocks
___ School Work
___ Bar Code Scans
___ Car Starter
___ Other (please explain below)

4. Current Academic Standing

___ Junior
___ Senior

5. Gender

___ Male
___ Female

6. Current Age _____

7. Currently Enrolled

___ Central High School
___ Community High School
___ Red River High School

8. Future Plans Following High School Graduation:

Check all that apply.

___ Work Full-time
___ Attend a Two-year Technical School
___ Attend a Four-year Private Institution
___ Attend a Four-year State Institution

If you checked more than one, please explain:

9. Future Educational Goals:

___ High School Diploma
___ Associate Degree (2 yr)
___ Bachelor's Degree (4 yr)
___ Master's Degree (6 yr)
___ PhD or MD or JD (12 yr)

PLEASE TURN TO THE OTHER SIDE TO COMPLETE THE QUESTIONS

	Please rate each of the statements below by circling the appropriate option based on the following questions:	Strongly Disagree	Disagree	Slightly Disagree	Slightly Agree	Agree	Strongly Agree
1.	In my opinion, I understand my high school's current cell phone usage policy.	1	2	3	4	5	6
2.	I feel my high school's current cell phone usage policy is fair.	1	2	3	4	5	6
3.	In my high school, I feel the cell phone usage policy is enforced.	1	2	3	4	5	6
4.	I feel the consequences for improper use of my cell phone during school hours are fair.	1	2	3	4	5	6
5.	I think cell phones could be used in my high school classes as a tool for learning.	1	2	3	4	5	6
6.	I think cell phones could be used in high school by students to participate in surveys.	1	2	3	4	5	6
7.	In my opinion, cell phones could be used in high school by teachers to provide feedback to students.	1	2	3	4	5	6
8.	In my opinion, cell phones could be used by students in high school classrooms to compete in an educational activity.	1	2	3	4	5	6
9.	In my opinion, cell phones could be used in high school by students to obtain homework assistance from peers.	1	2	3	4	5	6
10.	I think that cell phones could be used in high school by students to submit assignments to teachers.	1	2	3	4	5	6
11.	In my opinion, cell phones could be used in high school by students to collaborate with other students on class projects.	1	2	3	4	5	6
12.	In my opinion, cell phones could be used in high school by students to seek teacher assistance on assignments.	1	2	3	4	5	6
13.	I feel my parents would approve of cell phone use within high school classes for learning.	1	2	3	4	5	6
14.	In my opinion, I believe my classmates would be in favor of using cell phones in the classroom as a learning tool.	1	2	3	4	5	6
15.	I feel high school teachers would favor the use of cell phones in class when used as a tool for learning.	1	2	3	4	5	6
16.	I think school administrators would support the use of cell phones within the classroom when used for learning.	1	2	3	4	5	6

Information regarding this research may be obtained by contacting mary.theden@my.und.edu

Appendix B
Institutional Review Board Approval to Conduct Research

UNIVERSITY OF UND NORTH DAKOTA

INSTITUTIONAL REVIEW BOARD
c/o RESEARCH DEVELOPMENT AND COMPLIANCE
DIVISION OF RESEARCH
TWAMLEY HALL ROOM 100
264 CENTENNIAL DRIVE STOP 7134
GRAND FORKS ND 58202-7134
(701) 777-4279
FAX (701) 777-6708
http://und.edu/research/research-economic-development/institutional-review-board/

April 17, 2012

Mary Beth Humble-Thaden
815 40th Avenue South G127
Grand Forks, ND 58201

Dear Ms. Humble-Thaden:

We are pleased to inform you that your project titled, "Tools for School: An Analysis of Student Perception and Fluency of Cell Phone Use for Learning" (IRB-201204-365) has been reviewed and approved by the University of North Dakota Institutional Review Board (IRB). The expiration date of this approval is April 15, 2013. Your project cannot continue beyond this date without an approved Research Project Review and Progress Report.

As principal investigator for a study involving human participants, you assume certain responsibilities to the University of North Dakota and the UND IRB. Specifically, an unanticipated problem or adverse event occurring in the course of the research project must be reported within 5 days to the IRB Chairperson or the IRB office by submitting an Unanticipated Problem/Adverse Event Form. Any changes to or departures from the Protocol or Consent Forms must receive IRB approval prior to being implemented (except where necessary to eliminate apparent immediate hazards to the subjects or others.)

