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Missouri Educator Perceptions on the use of Smartphones/Cell Phones in a Secondary School Setting: Their Relationship to Instruction

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`Missouri Educator Perceptions on the use of Smartphones/Cell Phones in a

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by

Christopher Birch

A Dissertation submitted to the Education Faculty of Lindenwood University

in partial fulfillment of the requirements for the

degree of

Doctor of Education

School of Education

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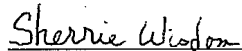
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Dr. Lynda Leavitt, Dissertation Chair   Date
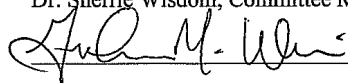
_Sherrie Wisdom_____   _4/20/2012_

Dr. Sherrie Wisdom, Committee Member   Date

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Dr. Graham Weir, Committee Member   Date

Declaration of Originality

I do hereby declare and attest to the fact that this is an original study based solely upon my own scholarly work here at Lindenwood University and that I have not submitted it for any other college or university course or degree here or elsewhere.

Full Legal Name: Christopher James Birch

Signature: _____ Date: April 20, 2012

Acknowledgements

I would like to thank my dissertation chair, Dr. Lynda Leavitt, for her persistence in motivating me to continue working re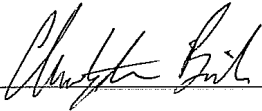gardless of the difficulty. I am also grateful to the members of my committee: Dr. Sherrie Wisdom for her support in this study, particularly the data and methods portion and Dr. Graham Weir for his feedback through the drafting phase. I am especially appreciative of my wife, Heather, for her understanding and personal sacrifice to our family as I prepared and crafted this research. Her willingness to allow me to work in solitude away from our home took a tremendous amount of patience and flexibility, and I am forever indebted to her. Finally, I would also like to acknowledge the participants of this study, who despite their demanding time devoted to public education, assisted me with this research.

Abstract

This mixed methods study evaluated the differences in the perceptions of educators in the state of Missouri on cell phone use in the classroom setting and its relationship to instruction. Specifically, this study analyzed the difference in perceptions and relationships that exist among educators (teachers and counselors) and administrators in Missouri public schools. Furthermore, this study also examined relationships between region (rural versus suburban), school setting (middle school versus high school), and education level (bachelors and masters/specialist/doctorate) and interest level in using cell phones as an instructional tool. In addition, this research investigated current instructional practices involving mobile technology.

Through a collection of survey data and interviews, the results of the research indicated that educators have a negative perception of cell phone use as an instructional tool and that educators may not be willing to fully integrate mobile technology in the classroom; however, the perception varies widely among region and educational role. Several applications exist for mobile technology in the classroom and many Missouri educators are utilizing them for instruction. This research could provide insight into how Missouri school districts move forward with the integration of smartphone/cell phone technology in secondary classrooms.

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Chapter One: Introduction to the Study

Background of the Study

  Students today are digital natives; since birth, technology has consistently engulfed them, and as a result, they are increasingly familiar with the technology that surrounds them, including mobile phones. Nielson (2009) concluded that over three fourths of high school students own cell phones (as cited in Lemke, 2010). With the evolution of mobile technology, besides a two-way communication device, 3G/4G cell phones have now essentially become handheld computers, yet most schools continue to block and ignore the potential learning opportunities these devices have to offer. Obringer and Coffey (2007) found in a nationwide survey of 112 high school principals in 46 states that only 24% of their schools permitted cell phone use by students. Using technology as a tool to research, organize, evaluate, and communicate, it's use and applications has become a 21st century skill (Partnership for 21st Century Skills, 2004). The researcher believes that mobile learning, integrating cell phone technology into the classroom, would increase student achievement and engagement as well as revolutionize instruction. The researcher's intent was to gain the understanding of educator perceptions regarding these devices that could possibly lead to redefining current policies that exist in the Missouri public schools. The population for this study included all public and charter K-12 Missouri educators (defined as counselors, teachers, and administrators).

Statement of Problem

  The researcher has found limited research on educator perceptions of cell phone technology integration in the public school classroom since most high schools ban them

(Obringer & Coffey, 2007). Diamantes (2010) noted that criminal charges also exist in some cases that involve student possession of cell phones. Integrating smart phone/cell phone technology in the public school classroom remains very limited (Common Sense Media, 2009; Kolb, 2007; Meer, 2004; Obringer & Coffey, 2007). Through an intensive review of literature, the researcher has discovered that several studies have investigated teacher and administrator perceptions of technology (Chang & Hsu, 2008; Gorder, 2008; Guerro, Walker, & Dugsdale, 2004; Murphrey, Miller, & Roberts, 2009; Palak & Walls, 2009; Li, 2007). However, limited research exists on the perceptions of Missouri educators and the use of smart phones/cell phones in an educational setting and any relationship these electronic devices may have on instruction (Brown, 2008; Kinsella, 2009; McConatha, Praul, & Lynch, 2007; Roberson & Hagevik, 2008). This study provided insight into the perceptions of smart phones/cell phones that exist among various demographics of Missouri educators and, due to their capabilities, may determine new instructional strategies for integrating smart phone technology into the classroom.

Purpose of Study

The purpose of this study was to determine that differences in perceptions related to cell phone use and its relationship to instruction exist among Missouri educators. Specifically, this study analyzed the perceptions and relationships that existed among educators (teachers and counselors) and administrators in Missouri public schools. This study was also intended to determine a possible difference in perceptions of Missouri middle school educators (teachers/counselors and administrators) and Missouri high school educators (teachers/counselors and administrators) on cell phone use in the classroom setting and its relationship on instruction. Furthermore, this study analyzed

relationships between region (rural vs. suburban), education level (bachelors and masters/specialist/doctorate), teacher/counselors, and administrators and interest level in using cell phones as an instructional tool. This research should provide insight into how Missouri school districts move forward with the integration of smartphone/cell phone technology in secondary classrooms.

Research Questions

The following research questions allowed the researcher to conduct a thorough analysis of Missouri educator perceptions of cell phone use in the classroom and their impact on student achievement and engagement and were the focus of this study:

1. How do Missouri public secondary school (grades 6-12) educators (administrators and teachers/counselors) perceive the use of cell phones in the classroom?

2. What is the relationship between Missouri secondary school (grades 6-12) educators (administrators and teachers/counselors) and interest level in using a smartphone/cell phone as an instructional tool?

3. What is the relationship between the region (suburban and rural) and interest level in using a smartphone/cell phone as an instructional tool?

4. What is the relationship between the education level (bachelors and masters/specialist/doctorate) and interest level in using a smartphone/cell phone as an instructional tool?

5. In what ways do Missouri secondary school (grades 6-12) educators (administrators and teachers/counselors) utilize smartphone/cell phone technology applications in the classroom?

Independent Variables

Region. The relationship between region (rural and suburban) and interest level in using a smartphone/cell phone as an instructional tool was analyzed.

Education level. The relationship between education level (bachelors and masters/doctorate/specialist) and interest level in using a smartphone/cell phone as an instructional tool was analyzed.

Teachers/Counselors. The relationship between teachers/counselors and interest level in using a smartphone/cell phone as an instructional tool was analyzed.

Administrators. The relationship between administrators and interest level in using a smartphone/cell phone as an instructional tool was analyzed.

Dependent Variable

Interest level in using cell phones as an instructional tool. The dependent variable in this study was the interest level (defined as not very interested in allowing students to use cell phones/ moderately interested in allowing students to use cell phones/ very interested in allowing students to use cell phones) as an instructional tool. The study analyzed the relationships between the independent variables and the dependent variable.

Hypotheses

Null Hypothesis #1. There is no measurable difference between the perceptions of Missouri public school educators (teachers and counselors) and Missouri public school administrators on cell phone use in the classroom setting.

Null Hypothesis #1A. There is no measurable difference in the proportions of Missouri public educators (teachers and counselors) and Missouri public school administrators in interest level in using a smartphone/cell phone as an instructional tool.

Null Hypothesis #1B. There is no relationship between teacher/counselor and interest level in using a smartphone/cell phone as an instructional tool.

Null Hypothesis #1C. There is no relationship between administrator and interest level in using a smartphone/cell phone as an instructional tool.

Null Hypothesis #2. There is no measurable difference between the perceptions of Missouri middle school educators (teachers/counselors and administrators) and Missouri high school educators (teachers/counselors and administrators) on cell phone use in the classroom setting.

Null Hypothesis #2A. There is no measurable difference in the proportions of Missouri middle school educators (teachers/counselors and administrators) and Missouri high school educators (teachers/counselors and administrators) and interest level in using a smartphone/cell phone as an instructional tool.

Null Hypothesis #2B. There is no relationship between Missouri middle school educators (administrators and teachers/counselors) and interest level in using a smartphone/cell phone as an instructional tool.

Null Hypothesis #2C. There is no relationship between Missouri high school educators (administrators and teachers/counselors) and interest level in using a smartphone/cell phone as an instructional tool.

Null Hypothesis #3. There is no relationship between the region (suburban and rural) and interest level in using a smartphone/cell phone as an instructional tool.

Null Hypothesis #4. There is no relationship between the education level (bachelors, masters, and doctorate/specialist) and interest level in using a smartphone/cell phone as an instructional tool.

Alternative Hypothesis #1. There is a measurable difference between the perceptions of Missouri public school educators (teachers and counselors) and Missouri public school administrators on cell phone use in the classroom setting.

Alternative Hypothesis #1A. There is a measurable difference in the proportions of Missouri public educators (teachers and counselors) and Missouri public school administrators in interest level in using a smartphone/cell phone as an instructional tool.

Alternative Hypothesis #1B. There is a relationship between teacher/counselor and interest level in using a smartphone/cell phone as an instructional tool.

Alternative Hypothesis #1C. There is a relationship between administrator and interest level in using a smartphone/cell phone as an instructional tool.

Alternative Hypothesis #2. There is a measurable difference between the perceptions of Missouri middle school educators (teachers/counselors and administrators) and Missouri high school educators (teachers/counselors and administrators) on cell phone use in the classroom setting.

Alternative Hypothesis #2A. There is a measurable difference in the proportions of Missouri middle school educators (teachers/counselors and administrators) and Missouri high school educators (teachers/counselors and administrators) and interest level in using a smartphone/cell phone as an instructional tool.

Alternative Hypothesis #2B. There is a relationship between Missouri middle school educators (administrators and teachers/counselors) and interest level in using a smartphone/cell phone as an instructional tool.

Alternative Hypothesis #2C. There is a relationship between Missouri high school educators (administrators and teachers/counselors) and interest level in using a smartphone/cell phone as an instructional tool.

Alternative Hypothesis #3. There is a relationship between the region (suburban and rural) and interest level in using a smartphone/cell phone as an instructional tool.

Alternative Hypothesis #4. There is a relationship between the education level (bachelors, masters, and doctorate/specialist) and interest level in using a smartphone/cell phone as an instructional tool.

Rationale for the Study

At the time of this research, 62% of all schools in the country did not allow students to use cell phones in class (Nash, 2011). However, cell phone use in the classroom provides students and school districts with several opportunities and can save districts money on technology. Project Tomorrow (2010) reported that 98% of 9th-12th graders and 83% of 6th-8th graders own a cell phone (as cited in Kolb, 2011). The researcher's experience has revealed that these tools are already in the hands of students.

Another benefit to allowing students to use smartphone technology is that classroom activities with this technology allow students to further develop their digital literacy skills and prepare them for 21st century jobs (Elgan, 2008; Kolb, 2011). In addition, as Kolb (2011) noted, "cell phone instructional activities give educators the opportunity to talk to their students about mobile etiquette" (p. 41). Current smartphone applications allow students and teachers to enhance their current instructional practices. Teachers can utilize software like Poll Everywhere—an instant feedback system that allows students to text responses to any number of multiple choice/matching items

(McLester, 2011). Students do not currently see the connection between their tools and learning. Fisher and Frey (2010) claimed, "most students do not know how to use it as a learning tool" (p. 227). In addition, noted educational gaming expert Marc Prensky (2005) also recognized that kids are nevertheless employing cell phones for what they want to know—finding information, texting, etc.

Students find the use of cell phones in the classroom to be motivational. Kolb (2011) recognized "integrating their favorite device [cell phones] into learning can get students more engaged with classroom content" (p. 40). Roberson and Hagevik (2008) acknowledged "considering how to use cell phones in education is one way to blend real life and school life to make learning more relevant, personal, and meaningful" (para. 15). Specific cell phone technology can also enhance levels of engagement among students. Some studies (Mula & Kavanagh, 2009; Patry, 2009) have suggested that automatic response systems have the potential to raise student engagement, concentration and participation. Marcoux (2009) also endorsed the use of cell phones, suggesting that "the cell phone optimizes current digital engagement as it allows for personal thought and instant feedback" (para. 14).

In the experience of the researcher as a suburban high school assistant principal, current cell phone policies create situations that quickly escalate beyond the normal realm of classroom disruption when students refuse to hand over their device to the teacher and/or administrator. In the researcher's district, this type of incident results in a three-day suspension. Other administrators are facing similar situations, noting that "the cell phone has become a virtual appendage—an essential communication tool, and not necessarily more disruptive than a student tapping a pencil" ("Among Colleagues," 2011,

p. 96). According to Ramaswami (2008), rather than fear the technology of cell phones, administrators should begin considering their applications in the classroom.

Current cell phone bans are also met with resistance among parents (Hamilton, 2008). However, Engel and Green (2011) recognized that "clear policies must be in place that outline when, where, and how the devices can be used . . . it is a good idea to have a classroom policy as well that reiterates these policies" (p. 45). Parents also see cell phones as a vital means of communication with their children (Perona, 2006; Song, 2006). Despite concerns over their use, cell phone technology in the classroom setting reflect skills that students can eventually use in the 21st century world that awaits them.

Definition of Terms

1:1 Computing: A "technology-rich educational reform where access to technology is not shared—but where all teachers and students have ubiquitous access to laptop computers" (Bebell & O'Dwyer, 2010).

3G Network: Third-generation cell phones that include the ability to transfer voice data and download information online, exchange e-mail, and instant messaging (UMTS World, 2009).

4G Networks: Fourth-generation cell phones that include high-speed mobile wireless access with rapid data transmission speed (UMTS World, 2009).

21st Century Skills: The Partnership for 21st Century Skills (2004) defined 21st century skills as including the following student outcomes: life and career skills, learning and innovation skills, core subject and 21st century themes, and information, media, and technology skills and involving the following foundations: standards and assessments, curriculum and instruction, professional development, and learning environments.

Bring Your Own Technology (BYOT): A school wide initiative that allows students to bring their own technology products for learning (Ullman, 2011).

Digital Literacy: Framing the Information and Communication Technology (ICT) Literacy Panel's definition of digital literacy, Borawski (2009) defined the term as "using digital technology, communications tools, and/or networks to access, manage, integrate, evaluate, and create information in order to function in a knowledge society" (p. 53).

Mobile Learning: Utilizing any mobile communication or cell phone device for educational purposes (Keskin & Metcalf, 2011).

Mobile Technology: For the purpose of this study any application of cellular phone devices.

Perception: For the purpose of this study, a personally held belief about some concept or entity.

Short Messaging Service (SMS): The texting component of any cell phone or other communication device (UMTS World, 2009).

Smartphones: A smartphone is any cellular device that can perform multiple functions with various technology (Ramaswami, 2008).

Student Engagement: Newman (1992) defines student engagement as "the student's psychological investment in and effort directed toward learning, understanding, or mastering the knowledge, skills, or crafts that academic work is intended to promote" (p. 12).

Student Achievement: The measurement of student performance on any given educational task or assessment (Wong & Nicotera, 2007).

Limitations

The researcher was the only responsible party in collecting and analyzing data as well as preparing all discussion related to the study. Although the researcher's intent was to gather input from every Missouri public educator (roughly 22,000 Missouri educators), the actual number of respondents was 319, which limited the overall review and analysis of data.

Delimitations

The researcher chose to limit this study to educators in the state of Missouri. Including other states or the entire population of educators in America may not have been possible because of the difficulty in gathering contact information to launch the survey instrument. This study was limited to secondary educators (grades 6-8) because most scholarly discourse on mobile technology reflects secondary and higher education.

Assumptions

Cell phones are useful educational tools with limited use in the classroom; however, they have multiple purposes and applications that can be used. The researcher believes that these are currently being under-utilized.

Summary

Since their inception, mobile devices have revolutionized the way society communicates; however, the researcher believes that because of safety and privacy concerns, cell phone use for educational purposes in the educational setting is limited. Gaining an understanding of educators' beliefs of these tools may help reform contemporary technology use practices in Missouri public schools. The purpose of this mixed methods study was to measure how Missouri educators perceive cell phone use in

the classroom and how Missouri educators are currently integrating mobile technology

for instructional purposes. The research questions and related hypotheses reflect the

purpose of the study. The researcher analyzed relationships that exist between various

demographics of Missouri educators and their interest in using cell phones for instruction.

Specifically, this study examined perceptions based on educational setting, region, and

level of education. Furthermore, the study was intended to increase educator awareness

in instructional practices related to cell phone use in the classroom. Chapter Two reviews

the literature related to the study, which includes a discussion of the evolution of

technology in the educational setting, cell phone bans in schools, technology integration

in the classroom, and various educator perceptions of technology use. Chapter Three

explains the methodology of the study. The research results and data analysis is

examined in Chapter Four, and Chapter Five elaborates on the conclusions and

educational implications of this research.

Chapter Two: Review of Related Literature

Introduction

　　This study intended to identify the perceptions of cell phone technology that exist among Missouri educators and asserts that integrating current cell phone technology into the classroom would increase student achievement and engagement as well as revolutionize instruction. The following review of literature recognizes the historical background of instructional technology, noting the transition of audio-visual equipment to computer-based innovations. The review also analyzes the role digital literacy plays in recent learning environments. In addition to the 21st century skills initiative, programs like 1:1 computing and Bring Your Own Technology are also examined.

　　This chapter also elaborates on the role of the cell phone in society, tracing the origins of the modern smart phone and the rationale behind cell phone bans in schools. Technology in learning environments—its effects on student engagement and student achievement along with its barriers—are also discussed. The literature related to professional development and technology integration is addressed. Finally, research on integrating cell phones in the classroom and teacher and administrator perceptions of technology ise included. This literature review provides the knowledge base for this mixed methods study.