All Full Board and Expedited proposals must be reviewed at least once a year. Approximately ten months from your initial review date, you will receive a letter stating that approval of your project is about to expire. If a complete Research Project Review and Progress Report is not received as scheduled, your project will be terminated, and you must stop all research procedures, recruitment, enrollment, interventions, data collection, and data analysis. The IRB will not accept future research projects from you until research is current. In order to avoid a discontinuation of IRB approval and possible suspension of your research, the Research Project Review and Progress Report must be returned to the IRB office at least six weeks before the expiration date listed above. If your research, including data analysis, is completed before the expiration date, you must submit a Research Project Termination form to the IRB office so your file can be closed. The required forms are available on the IRB website.

If you have any questions or concerns, please feel free to call me at (701) 777-4279 or e-mail michelle.bowles@research.und.edu.

Sincerely,

Michelle L. Bowles, M.P.A., CIP
IRB Coordinator

MLB/jle

Enclosures

REPORT OF ACTION: EXEMPT/EXPEDITED REVIEW

University of North Dakota Institutional Review Board

Date: 4/9/2012 **Project Number:** IRB-201204-365

Principal Investigator: Humble-Thaden, Mary Beth

Department: Teaching and Learning

Project Title: Tools for School: An Analysis of Student Perception and Fluency of Cell Phone Use for Learning

The above referenced project was reviewed by a designated member for the University's Institutional Review Board on April 16, 2012 and the following action was taken:

☑ Project approved. **Expedited Review** Category No. Seven (7)
Next scheduled review must be before: April 15, 2013

☐ **Copies of the attached consent form with the IRB approval stamp dated _____ must be used in obtaining consent for this study.**

☐ Project approved. **Exempt Review** Category No. _____
This approval is valid until _____ as long as approved procedures are followed. No periodic review scheduled unless so stated in the Remarks Section.

☐ **Copies of the attached consent form with the IRB approval stamp dated _____ must be used in obtaining consent for this study.**

☐ Minor modifications required. The required corrections/additions must be submitted to RDC for review and approval. **This study may NOT be started UNTIL final IRB approval has been received.**

☐ Project approval **deferred. This study may not be started until final IRB approval has been received.**
(See Remarks Section for further information.)

☐ Disapproved claim of exemption. This project requires Expedited or Full Board review. The Human Subjects Review Form must be filled out and submitted to the IRB for review.

☐ Proposed project is not human subject research and does not require IRB review.
☐ Not Research ☐ Not Human Subject

PLEASE NOTE: Requested revisions for student proposals MUST include adviser's signature. All revisions MUST be highlighted.

☒ Education Requirements Completed. (Project cannot be started until IRB education requirements are met.)

cc: Dr. Bonni Goumeau

Signature of Designated IRB Member
UND's Institutional Review Board

4/16/12
Date

If the proposed project (clinical medical) is to be part of a research activity funded by a Federal Agency, a special assurance statement or a completed 310 Form may be required. Contact RDC to obtain the required documents.

(Revised 10/2006)

Appendix C
Grand Forks Public Schools Policy 2130 on Conducting Research

Policy 2130

ADMINISTRATION

Research

Educational

The Grand Forks School Board recognizes that systematic study of instructional programs can be useful and beneficial. The Board, therefore, encourages well designed educational research projects within the district.

The Board, while recognizing the value of educational research, also wishes to protect students, parents, and staff from harassment; invasion of privacy; and physical, social, and educational injury. Consequently, the Board requires that all research proposals be screened by the Assistant Superintendent for Teaching and Learning in order to ensure that the proposed research has potential value for the district and is consistent with district philosophies, legal obligations, and standards of good scholarship.

Written approval must be provided to researchers before any project can begin. This policy applies to those research projects not sponsored by the district, as well as those initiated by the district.

Major research projects will not be approved for undergraduate work.

All educational research is conducted through the Assistant Superintendent of Teaching and Learning. Other district administrators or teachers will be asked to participate in screening or supervising projects when appropriate. School Board members will be informed about the nature of projects that have been approved.