Evolution of Technology Integration in Education

　　Technology in education began in the early 1900s with the integration of educational films (Schneider, 2011). Use of sound recordings, radio broadcasting, and motion pictures in the classroom expanded in the 1920s (Nworie, 2007). The use of these types of media influenced educators to create the educational term audiovisual instruction

(McClusky, 1981). Lumsdaine (1961) noted that because of an increase in film use by the military for training purposes during World War II, research studies on audio-visual materials and their impact on learning emerged in the 1940s (as cited in Nworie, 2007). Ely (2008) characterized this period with "learning materials such as films, filmstrips, recordings and other media to enrich the curriculum" (p. 245).

During the 1950s technology use evolved dramatically with the Soviet Union launch of the Sputnik satellite in 1957, which marked the beginning of the Space Age (Fitzgerald, 2002). Melillo (2008) noted that typewriters, calculators, and other audio visual equipment emerged during the decade (as cited in Elliot, 2010). Computers in classrooms were not prevalent until the age of the personal computer in the late 1970s, marked by the emergence of the Apple II (Fingal, 2009). By 1981, personal computers had the first educational drill and practice programs (History, 2008). In 1984, computers usage among students was relatively minimal, with only 28% of students using them at school and only 12% using them at home; however, this number had increased to 59% of students using them at school and 28% using them at home by 1994 (Kennedy, 1999). As the computer became increasingly prevalent, educators became more interested in their integration within the classroom setting (Betrus & Molenda, 2002). Accessibility to computers in the classroom also increased in the same time frame from 1 computer for every 75 students in 1984 to 1 computer for every 12 in 1994 (Prawd, 1996). However, technology for classroom use in the 1980s was still limited to primarily instructional television (Saettler, 1990). The promise of public television and the many series intended for education never came to fruition (Saettler, 1990). The advancement of the Internet greatly impacted technology integration in schools, and 95% of U.S. public schools had

access to the Internet in 1999 (Means, 2001). In his text, *The Evolution of American Educational Technology,* Saettler (1990) remarked that changes in educational technology would emerge more in the 21st century.

The early 21st century has seen an exponential increase in technology in the classroom. It is estimated that by 2004, school districts across the United States spent a total of $7 billion on technology (November, 2010). The first podcast was created in 2001 (Fingal, 2009). Hamilton (2008) acknowledged that 98% of K-12 students have access to the Internet at school. Social networking sites began to emerge in the early 2000s with Friendster, Bebo, and MySpace (Brooks-Young, 2010). With the inception of social networking sites like Facebook and MySpace, more people are sharing their common interests and daily tasks with their friends; in fact, recently Facebook hit over half a billion users (Wortham, 2010).

As Web 2.0 applications rose, so did their use in the classroom. Web 2.0 applications include wikis and blogs—more interactive online environments that allowed users to actively participate across the web (Hanson et al., 2008). With the innovations of online gaming, educators also began to creatively find ways to integrate the new applications for instruction. In a 2007 Speak Up survey of educators, 50% of the teachers agreed that they would like to learn more about gaming in the classroom (Project Tomorrow, 2009). Another initiative that emerged in the early 21st century is 1:1 computing, a "technology-rich educational reform where access to technology is not shared—but where all teachers and students have ubiquitous access to laptop computers" (Bebell & O'Dwyer, 2010, p. 5). The Partnership for 21st Century Skills (2004) found

that teachers and school leaders identified 1:1 computing as essential for 21st century classrooms.

Digital Literacy

The term digital literacy has varied since its inception many years ago. In 1997, Paul Gilster authored the book, *Digital Literacy* and explained it as evaluating information in a variety of formats, including those of a computer (as cited in Pool, 1997). Over time, this term has morphed into various concepts involving technology and students' ability to understand its multiple dynamics (Borawski 2009; Kinnane 2008; Merchant 2007; Ohler 2009). From reading information online to creating multimedia presentations, the researcher affirms that proficiency in digital literacy is indeed essential for 21st century students if they are to function successfully in a global community. Furthermore, the researcher's experience has found students to be increasingly savvy in their use of technology, which often makes the traditional methods of instruction they receive in schools ever more uninviting to them.

Definitions of Digital Literacy are not only generous in detail and dimension, but they also vary in identifying the term itself. Merchant (2007) differentiated the meaning of digital literacy with print literacy, and he attempted to map the concept into three aspects including materiality, textual forms, and criticality. The relationship with the text radically changes functionally and geographically as educators shift to computer-based writing—what Merchant (2007) referred to as materiality. Textual forms have also changed the landscape of digital literacy; these include blogging, chat rooms, e-mail, and social networking (Merchant, 2007). Perhaps most significant is the conclusion that students also must critique the digital media in which they are exposed because this

particular skill is most relevant not only to students as they engage in school-based computer activities, but also as they participate in the digital community at large (Merchant, 2007). Jenkins (2009) articulated the following digital literacies based on the new media available: play, performance, simulation, appropriation, multitasking, distributed cognition, collective intelligence, judgment, transmedia navigation, networking, and negotiation (as cited in Dede, 2010).

Framing the Information and Communication Technology (ICT) Literacy Panel's definition of digital literacy, Borawski (2009) elaborated on the term as "using digital technology, communications tools, and/or networks to access, manage, integrate, evaluate, and create information in order to function in a knowledge society" (p. 53). The author also expanded on the notion that a student's fluency in digital literacy is based on three major factors, including how often students use computers and the Internet at home, how much the students' parents understood technology, and what, if any, technology instruction occurred at school; moreover, this work clarified what skills are required to be digitally literate: the ability to troubleshoot, to use common tools, to communicate online, to understand the rationale for computer usage, and to acquire a general knowledge of the web (Borawski, 2009). Becoming increasingly evident is the variety in which digital literacy is characterized and reshaped. Ohler (2009) asserted that digital literacy is a trendy concept regarding the "skills, expectations, and perspectives involved in living in a technological society" (p. 9).

Traditional notions of literacy involved reading and writing in a variety of contexts; however, new media has advanced literacy in three major ways—modern literacy demands reading a variety of multimedia texts (visual, audio, web-based, and

moving), assorting those texts into a single or multilayered product (e.g., a webpage), and participating in a larger more social media like blogs or Facebook (Ohler, 2009). Kinnane (2008) suggested digital literacy involves navigating numerous layers of visual text and creating new media developed through different pathways. Digital literacy exposes students to more interaction with multiple media and with each other, and as students sift through information at a much faster rate to locate the solutions to problems; they also must understand how a diverse set of resources in a computer network can provide them with these answers (Kinnane, 2008). When incorporating digital literacy in their classes, educators can no longer rely on a fragmented peppering of technology instruction; instead, they must envision how the technology can facilitate the expected outcomes of each lesson (Kinnane, 2008).

Considine, Horton, and Moorman (2009) elaborated on analyzing meaning in multimedia text as essential to creating change in the classroom practices that include technology. Students must have opportunities to break down the many facets of a website, the hyperlinks, sounds, and images, and they need to examine multimedia and analyze the digital framework that surrounds them to create a rich product, applying higher order skills through their journey (Considine, Horton, & Moorman, 2009). Ohler (2009) offered eight guidelines for teachers as they prepare their students to become more proficient in developing the specific skills; the suggestions include developing digital fluency, where teachers have mastered the skills necessary to develop creative and innovative lessons that are connected to their student's lives.

Equally significant is the way in which digital literacy is transforming instruction; while research in implementing diverse instructional techniques produces more

information about the impact this is having in the classroom, it also clarifies the need for changes to take place. Weigel and Gardner (2009) recognized the challenges that lay ahead for teachers as they begin to understand the role technology plays in their worlds. They suggested that educators consider tasks that require researching multiple media centered on a common goal; furthermore, Weigel and Gardner (2009) empowered educators to take risks and have "faith in their students, faith in themselves, and faith that they will have the support from their administration" (p. 41). This type of risk taking does not necessarily produce the same or better results in achievement. Friedman and Heafner (2008) concluded from their study of a 9th grade World History class, that when the students created a website based on their knowledge and study of World Wars I and II, their overall knowledge of the expected targets of the lesson was often less than their counterparts who studied the wars through a textbook based approach. The students who developed the website spent too much time finding low-level responses to the higher-order questions assigned and became involved in a large information-gathering task rather than the opportunity to create a product that clearly demonstrated mastery of their knowledge of the content (Friedman & Heafner, 2008).

1:1 Computing

One advantage with the evolution of mobile technology is that educators now have the opportunity for 1:1 computing, perhaps even in a much less expensive way since students are bringing their own handheld computers in the form of cell phones. Prensky (2005) recognized that when students have 3G technologies in their cell phones, it essentially equates to 1:1 computing. Wagner (2005) argued that more than ever before

"more wireless networks and services are available . . . consumers are demanding better mobile experiences . . . people want 'anytime, anywhere' connections" (pp. 49-51).