Nothing in this policy prevents or discourages teachers and principals from conducting surveys or studies in an effort to analyze student performances or instructional materials. In addition, projects conducted by staff members for graduate study that are limited to the staff members' schools and involve only minor changes in the instructional program require permission of the building principal and the Assistant Superintendent of Teaching and Learning.

Request to Conduct Research

Researchers should secure copies of "Request to Conduct Educational Research" and "Guidelines for Proposals to Conduct Research in the Grand Forks Public Schools" from the Assistant Superintendent of Teaching and Learning. The proposal, the completed request form, and all materials to be used in the project should be submitted to the Assistant Superintendent of Teaching and Learning.

Review of Research Proposals

All research proposals will be reviewed by the Assistant Superintendent of Teaching and Learning for acceptability in the following areas:

1) Benefits to the district
2) Compatibility with the regular instructional program
3) Effect on student, parents, and staff
4) Technical adequacy

Following approval from the Assistant Superintendent of Teaching and Learning, principals will be contacted to determine whether they wish to participate. Four weeks should be allowed for the completion of the process.

Other Research

Requests for research projects that are not specifically education related shall be brought to the School Board for consideration. The School Board intends to limit approval of these types of research because of the priority placed on educational research

Conducting the Research Project

Approved research projects are regarded as contracts. Any deviation from procedures described in the application must be approved by the Assistant Superintendent of Teaching and Learning who originally approved the application. Unapproved procedural changes will be considered reason for termination of the project. All research activities must be completed by April 30. Research activities involving students will not be permitted during May and September.

Documentation

Copies of all project reports (dissertation, thesis, journal article or whatever) and a one-page summary of results must be submitted to the Assistant Superintendent of Teaching and Learning at the conclusion of the research project.

Dissemination

Results of research will be shared with the superintendent's cabinet and with appropriate leadership personnel. At the conclusion of each year, the Assistant Superintendent of Teaching and Learning will submit a summary of all research projects to the superintendent of schools and School Board.

Protection of Student Rights

Student anonymity must be assured in all research. Results that identify individual students must never be publicized and may be shared with teachers only after securing parental permission.

Researchers are required to notify parents by mail prior to the beginning of any approved research project if the project involves activities or testing not normally included in the school's regular instructional program. Parents have the option of excluding their child from the project. If letters of notification are required, all mailing costs will be borne by the researcher.

The Grand Forks School District will notify parents and students annually of their rights under the federal Family Educational Rights and Privacy Act (FERPA) and the Protection of Pupils Rights Amendment (PPRA). This notification will be through parent newsletters and student handbooks.

Policy Adopted: 05/25/76

Policy Amended: 11/22/94, 10/26/00, 11/15/01, 10/28/02, 3/26/07, 3/11/09

Appendix D
Request to Conduct Research

Request to Conduct Research in the Grand Forks Public Schools

Date: March 26, 2012	**Name:** Mary Beth (Betsy) Humble-Thaden	**Phone:** 746-2407 ext 615 (work) 775-3790 (home)
Fax or Email: betsy.thaden@gfschools.org or mary.thaden@my.und.edu **Address:** 815 40th Ave South G127, Grand Forks, ND 58201		**Research Advisor:** Dr. Bonni Gourneau (701)777-2920 **College or Dept.:** College of Education and Human Development Teaching and Learning
Research Title: Tools for School: An analysis of student perception and fluency of cell phone use for learning.		

Give a brief description of your research. Attach additional papers if necessary. Please attach sample copies of assessment instrument, tests, or communications to be used. The purpose of this study is to investigate junior and senior high school student perception of school cell phone policy, cell phone usage in high school as a possible educational learning tool, and to explore potential perceptual differences by gender. Gender differences in computer technology applications have been studied and documented. What needs to be determined is whether there is a difference in male and female student perception of cell phone usage in education and if student interest to use cell phones as educational learning tools within the classroom exists. Determining answers to these questions may uncover underlying factors that will need to be considered and addressed prior to any implementation of cell phones as learning tools within the high school classroom. Differences in gender perception may precipitate the need for pre-training before implementation can take place.