Studies on 1:1 computing programs have produced mixed results. Oliver and Corn (2008) found in a mixed methods study that technology skills increase and classroom activities become more student-centered when students have one to one computing available. One superintendent in Virginia characterized that his district's initiative to provide a laptop to each student "engaged our students, enlivened the learning environment, and moved us toward the kind of equity of opportunity that ought to be at the heart of our democracy (Hamilton, 2008, p. 66). Muir, Knezek, and Christenson (2004) found behavior and attendance improved when students participated in one to one computing (as cited in Oliver & Corn, 2008). In addition, Christenson (2004) concluded that this participation lead to an overall improvement in student learning. In a review and analysis conducted by the Metiri Group (2006), "it was found that students in the 1:1 program earned significantly higher test scores and grades for writing, English-language arts, mathematics, and overall grade point averages than students in 1:1 programs" (as cited in Holcomb, 2009, p. 50). However, Goodwin (2011) reported that poor implementation and teacher development have taken a recent toll on the 1:1 initiative and—as a result—schools do not see the anticipated outcomes they desired. When teachers do not receive effective professional development, especially learning the technological applications for their specific content areas, positive results are more difficult to achieve (Goodwin, 2011). Bebell and O'Dwyer (2010) explained in their analysis of several individual 1:1 initiatives throughout various schools. The authors concluded that variation in teacher use had the largest positive impact on

student outcomes; moreover, they predicted that 1:1 computing "will be the norm for the majority of American classrooms at some point in the future" (Bebell & O'Dwyer, 2010, p. 12).

Holcomb (2009) concluded that 1:1 initiatives must include effective training for both teachers and students. Furthermore, Weston and Bain (2010) recommended that the school community must have rules in place, develop best practices, engage in the design of its use, obtain feedback from stakeholders, and generate systemic use of the technology. Weston and Bain (2010) also encouraged districts to continue ongoing assessment of the technological applications available and to provide collaboration time for educators in a consistent manner. In addition, research on 1:1 computing has indicated that it is costly (Dunleavy, Dexter, & Heinecke, 2007). Districts face the initial cost of computers for each student in addition to the upgrades and maintenance necessary to continuously provide effective programs (Dunleavy, Dexter, & Heinecke, 2007). Students, however, desire the benefits of having their own computer. In a Project Tomorrow (2009) survey of over 280,000 students, 52% of respondents recommended a laptop for each student (as cited in Fisher and Frey, 2010).

21st Century Skills

While technology innovations continue to become more dynamic, many educators are calling for changes in the current school model by incorporating 21st century skills. Kay (2010) justified a 21st century model with the following parameters: "the world is changing, U.S. schools and students have not adapted to the changing world, and the United States has no clear sense of purpose or direction for securing our future economic competitiveness" (p. xvii). In addition, Kay (2010) recommended a shift from a vision of

education to a commitment to outcomes. Hargreaves (2010) reasoned that the following

practices are necessary:

> Mindful teaching and learning, increased innovation and curriculum flexibility;
> learning that is personally customized and also connected to students' wider life
> projects; evidence-informed rather than data-driven improvement; shared
> improvement targets; prudent accountability by samples on measures that match
> knowledge society objectives; energizing networks that connect schools to each
> other; and systemic leadership through which leaders assist weaker neighbors in
> the service of a greater common good. (p. 346)

Darling-Hammond (2010) noted "all students need to develop more complex cognitive

abilities so that they can find, analyze, and use information for a range of purposes,

including the development of new products and ideas" (p. 34). Still others (Johnson &

Johnson, 2010; McTighe & Seif, 2010) justified additional changes in the required

abilities for students in the current global society. Johnson and Johnson (2010)

encouraged an increase in digital citizenship skills that allow students to use technology

safely and responsibly: "Like all skills, digital citizenship has corresponding attitudes

about responsible and productive use of technology, such as cooperativeness and the

avoidance of competitiveness" (p. 211). McTighe and Seif (2010) suggested that as

education shifts the curriculum and learning environment to reflect the 21st century,

schools should "overtly articulate the 21st century knowledge, skills, habits of mind, and

personal qualities to be cultivated by learners" (p. 151). The authors endorsed a more

focused curriculum centered on big ideas and essential questions within the content area

as well as a backwards design in implementation; their framework includes: "mission

statement, learning principles, curriculum, assessment, instruction, and systemic factors"
(p. 170).

As the global community continues to evolve, several scholars have created revisions that are necessary for the current educational culture to effectively adapt by incorporating 21st century skills. According to Dede (2010), several organizations and initiatives have framed different models of these skills based on more complex information and communication technologies (ICT). The enGauge framework from the North Central Regional Education Laboratory and Metiri Group includes digital-age literacy, inventive thinking, effective communication, and high productivity (Dede, 2010). The International Society for Technology in Education (IST) includes creativity and innovation, communication and collaboration, research and information fluency, critical thinking, problem solving, and decision making, digital citizenship, and technology concepts and operations; the Educational Testing Service ICT framework includes cognitive, technical, and ICT proficiency (Dede, 2010).

The Partnership for 21st Century Skills (2004) recognized student outcomes like life and career skills, learning and innovation skills, core subject and 21st century themes, and information, media, and technology skills as necessary for preparing our students for a global learning environment. Kay (2010) contended that student outcomes within the model involve critical thinking, problem solving, and creativity because these skills, which are not currently infused within most curricula, are essential for all students today as a requirement in the workforce. Kay (2010) also asserted "infusing 21st century skills into core subjects actually ratchets up rigor." (p. xxiv). The National Council for Teachers of English (2009) recommended several outcomes for 21st century readers and

writers. These include developing proficiency with the tools of technology, building

relationships with others to pose and solve problems collaboratively and cross-culturally,

designing and sharing information for global communities to meet a variety of purposes,

managing, analyzing, and synthesizing multiple streams of simultaneous information,

creating, critiquing, analyzing, and evaluating multi-media texts, and attending to the

ethical responsibilities required by these complex environments (as cited in Fisher and

Frey, 2010). Fisher and Frey (2010) also asserted that technology functions like

communicating, networking, presenting, and sharing are already available in the tools

that currently exist. For example, students can use PowerPoint, Keynote, and Wimba for

presenting; Text messaging, Twitter, and Digg for communicating; and YouTube, blogs,

Flickr, and Google Docs for sharing (Fisher & Frey, 2010).

Assessment revisions are also required as educators prepare to meet the demands

of the 21st century. Reeves (2010) remarked that "while the need for 21st century skills is

clear, assessment practices lag far behind because they are bound by three destructive

traditions: standardized conditions, secrecy of content, and individual results" (p. 307).

Reeves (2010) also contended that 21st century assessment values openness, suggesting

students help develop these assessments. In addition, five essential core realms for the

assessment of 21st century skills exist: learn, understand, create, explore, and share

(Reeves, 2010). Dufour and Dufour (2010) emphasized the role of assessment as well in

developing students' comprehension of 21st century skills. Dufour and Dufour

concluded:

In short, if schools are to teach students 21st century skills, educators must

collaboratively engage in the process to clarify what those skills are, the

indicators they will monitor to ensure each student has acquired the skills, and the best strategies they can employ in helping students develop the skills (p. 81).

Bring Your Own Technology

With the advanced technology in handheld devices, some schools are moving in the direction of Bring Your Own Technology (BYOT). In an *Electronic Education Report* cover story, schools that allowed students to use their own cell phones, iPods, tablets, and other tools have shown benefits such as "students becoming responsible Internet users, more personalized learning and a move away from traditional print resources to digital learning" ("Schools try Bring," 2010). Ullman (2011) noted that school officials have seen immediate benefits to BYOT. "The kids choose the tools, are engaged, and we don't have to support it [BYOT]. Instead we can devote resources on the back end. As long as we build the infrastructure, the front end is easier to handle" (Ullman, 2011, p. 54).

Weinstock (2010) reported that as some schools begin BYOT, they are recognizing how it allows students who may not own technological tools to use the school's resources while other students bring their own. These schools, according to Weinstock (2010) also encourage collaborative learning among students while sharing each other's technology. While concerns over equity may arise with this initiative, school districts have responded. Schaffhauser (2011) examined one Louisiana district's BYOT response to this potential threat. By allowing students to bring in their own devices, the district was able to free up their own resources, apply for technology grants, and look to local businesses to provide access for students who could not afford these tools (Schaffhauser, 2011). Norris and Soloway (2011) predicted that due to the

problematic economic times, most districts would have no choice to move forward with BYOT. The authors also suggested school officials consider accessibility, classroom applications, and reviewing their current technology policies while pursuing BYOT (Norris and Soloway, 2011).

Historical Background of Cell Phones

Cell phone technology began in 1981 with the development of the first-generation or 1G network, which meant basic two-way voice (analog) communication (UMTS World, 2009; Wordpress, 2011). Beginning in 1992, second-generation (2G) mobile telephone technology expanded to include digital voice communication and other basic data such as time and date (Poole, n.d.). These early analog systems, although effective in communicating, fell short of expectations due to a lack of multiple access among users (Poole, n.d.).   The 2G networks could not normally transfer data, such as e-mail or software; however, they could generate Short Messaging Service (SMS) or texting, which became available for data transmission for some standards (Poole, n.d.). The first third-generation (3G) network was launched by NTT DoCoMo in Japan in 2001 (History of Cell Phones, n.d.). Third-generation (3G) included the ability to transfer voice data and download information online, exchange e-mail, and instant messaging (UMTS World, 2009). Poole (n.d.) noted "the idea for this system was that many of the applications would only need a data connection, as in the case of a data card for use in a PC to provide a wireless Internet capability over a mobile phone system" (para. 21). Finally, in 2009, the current network, fourth-generation (4G), features high-speed mobile wireless access with a very high data transmission speed; users can simultaneously connect to several wireless access technologies and can seamlessly move between them (Wordpress, 2011).