The study will use quantitative research methods by means of a pencil and paper survey. The survey will be administered to junior and senior students enrolled within the Grand Forks Public School District within Central High School, Community High School, and Red River High School during the second period classes. Second period courses have been chosen due to the determination that second period classes contain additional minutes used for daily announcements and would likely cause the least amount of disruption in academic instruction. Once permission has been granted in writing, the principal investigator will request the quantity of junior and senior students enrolled per second period course from the administrator within each of the three high schools. Manila envelopes will be prepared and distributed to each of the three high schools containing the appropriate number of surveys and instructions for completion.

Participants will self-report non-identifiable demographic information and using a six point Likert-type rating scale report perceptions regarding educational cell phone policy and usage. No student names will be identified or written on any of the forms. No compensation will be provided to participating students. The survey is strictly voluntary and should take approximately five minutes or less to complete. Second period teachers will instruct, distribute, and collect completed surveys to be placed within a sealable manila envelope and deliver to the high school office for pick-up by the principle investigator.

Number of students needed for research: Approximately 1000. All junior and senior students currently enrolled in second period courses in all three high schools.	**Number of teachers needed for research:** Second period instructors teaching junior and senior students in each high school.	**Grade Level or Dept.:** Junior and Senior High School Students enrolled at Central, Community, and Red River High Schools.
What schools are you interested in conducting the research in? Central High School, Community High School, Red River High School		
Will confidential records be required? (If yes, indicate type.) No confidential records will be accessed. No student identifiable information will be collected.		**Length of time required to complete the research:** Approximately five minutes of time will be needed by students to complete the paper survey.

To be completed by School District Official:

Approved: (circled) **Not Approved:**

Assistant Superintendent Signature: J Thompson **Date:** 4-2-12

Approved to conduct research in the following schools: Central, Community + Red River w/ principal permission

Send completed form to: Grand Forks Public Schools, Box 6000, Grand Forks, ND 58206-6000
Attn: Assistant Superintendent's Office

Appendix E
Letter of Permission to Conduct Research

Grand Forks Public Schools

A Great Place to Grow and Learn!

Mission Statement:
Grand Forks Public Schools will provide an environment of educational excellence that engages all learners to develop their maximum potential for community and global success.

Established 1879

Mark Sanford Education Center
PO Box 6000 (58208-6000)
2400 47th Avenue South (58201-3405)
Grand Forks, ND
www.gfschools.org

Jody Thompson
Assistant Superintendent of Teaching and Learning
Phone: 701.746.2205, Ext. 121
Fax: 701.772.7739
jody.thompson@gfschools.org

April 10, 2012

Institutional Review Board
Attn: Michelle Bowles, IRB Coordinator
Twamley Hall Room 106
264 Centennial Drive Stop 7134
Grand Forks, ND 58202-7134

Dear Ms. Bowles:

I, Jody Thompson, Assistant Superintendent of Teaching & Learning authorize M. Beth (Betsy) Humble-Thaden to conduct research within the Grand Forks Public Schools. I understand that the research consists of administering and collecting a two-sided paper and pencil survey on student perception of cell phone policy and cell phone use as a possible learning tool to junior and senior academic standing students during second period classes within my school. The survey should take approximately five minutes to complete.

I further understand that Ms. Thaden will be requesting the number of junior and senior students enrolled in each second period course, in order to prepare manila envelopes containing the appropriate number of surveys to be administered to each class. No student identifiable information is to be collected. Upon survey completion, the course instructor will place the surveys into the manila envelope, seal it, and return it to the main school office for pick-up by Ms. Thaden.

Sincerely,

J Thompson

Jody Thompson

Assistant Superintendent of Teaching & Learning

Providing Equal Opportunities in Education and Employment

Appendix F
Letter of Cooperation – Central High School

Grand Forks Central High School

"Home of the Knights"

115 North 4th Street
Grand Forks, ND 58203
Telephone 701-746-2375
Fax 701-746-2387

Mr. Buck Kasowski, Principal
Mr. Gabe Dahl, Associate Principal
Mr. Jon Strandell, Associate Principal
Mr. Kyle Ellingson, Activities Director

Please copy and paste the information below onto school letterhead, sign and date, and then fax or mail to Michelle Bowles, Institutional Review Board Coordinator, at the University of North Dakota. Further information may be obtained by contacting michelle.bowles@research.und.edu

I, Gabriel Dahl (name), Administrator at Central High School authorize M. Beth (Betsy) Humble-Thaden to conduct research within my school. I understand that the research consists of administering and collecting a two-sided paper and pencil survey on student perception of cell phone policy and cell phone use as a possible learning tool to junior and senior academic standing students during second period classes within my school. The survey should take approximately five minutes to complete.