The Role of Cell Phones in Society

Jan Chipchase (2007) has argued that cell phones have now become the third of three most important things people carry—only behind keys and money. Kessler (2010) has estimated that there are over four billion mobile phones in use and that by 2014 mobile Internet access will surpass traditional desktop Internet usage. The Cellular Telecommunications Industry Association (2008) estimated that 84% of all households have at least one cell phone and that roughly 79% of all teens have them. The Federal Communication Commission (FCC) reported that over 270 million Americans are using phones and that smartphone ownership worldwide will triple from 165 million to 500 million by 2012 (as cited in Hanson, 2011).

Cell Phone Bans in Schools

At the time of this research, 62% of all schools in the country do not allow students to use cell phones in class (Nash, 2011). However, cell phone use in the classroom provides students and school districts with several opportunities and can save districts money on technology. Project Tomorrow (2010) reported that 98% of 9th—12th graders and 83% of 6th—8th graders own a cell phone (as cited in Kolb, 2011). Students also do not currently see the connection between their tools and learning. Fisher and Frey (2010) claimed "most students do not know how to use it as a learning tool" (p. 227). In addition, noted educational gaming expert Marc Prensky (2005) also recognized that kids are nevertheless employing cell phones for what they want to know—finding information, texting, etc.

Current school cell phone policies also can escalate beyond the normal realm of classroom disruption when students refuse to hand over their device to school personnel.

Some administrators have noted that "the cell phone has become a virtual appendage—an essential communication tool, and not necessarily more disruptive than a student tapping a pencil" ("Among Colleagues," 2011). According to Ramaswami (2008), rather than fear the technology of cell phones, administrators should begin considering their applications in the classroom. Current cell phone bans are also met with resistance among parents (Hamilton, 2008). Parents also see cell phones as a vital means of communication with their children (Perona, 2006; Song, 2006). Diamantes (2010) noted that criminal charges also exist in some cases that involve student possession of cell phones. However, Engel and Green (2011) recognized that "clear policies must be in place that outline when, where, and how the devices can be used . . . it is a good idea to have a classroom policy as well that reiterates these policies" (p. 45).

Despite concerns over their use, cell phone technology in the classroom setting reflects skills that students can eventually use in the 21st century world that awaits them. With the advancement of 3G and 4G technology phones have the ability to transmit data at high speeds on the Internet and between other mobile devices (Poole, n.d.). In addition, cell phone use among teens is at an all- time high; according to a Nielson (2009) study, 77% of American teens own a mobile phone (as cited in Lemke, 2010). Another study (Lenhart, et al, 2010) revealed that over half of American teens text on a daily basis. Cell phone use among older students is even higher; Kroski (2008) indicated that 9 out of 10 college age students own a cell phone, yet schools continue to block their use. Obringer and Coffey (2007) found in a nationwide survey of 112 high school principals in 46 states that only 24% of their schools permitted cell phone use by students.

Schools that currently ban cell phone use often cite cheating as a major reason for such bans (Common Sense Media, 2009; Meer, 2004). Farr (2009) argued that students are accessing them behind the barriers of school walls and rather than ignore them, educators need to help students understand how to use these devices safely and appropriately. Today, students may rarely utilize the privacy settings and are sometimes quick to share their personal information, even creating false information to gain social acceptability, but schools can provide the opportunities to help students safely navigate online environments and develop digital responsibility using the tools they already use regularly (Hamilton, 2008). Kolb (2007) defended cell phones as learning tools because they "will give teachers the opportunity to introduce appropriate cell phone etiquette to students as well as show them how their toy can become an essential professional tool" (p. 9). Villano (2008) agreed, defending schools in their efforts to teach students digital citizenship. Schools can use the devices to educate students on etiquette, responsible use, and privacy issues that arise, skills that may not be as easily taught with traditional technology (Villano, 2008). Cell phones also create disruption to the learning environment; another reason schools choose to ban them. The National School Safety Security Services (2007) included other reasons for cell phone bans in schools: they can be used to call in a bomb threat, to hamper rumor control, to impede public safety, and to overload current cell phone systems (as cited in Kolb, 2008).

Burns and Lohenry (2010) concluded that students and faculty find the use of cell phones distractive during class time instruction (text messaging, checking voice mail, and answering calls). Furthermore, the authors cite the necessity for schools to develop more clear policies (Burns and Lohenry, 2010). Recent changes in laws have allowed some

districts latitude in determining what is the best cell phone policy available. Zirkel (2008) and Taylor (2011) suggested that districts consider future technology applications that are available when districts review their policies. Taylor (2011) further recommended that all stakeholders be included in acceptable use policy reviews.

Many schools face pressure from parents who see cell phones as a vital means of communication with their children (Perona, 2006; Song, 2006). A survey of parents from ACE*COMM Corp. revealed that: 99% of all parents want to be able to contact their children and have their children contact them via cell phone in an emergency, 99% of parents want their children to be able to contact them by cell phone if a dangerous situation arises on the way to and from school, 84% of parents want to be able to contact their children and have their children contact them via cell phone during school hours if there is a schedule change, and 71% of parents say their children need a cell phone at school because school administrators won't allow them to use the office phone except in case of illness or emergency (as cited in Song, 2006). Safety, according to Hunter (2007), is another reason why parents insist their children be allowed to have cell phone access in school (as cited in Kolb, 2008). The researcher believes that educators must reconsider the use of these tools for learning by examining how students can utilize cell phones for school-related tasks, and the following section explores the means to accomplish such an undertaking.

Technology in Learning Environments

Technology has indeed transformed instruction and created new opportunities for educators. Weigel and Gardner (2009) recognized some of the challenges that lay ahead for teachers as they begin to understand the role technology plays in their worlds and

suggest that educators consider tasks that require researching multiple media centered on a common goal. Furthermore, Weigel and Gardner (2009) encourage educators to take risks and have "faith in their students, faith in themselves and faith that they will have the support from their administration" (p. 41). Along with being unafraid of the challenges ahead, the researcher believes educators should be creative in developing methods of instruction that will engage learners and prepare them for the 21st century world that awaits them. Merchant (2009) studied several teaching practices involving technology, including blogging, which is becoming more prevalent throughout the world and is generally perceived as a useful tool in enhancing instruction. One specific study of first graders in Canada revealed that students are "using new literacies to participate in a digitally mediated culture as they become involved in online communicative interaction in a shared space related to a joint endeavor" (Merchant, 2009, p. 112). In this specific case, the teacher, Mrs. Chassidy, set up a blog that related to the lesson on parts of plants; students not only interacted with each other, but also had an opportunity to hear feedback from other participants (Merchant, 2009). The researcher believes this type of collaborative culture is also redefining the way digital literacy is changing how students communicate as online environments present new and exciting ways for learners to engage in a more socially connected common ground.

Technology continues to advance exponentially and extend throughout our society and into our homes; with adults and kids alike finding new ways to capitalize on the opportunities the Internet has to offer, especially when it comes to communicating. With the inception of social networking sites like Facebook and MySpace, more people are sharing their common interests and daily tasks with their friends; in 2010, Facebook

hit over half a billion users (Wortham, 2010). Meanwhile, schools continue to block and ignore the potential of the learning opportunities social networking sites have to offer, although Reid (2009) has implored that educational policy makers "think seriously about the implications of social networking sites . . . for the future wellbeing of the teaching profession and for future generations of young citizens" (p. 22). Some innovative educators are reconsidering the use of social networking sites like Facebook, MySpace, and Ning by examining how students can navigate online environments for school-related tasks. For example, Stewart (2009) elaborated on one high school librarian's experience creating virtual literature circles employing Facebook. While reading, each student played a different role—from team leader to recorder—and used Facebook applications like The Wall and Discussion Board (Stewart, 2009). In a recent study in Australia, Wilson and Stemp (2010) discussed how a school for disadvantaged students employed Ning to communicate information with students from a different learning center as they completed an environmental study of nearby wetlands. The students who conducted the project downloaded digital photographs with descriptions on Ning, which created a particularly unique learning opportunity because the students who received the images and material lived in an arid region where wetlands do not exist (Wilson & Stemp, 2010).

Educational institutions that have already begun to incorporate social networking sites into instruction have experienced positive results, including attachment and engagement. Barbour and Plough (2009) elaborated on Odyssey Charter High School, a distance education facility in Las Vegas; students and staff established their own forum using Ning, a specific social networking site, which "became a place that motivated students by allowing them to become more connected to the school and the school

community" (p. 58). Computer-mediated networking environments can also affect how students perceive their teachers and develop associations with them. In an experimental study, Mazer, Murphy, and Simonds (2007) analyzed the role Facebook can play in establishing positive student-teacher relationships. Students examined a teacher's Facebook page before physically meeting the instructor and the researchers concluded that with appropriate content the site "can offer teachers and students a unique method to nurture the student-teacher relationship, which can ultimately create a positive learning experience for both parties" (Mazer, Murphy, & Simonds, 2007, p. 15). Activities like these allow educators to "use affordances in Facebook to turn a predominantly social experience into a successful academic learning environment and, in the process, scaffold the development of students' literacy skills" (Stewart, 2010, p. 33).