I further understand that Ms. Thaden will be requesting the number of junior and senior students enrolled in each second period course, in order to prepare manila envelopes containing the appropriate number of surveys to be administered to each class. No student identifiable information is to be collected. Upon survey completion, the course instructor will place the surveys into the manila envelope, seal it, and return it to the main school office for pick-up by Ms. Thaden.

Signed _____ Date 4-4-2012

Title Associate Principal

Providing Equal Opportunities in Education and Employment

Appendix G
Letter of Cooperation - Community High School

Community High School

"Another Road to....Success"

Stanford Centre
500 Stanford Road
Grand Forks, ND 58203
www.gfschools.org

Mr. Terry Bohan, Principal
Phone: 701.795.2777
Fax: 701.795.2770
terry.bohan@gfschools.org

April 20, 2012

I, Terry Bohan, Administrator at Community High School authorize M. Beth (Betsy) Humble-Thaden to conduct research within my school. I understand that the research consists of administering and collecting a two-sided paper and pencil survey on student perception of cell phone policy and cell phone use as a possible learning tool to junior and senior academic standing students during second period classes within my school. The survey should take approximately five minutes to complete.

I further understand that Ms. Thaden will be requesting the number of junior and senior students enrolled in each second period course, in order to prepare manila envelopes containing the appropriate number of surveys to be administered to each class. No student identifiable information is to be collected. Upon survey completion, the course instructor will place the surveys into the manila envelope, seal it, and return it to the main school office for pick-up by Ms. Thaden.

Sincerely,

Terry Bohan

Principal

Providing Equal Opportunities in Education and Employment

Appendix H
Letter of Cooperation – Red River High School

Red River High School
Home of the ROUGHRIDERS

2211 17th Avenue South
Grand Forks, ND 58201
(701) 746-2400
Fax (701) 746-2406

Mr. Kristopher G. Arason, Principal
Dr. Kelly D. Peters, Associate Principal
Mr. Joel Schleicher, Associate Principal
Mr. Nathan Olson, Activities Director

I, Kris Arason (name), Administrator at Red River High School authorize M. Beth (Betsy) Humble-Thaden to conduct research within my school. I understand that the research consists of administering and collecting a two-sided paper and pencil survey on student perception of cell phone policy and cell phone use as a possible learning tool to junior and senior academic standing students during second period classes within my school. The survey should take approximately five minutes to complete.

I further understand that Ms. Thaden will be requesting the number of junior and senior students enrolled in each second period course, in order to prepare manila envelopes containing the appropriate number of surveys to be administered to each class. No student identifiable information is to be collected. Upon survey completion, the course instructor will place the surveys into the manila envelope, seal it, and return it to the main school office for pick-up by Ms. Thaden.

Signed Kris Arason Date 4/4/12

Title Principal

Providing Equal Opportunities in Education and Employment

Appendix I
Student High School Usage Survey Instructions

Student High School Usage Survey Instructions

The enclosed two-sided survey is intended for junior and senior academic standing high school students within your second period class.

Instructions:

1. Please read the following statement aloud to the students before administering the survey:

   "This survey is being conducted, as part of a dissertation research in Teaching and Learning by a doctoral student at the University of North Dakota, to assess student opinions regarding cell phone policy and the possible use of cell phones in education. This survey is completely anonymous. Please do not write your name or any other identifying information on the survey. Please answer the questions on both sides of the survey as accurately and honestly as possible. The survey is completely voluntary and you may quit at any time with no consequences to you. If at any time you would like further information regarding this research contact information is listed at the bottom of the survey. Thank you for time and willingness to participate."

2. Hand-out the surveys to be completed by the students, then collect all surveys and place them within the provided manila envelope. Please seal the envelope and return it to the main office for pick-up by the principle investigator.