A major concern associated with social networking sites is public accessibility to private and personal information. Don Tapscott, in his book, *Growing Up Digital: the Rise of the Net Generation* (1998) warned readers that their rights to privacy may eventually fade as they interact online. Educators must therefore investigate ways to prepare students for navigating in a digital world and a global society (Tapscott, 1998). Furthermore, Peluchette and Karl (2009) have cautioned that students rarely utilize the privacy settings and are exceedingly open regarding their personal information, even creating false information to gain social acceptability. This naiveté ultimately may lead to fewer future professional opportunities for those students because employers in today's job market often utilize the Internet and online social networks for background checks of potential candidates (Peluchette & Karl, 2009). These unsafe practices are not limited to children and adolescents. In a study of preparatory teachers, Foulger, Ewbank, Kay,

Popp, and Carter (2009) concluded that more professional development is needed so new teachers "can anticipate and prevent potential problems, develop well-reasoned responses to classroom decisions, and participate in the construction of school and district protocols that continue to harness the educational potential of social networking tools" (p. 18).

In addition to justifying accessibility to social networks as a way of teaching safe and ethical technology skills, Farr (2009) explained that, despite schools efforts to block these sites, students interact and find innovative ways to use them outside the barriers of schools for social and educational reasons. Rather than ban these sites, O'Hanlon (2007) recognized the opportunity educators have in teaching students to understand more effectively the potentially dangerous landscape of online communication and offering detailed information regarding other more student-friendly networking locations. Learners navigated in closed-network sites and developed responsibility (O'Hanlon, 2007), and the "secure sites enable[d] students to make mistakes and learn what's acceptable online behavior before they venture[d] out into the open Internet" (p. 39). Lemke (2010) noted how most students are completely unaware of analyzing and interpreting social networking sites and other forms of multimedia. Hansford and Adlington (2009) have contended that teachers "need to consider the social purposes online environments address that classroom situations cannot" (p. 66). They suggested utilizing students' digital experiences and connecting it with classroom lessons and activities because these situations will prepare them for future working environments (Hansford & Adlington, 2009). University of Louisville Professor Bronwyn Williams (2008) agreed, proposing that the technological experiences of students "offer new opportunities for connecting our pedagogies with their lives" (p. 685). Furthermore, Will

Richardson (2010), creator of Webblog-ed.com, acknowledged that when students who have a shared interest engage in online social networks they collaborate and develop "virtual classrooms, ones that look nothing like the spaces they inhabit during the school day" (p. 288). Luckin et al., (2009) concurred and suggested, "teachers, learners and institutions need to be able to develop new ways of thinking about technologies and new ways of understanding and interacting with the new opportunities they afford" (p. 102).

The ascension of social networking sites has also given rise to a participatory culture where individuals involved play a more active role. Lemke (2010) explained that the very nature of these online communities "evolves over time, shaped by dialogue, discussion, shared resources, responses to inquiries, commentary and critique, and levels of participation based on perceived value" (p. 264). The author discussed a middle school in San Diego where a science class used Facebook to learn more about the periodic table; specifically, each student analyzed an element and developed a Facebook page for it (Lemke, 2010). The project also required students to "friend" other elements that shared their own element's characteristics and elaborated on those attributes (Lemke, 2010, p. 265).

Students' digital proficiency with social networking can assist them with developing wikis. Richard Byrne (2009), high school history teacher and author of the blog, Free Technology for Teachers, argued "if your students can manage a social networking profile, they can use a wiki or a blog" (p. 51). Davidson and Goldberg (2010) suggested sites like Facebook can help students identify their own communities and allow them to develop their own structures for learning and collaborating with others in their group.

Educators have also integrated other features of the Internet in their classroom. In his text *Using the Internet to Strengthen Curriculum,* one of the first books to analyze the Internet for classroom use, Larry Lewin (2001) examined webquests, e-sheets, and website design as worthwhile lessons that involve online environments and multimedia texts. Considine, Horton, and Moorman (2009) elaborated on analyzing meaning in multimedia text as essential to creating change in the classroom practices that include technology. Students must have opportunities to break down the many facets of a website, the hyperlinks, sounds, and images, and they need to examine multimedia and analyze the digital framework that surrounds them to create a rich product, applying higher order skills through their journey (Considine, Horton, & Moorman, 2009).

November (2010) discussed how video-conferencing can transform learning. Dammers (2009) explored the use of Skype to enhance music lessons for middle school students. Additional studies (Schauffhauser, 2009; "Skyping Science", 2010) have acknowledged how Skype connects students from multiple places and allows them to participate in collaborative learning. Blogging is another method of technology integration that educators employ. Stevens and Brown (2011) concluded that blogging enhances knowledge. The authors noted "teaching students to interrogate the texts they read, whether they appear in print or in media/digital format, is a key and growing concern for both instructional technology and critical multicultural educators" (Stevens & Brown, 2011, p. 48). Research (Kerstetter, 2010; Sawmiller, 2010; Zawlinski, 2009) has also indicated students are more connected to their learning and develop multimedia literacy skills.

The launch of the iPad has also influenced technology integration and may surpass netbooks and laptops for instructional purposes (Waters, 2010). Demski (2011) discussed the potential the iPad has in enhancing the instruction of English Language Learners. The author noted how several applications have transformed traditional ELL classrooms and provided more engaging activities for students that increase their reading fluency (Demski, 2011). Takahashi (2011) discussed how schools are using the note taking and video tutorials on the iPad to enhance student learning. One school district in Virginia began replacing its textbooks with iPads ("EER District Spotlight", 2011).

As educational environments move forward in the 21st century, several scholars suggested breaking down barriers that currently exist and allow the tools with which their students use on a daily basis—tools like cell phones, iPads, and mp3 players into the classrooms. Burkhardt et. Al (2003) suggested "it is imperative that students learn to communicate effectively using a range of media, technology, and environments" (p. 56). One study, Fahser-Herro and Steinkuehler (2009) revealed that relying on students' abilities to use their own resources called for a complete revision of one district's technology curriculum. This required a grassroots effort of the entire community to rethink the integration of technology in the classroom to include students' tools and knowledge, and the district purchased Blackboard to support online communication and 60 iPods for podcasting activities (Fahser-Herro & Steinkuehler, 2009). Professional development was also significant in preparing teachers to implement these new tools as the school embraced the technological resources and relied on each other and their students to lead the way (Fahser-Herro & Steinkuehler, 2009).

Collins and Halverson in their book, *Rethinking Education in the Age of Technology* (2009) envision a restructuring of curriculum development so that students are using digital tools and developing their own learning. Rather than rely on the traditional content, students would play a critical role in reshaping the curriculum around their own interests and needs; the subject area content interweaves within this context as students participate in complex multimedia tasks that demonstrate their understanding of the content (Collins & Halverson, 2009). Specifically, students begin as novices studying the particular subjects; however, as they complete a culminating digital project that demonstrated their learning of the topic(s), they became experts who shared their knowledge with others through a teaching opportunity, and ultimately moved into the role as mentors for younger peers as they created learning products (Collins & Halverson, 2009). Indeed such classroom opportunities can lead to a deeper understanding and higher order thinking, which Sprenger (2009) acknowledges, "encouraging students to teach one another about digital skills can help them see how they can use their instant access to information to help them evaluate and synthesize concepts and create something new" (p. 37). November (2010) noted that:

> When technological tools used in the real world are put in the hands of students, those students can better see themselves as problem solvers and can better and more fully communicate their capacity to solve problems to the larger world community. (p. 56)

Considine, Horton, & Moorman (2009) further explained that as curriculum is developed "educators need to acknowledge and respect the skills, attitudes, and knowledge that students bring with them to school and build on those to ensure success in

the academic disciplines" (para. 42). Richardson (2011) endorsed personalizing curriculum for students, but also recognized "most schools have been slow to discover its potential through the use of the social web, interactive games, and mobile devices" (pp. 22-23). Schools will also need to modify some of their facilities to support a productive learning environment that enhances digital skills (Pearlman, 2010). These institutions include a primary work area, presentation, extended, and large-group spaces, and specialty labs that support content areas like engineering, multimedia, and digital arts (Pearlman, 2010).

Barriers to Technology Integration

Hannifin (2008) reported that strained relationships with the Information Technology department within a district could prevent adequate technology integration. Ching-Chui (2011) acknowledged that when "teachers have no need to worry about issues like technical maintenance, computer system compatibility, or negotiation of technology-related policies and procedures; they can dedicate most of their energy to innovative pedagogical practice" (p. 15). Hew and Brush (2007) identified the following six barriers based on a meta-analysis: resources, knowledge and skills, institution, attitudes and beliefs, assessment, and subject culture. Ertmer (2005) specified that "the decision of whether and how to use technology for instruction ultimately depends on the teachers themselves and the beliefs they hold about technology" (as cited in Hew & Brush, 2007, p. 229). Pierce and Ball (2009) found that teacher attitudes had a profound role on whether teachers integrated technology. Specifically, if teachers do not see initial gains in student understanding, they are less likely to continue utilizing the technology in their own classrooms (Pierce & Ball, 2009). Mumtaz (2000) noted that teachers must

sense that students are motivated to learn when using specific technology in the classroom in order for technology integration to be successful. In addition, Lin and Wang (2011) noted that students need to gain comfort in understanding new technology environments within the classroom setting if they want to see academic gains. In her examination of mobile learning, Franklin (2011) acknowledged that perhaps the strongest barrier to integrating technology is that it "will have to be negotiated such that both faculty and student are not invading each other's social and private spaces and time" (p. 274).