I appreciate your time taken to administer the survey and thank you for helping me with the collection of data for my dissertation research. If you or any of the students would like more information regarding this study please contact me at the e-mail address provided.

Contact information: mary.thaden@my.und.edu

Appendix J
Survey Instrument – Code Sheet

Student High School Cell Phone Usage Survey (codes)

Please take a moment to complete the survey below. Participation is completely voluntary. The purpose of this survey is to assess student opinions of cell phone usage in high school education. I greatly appreciate your time and willingness to participate.

1. Cell Phone Status (1 = yes, 2 =no)

___ I have a cell phone
___ I do not have a cell phone (skip to # 4)

2. My Cell Phone is a Smart Phone

_1__ Yes
_2__ No

3. I Currently Use My Cell Phone for:

Check all that apply.

___ Calling
___ Texting
___ Photos
___ Videos
___ Internet Searches
___ Calculating
___ Calender
___ Clock
___ Alarm Clock
___ Planner
___ Games
___ Light
___ Music
___ Radio
___ TV
___ Weather
___ GPS
___ Shopping
___ Social Media
___ Email
___ Reading
___ Banking
___ Video Chat
___ Google Docs
___ Stocks
___ School Work
___ Bar Code Scans
___ Car Starter
___ Other (please explain below)

4. Current Academic Standing

__1_ Junior
__2_ Senior

5. Gender

_1__ Male
_2__ Female

6. Current Age _____

7. Currently Enrolled

_1__ Central High School
_2__ Community High School
_3__ Red River High School

8. Future Plans Following High School Graduation:

Check all that apply.

_1__ Work Full-time
_2__ Attend a Two-year Technical School
_3__ Attend a Four-year Private Institution
_4__ Attend a Four-year State Institution

If you checked more than one, please explain:

9. Future Educational Goals:

_1__ High School Diploma
_2__ Associate Degree (2 yr)
_3__ Bachelor's Degree (4 yr)
_4__ Master's Degree (6 yr)
_5__ PhD or MD or JD (12 yr)

PLEASE TURN TO THE OTHER SIDE TO COMPLETE THE QUESTIONS

Please rate each of the statements below by circling the appropriate option based on the following questions: (scale 1–6)		Strongly Disagree	Disagree	Slightly Disagree	Slightly Agree	Agree	Strongly Agree
1.	In my opinion, I understand my high school's current cell phone usage policy.	1	2	3	4	5	6
2.	I feel my high school's current cell phone usage policy is fair.	1	2	3	4	5	6
3.	In my high school, I feel the cell phone usage policy is enforced.	1	2	3	4	5	6
4.	I feel the consequences for improper use of my cell phone during school hours are fair.	1	2	3	4	5	6
5.	I think cell phones could be used in my high school classes as a tool for learning.	1	2	3	4	5	6
6.	I think cell phones could be used in high school by students to participate in surveys.	1	2	3	4	5	6
7.	In my opinion, cell phones could be used in high school by teachers to provide feedback to students.	1	2	3	4	5	6
8.	In my opinion, cell phones could be used by students in high school classrooms to compete in an educational activity.	1	2	3	4	5	6
9.	In my opinion, cell phones could be used in high school by students to obtain homework assistance from peers.	1	2	3	4	5	6
10.	I think that cell phones could be used in high school by students to submit assignments to teachers.	1	2	3	4	5	6
11.	In my opinion, cell phones could be used in high school by students to collaborate with other students on class projects.	1	2	3	4	5	6
12.	In my opinion, cell phones could be used in high school by students to seek teacher assistance on assignments.	1	2	3	4	5	6
13.	I feel my parents would approve of cell phone use within high school classes for learning.	1	2	3	4	5	6
14.	In my opinion, I believe my classmates would be in favor of using cell phones in the classroom as a learning tool.	1	2	3	4	5	6
15.	I feel high school teachers would favor the use of cell phones in class when used as a tool for learning.	1	2	3	4	5	6
16.	I think school administrators would support the use of cell phones within the classroom when used for learning.	1	2	3	4	5	6

Information regarding this research may be obtained by contacting mary.thaden@my.und.edu

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