Technology Integration Based on Educator Demographics

Research exists on the relationship between educational region (rural, suburban, and urban) and technology use. Howley, Wood, and Hough (2011) found in a study of educators that rural teachers had more significantly positive associations with technology integration than their non-rural counterparts. The researchers also noted that rural "teacher attitudes toward technology tend to be positive, but these teachers lack adequate technology and preparation" (p. 10). Gorder (2008) concluded that there is little to no difference in technology integration based on various educator demographics, including the level of education.

Integrating Cell Phones in the Classroom

Cell phone technology continues to advance exponentially and extend throughout our society and into our lives. Integrating smart phone/cell phone technology in the public school classroom remains very limited (Common Sense Media, 2009; Kolb, 2007; Meer, 2004; Obringer & Coffey, 2007). Adults and kids alike are finding new ways to capitalize on the opportunities cellular phones have to offer, especially when it comes to

communicating (Kolb, 2008). Incorporating cell phone technology in the classroom makes sense for several reasons and the research defending its use has evolved in the last few years. Brown (2008) identified an increase in student motivation when ninth graders had the opportunity to employ their cell phones in a reading class compared to other peers who did not. Cell phone use has also increased student understanding. In a study of college students who used HotLava Software on their mobile devices for updates and review questions, McConatha, Praul, and Lynch (2007), revealed that the Introduction to Sociology students who used the software showed more knowledge of the subject matter in both assessments than their peers who did not use the software. Likewise, Roberson and Hagevik (2008) concluded that cell phone use in education "is one way to blend real life to make learning more relevant, personal, and meaningful" (para 16). Kinsella (2009) indicated how students who texted questions and concerns to their instructor in large lecture classes increases student participation. The instructor also used text messaging in multiple-choice questions presented at the end of the lecture to gauge understanding of the material (Kinsella, 2009). Allen (2011) reported on a North Carolina school district that saw 10-20% gains in their math scores after implementing a curriculum that linked math learning with mobile devices. As part of the program, the district issued smart phones to students—these phones had Internet access, calculators, and other applications (Allen, 2011).

In addition to increasing student understanding and participation, cell phones can assist students in developing their learning. Ironically, most students have difficulty making a connection between their phones and gaining knowledge, as Fisher and Frey (2010) recently acknowledged, "most students do not know how to use it as a learning

tool" (p. 227). In his 2005 online article, educational gaming expert Marc Prensky also recognized that kids are nevertheless employing cell phones for what they want to know (finding information, texting, etc.). Furthermore, cell phones can support learning processes such as "listening, observing, imitating, questioning, reflecting, trying, estimating, predicting, speculating, and practicing" (para 7). Yet students want to manage their education with cell phones now. Project Tomorrow (2009), a national education nonprofit group, conducted an online survey of over 1.5 million K-12 students and the results indicated the following:

> If allowed to use their mobile devices, 53% of high school and middle school students would communicate with classmates, 34% would communicate with teachers, 48% would work with classmates on projects, 51% would receive alerts about tests and quizzes and 53% would conduct research. (as cited in Cramer, 2010, p. 7)

Students find the use of cell phones in the classroom to be motivational. Kolb (2011) recognized "integrating their favorite device [cell phones] into learning can get students more engaged with classroom content" (p. 40). Roberson and Hagevik (2008) acknowledged "considering how to use cell phones in education is one way to blend real life and school life to make learning more relevant, personal, and meaningful" (para. 15). Specific cell phone technology can also enhance levels of engagement among students. Some studies (Mula & Kavanagh, 2009; Patry, 2009) have suggested that automatic responses systems have the potential to raise student engagement, concentration and participation. Marcoux (2009) also endorsed the use of cell phones, suggesting "the cell

phone optimizes current digital engagement as it allows for personal thought and instant feedback" (para. 14).

Another benefit to allowing students to use smartphone technology is that classroom activities with this technology allow students to further develop their digital literacy skills and prepares them for 21st century jobs (Elgan, 2008; Kolb, 2011). In addition, as Kolb (2011) noted, "cell phone instructional activities give educators the opportunity to talk to their students about mobile etiquette" (p. 41). Current smartphone applications allow students and teachers to enhance their current instructional practices. Teachers can utilize software like Poll Everywhere—an instant feedback system that allows students to text responses to any number of multiple choice/matching items (McLester, 2011). In addition, applications like myHomework provide a free application where students can keep track of projects, homework, tests, and assignments (Caverly, Ward, & Caverly, 2009).

Some educators express concerns over the use of mobile technology because of access. Celano and Neuman (2010) recently reported, "economically disadvantaged children face tremendous challenges in accessing technology" (p. 50). However, a Pew Internet Project ascertained through a survey of over 1100 12- to 17-year-olds that 62% of students living in households with an income below 30K have mobile phones (Lenhart, 2009). In her book, *Toys to Tools,* author Liz Kolb (2008) contested the notion of accessibility, asserting "cell phones with Internet access may be an equalizer in the digital divide for students who do not have computers at home" (p. 170).

Research pertaining to mobile technology application in the classroom, while relatively new, has produced several opportunities for student learning. Ferriter (2010)

explained how one online text-messaging-based application, Poll Everywhere, instantly provided feedback to teachers when students responded to surveys. This software can also be used to allow students to quickly demonstrate their learning and allow teachers to immediately assess where learning gaps occur (Ferriter, 2010). In addition, Niazi and Mahmoud (2008) demonstrated how instructors can generate assessments and information for students to take on their mobile devices using Learning Management System (LMS), "a web-based learning management system which allows all educators to access, assemble, package and redistribute course materials and quizzes" (p. 65).

In his presentation at the Teaching and Technology Trends Symposium, Clark (2007) noted how cell phones could be used for digital note taking, distributing course material, downloading e-textbooks, and collaborative data gathering. Williams and Pence (2011) elaborated on how the modern cell phone's researching capabilities are transforming education and potentially replacing the personal computer. Lucking, Christmann, and Wighting (2010) explained that several free applications exist online to allow teachers to text their classes. In addition, the authors delineate other useful ways to integrate mobile technology such as Evernote, a site that indexes information, and eReader, a free electronic book provider (Lucking, Christmann, & Wighting, 2010).

Hartnell-Young and Vetere (2008) conducted a study using camera features on cell phones with indigenous students in the Northern Territory of Australia and deduced that student learning becomes more personalized and students increase their contribution to the curriculum. Lucking, Christmann, and Wighting (2010) reviewed a number of ways cell phone technology can be utilized in the classroom, including applications like calculators, digital cameras, accessing the Internet, and using a dictionary. In addition,

the authors recommended that teachers use the website textforfree.net that allows teachers to send a group text to students with updates and reminders regarding classroom activities (Lucking, Christmann, & Wighting, 2010).

In his article in *Futurist,* Docksai (2009) suggested several uses of cell phones in the classroom including using texting to enhance class projects and communicating to teachers in order to get help; students also use cell phones with Internet access in several ways such as to remind themselves of homework and to transfer electronic files from home to school. Survey results also indicated that students rank educational opportunities cell phones provide as extremely high compared to other possible uses of a phone such as using it for entertainment (Docksai, 2009). In her article *Adventures with Cell Phones,* Kolb (2011) discussed several uses of mobile devices in the classroom, including podcasting, creating digital story books, and utilizing the calendar feature of smart phones for keeping organized. In addition, cell phones have become, as one educator put it, "the Swiss Army knife of education tools" (Pascopella, 2009, p. 40). For many years, educators have found creative ways to integrate several types of computer-mediated technology in their classrooms; and teachers can continue this level of innovation by integrating the technological resources that students use in their personal tools, particularly cell phones (Brooks-Young, 2010). Students are already interacting and finding imaginative ways to use them outside the barriers of school (Farr, 2009). Moreover, Naismith, Lonsdale, Vavoula, and Sharples (2006) concluded that, "learning will move more and more outside of the classroom and into the learner's environments" (p. 36). Those in the teaching profession should begin thinking, as Marc Prensky proposed in 2008, of technological resources serving a function (e.g. presenting and

producing) rather than a form (e.g. Power Point and MySpace) (as cited in Fisher & Frey, 2010). Furthermore, Marcoux and Loertscher (2009) suggested that rather think about applications technology offers, "consider the number of learning and learner challenges for which particular applications are especially good in making a difference" (p. 20). Several studies (Hansford and Adlington, 2009; Richardson, 2010; & Luckin et al., 2009) have also suggested utilizing students' digital experiences and connecting them with classroom lessons and activities because these situations will prepare them for future working environments. Jukes, McCain, and Crockett (2011) noted "there is no one 'right' way and that exploration of the mobile devices, mobile environments and techniques will improve their learning and understanding of the world in which they live" (as cited in Franklin, 2011, p. 273). Finally, Elgan (2007) argued that instructional staff must acknowledge the mobile technology that their students have in their hands and teach them the educational value and necessary digital skills associated with cell phones by embedding them into instruction (as cited in Hamilton, 2010).

The Role of Professional Development

Perhaps the most significant belief that teachers have of technology is the need for effective professional development, and several studies concur. Pierce and Ball (2009) confirmed that professional development related to technology integration should address teacher attitudes and perceptions. In-service must also connect technology integration with the local curriculum standards (Plair, 2008). Furthermore, Gorder (2008) recommended collaboration among teachers and specific professional development related to integrating technology such as one-to-one computer classrooms and tablets.

Bower (2010) suggested schools devote excessively to funding the hardware involved while neglecting the training required for integration to be successful. Jones-Kavalier and Flannigan (2006) suggested one missing component of successful professional development is "training needed to gain the requisite computer skills to integrate technology into the curriculum effectively" (para. 5). Gayton and McEwen (2010) added that a major flaw in professional development programs for integrating technology for instructional purposes is that they focus on educator perceptions of the technology rather than what role the technology has on student learning. In a mixed methodology study of technology integration professional development initiatives, Matzen and Edmunds (2007) concluded that specific professional development activities that focus merely on technology skills may only result in teachers using the technology to enhance an instructional strategy. Ertmer and Ottenbreit-Leftwich (2010) warned "when learning experiences are focused solely on the technology itself, with no specific connections to grade or content learning goals, teachers are unlikely to incorporate technology into their practices" (p. 263). Cifuentes, Maxwell, and Bulu (2011) introduced a learning communities model with technology integration, where teachers consistently collaborated and shared various instructional methods using technology over a two-year period. The authors also noted that student engagement increased (Cifuentes, Maxwell, & Bulu, 2011).

Technology and its Effect on Engagement

Some have suggested that technology, like smart phones, can positively impact student engagement. Several studies (Mize & Gibbons, 2000; Page, 2002; Waxman, Connell, & Gray, 2002) recognized that technology allows students to play a more active

role in their learning (as cited in Pitler, Hubbell, Kuhn, & Malenoski, 2007). Salopek (2011) noted "students using technology are paying attention, responding to their teacher and to each other" (p. 3). Byrne (2009) recommended that only specific learning activities that involve students would keep them engaged. He discussed how various music and video producing software resulted in students finding other creative and effective ways to learn content knowledge in a secondary history class. Harper (2009) concluded that student engagement correlated with student achievement could be achieved through the use of technology. Harper (2009) and Shapiro (2009) also found a positive correlation between student attendance and the use of technology. Marzano (2011) indicated that teacher's use of web sites and collaboration sites helped to increase motivation and success. Adams (2011) utilized online real-time data (RTD) instruments with middle school science students to analyze water flow and concluded that

> Teaching science using the natural world, as the data stream may be the best application of technology that middle school educators can tap into and may serve as the engagement carrot for our students and possibly be the key to retaining their interest in science. (p. 37)

Prensky (2008) acknowledged when teachers allow students to take control of technology based projects, students are more engaged. Gaming as one mode of technology integration has positively impacted engagement. In a study of middle school history students, Huizenga, Admiraal, Akkerman, and Dam (2009) found that students who used a video game simulation to understand more about the history of Amsterdam were more engaged and gained more knowledge than their counterparts who did not use the video game. Brooks-Young (2010) suggested that students see video gaming in the

classroom in order to learn difficult concepts more engaging than traditional practices.

Teachers also are considering gaming as a new way to integrate technology (Project

Tomorrow, 2009). Trespalaocios, Chamberlain, and Gallagher (2011) concluded that

students are more likely to find gaming in collaborative groups more engaging than

gaming alone. In addition, the authors confirmed that gaming enhances 21st century

skills (Trespalacios, Chamberlain, & Gallagher, 2011). In a mixed methods study,

however, Hoffman and Nadelson (2010) affirmed "that the motivational engagement

exhibited when game playing is associated with entertainment and will be difficult to

transfer to contexts such as a classroom" (p. 267).

Specific cell phone technology can also enhance levels of engagement among

students. Some studies (Mula & Kavanagh, 2009; Patry, 2009) have suggested that

automatic responses systems have the potential to raise student engagement,

concentration and participation. Marcoux (2009) also endorsed the use of cell phones,

suggesting "the cell phone optimizes current digital engagement as it allows for personal

thought and instant feedback" (para. 14).

Technology and its Effect on Achievement

Older studies (Newmann et al., 2001; Wenglinsky, 1998) have revealed that

students learn more when technology is used in the classroom. Burkhardt et al. (2003)

noted "technology serves as a bridge to more engaged, relevant, meaningful, and

personalized learning—all of which can lead to higher academic achievement" (p. 10).

Specific software has since been created to enhance student learning, and in many cases

positively effected student achievement. Pitler, Hubbell, Kuhn, and Malenoski, (2007)

asserted that one specific program, MY Access! improved students' writing abilities. In

a study of SMART board technology, McCrummen (2010) reported that students who were taught using the SMART board outperformed their peers by 17 points. Moreover, November (2010) noted the following:

> When technological tools used in the real world are put in the hands of students, those students can better see themselves as problem solvers and can better and more fully communicate their capacity to solve problems to the larger world community. (p. 56)

Advances in technology have also allowed educators to use electronic classroom response systems (ECRS) or clickers. In a study by Bartch and Murphy (2011), the researchers determined that students who used these devices during a lecture were not only more engaged but also outperformed their peers who did not use the devices during the lecture. The authors also found that as students became more familiar with the clickers, their familiarity with the content of the lecture increased (Bartch & Murphy, 2011). Several other studies in post-secondary education (Milner-Bolotin, Antimirova, & Petrov, 2010; Shaffer & Collura, 2009; Wolter, Lundenberg, & Kang, 2011) have also concluded that students are more engaged and attentive during classroom lectures when using clickers.

Research on video gaming and achievement has revealed mixed results. In a study of Massively Multiplayer Online Games (MMOG), Schrader and McCreery (2007) concluded that gaming "provides learners opportunities to access vital information via social networks and construct knowledge as the result of social collaboration" (p. 570). Gerber and Logan (2011) found little to no difference in critical thinking skills of students who play video games compared to those who do not. Clark and Ernst (2009)

recognized that while educators need to consider new ways to integrate video gaming in the classroom, it is also a means to provide technological literacy; the authors also noted "students will develop heightened communication skills, visual capabilities, and computing proficiencies" (p. 25). Rosario and Widmeyer (2009) noted that some educational video games can enhance students' abilities to test hypotheses as well as maintain a high level of engagement. Gee (2007) determined that video games provide students with instant feedback in assessing performance as well as present challenging problems for students and allow students to be producers rather than consumers of knowledge.

Integration of mobile technology in the classroom also resulted in student progress. Ramaswami (2008) noted that when a middle school allowed students to use iPods for instruction, the overall performance on assessments improved. In a study of a technology enhanced learning environment Hsieh, Cho, Liu, and Schallert (2008) found that student performance increased dramatically. Fies and Marshall (2008) concluded that by texting an instructor as a form of closing activity, students can be provided more understanding of content than clicker devices. Harman and Sato (2011) determined a negative correlation exists between the number of times a college student sends or receives a text message and the student's grade point average.

Teacher Perceptions of Technology

Research on teachers' attitudes of computer technology in the classroom has produced various findings. Several studies have researched teacher and administrator perceptions of technology (Chang & Hsu, 2008; Gorder, 2008; Guerro, Walker, & Dugsdale, 2004; Murphrey, Miller, & Roberts, 2009; Palak & Walls, 2009; Li, 2007).

However, limited research exists on the perceptions of educators and the use of smart phones/cell phones in an educational setting and any relationship these electronic devices may have on instruction (Brown, 2008; Kinsella, 2009; McConatha, Praul, & Lynch, 2007; Roberson & Hagevik, 2008).

In a study of teacher perceptions of instructional technology integration, Gorder (2008) concluded that teachers who use technology more regularly have greater satisfaction in the results of their instruction, and little difference exists in the perceptions of teachers based on demographics and age. In addition, the teacher is the most significant factor in determining successful use of technology (Gorder, 2008). Teachers who integrate electronic tools that students already use also perceive the results as beneficial. Murphrey, Miller, and Roberts (2009) found that teachers who utilized iPods and mp3 players in their classrooms believed them to be helpful in several ways such as homework support and organization of content. Likewise, Palak and Walls (2009) noted the most significant predictor of technology use in the classroom is the teachers' attitude towards technology. These same authors specifically acknowledged "professional development with a focus on the integration of technology for student-centered practices appears to have a positive effect on shifting beliefs and practices. Goos and Benninson (2008) established that

> Teachers' own perceptions of their professional development needs in this area [technology integration] centered on finding enough time and getting enough help from colleagues so they could explore planning and pedagogy to integrate technology into their everyday classroom practice. (p. 127)

Yuen and Ma (2008) concluded that of all factors related to technology acceptance of teachers (intention of use, perceived usefulness, perceived ease of use, subjective norm, and computer self-efficacy) perceived ease of use was the strongest indicator of teacher acceptance. Other studies (Ertmer et.al. 2000; Talbert & Oberlander, 2007) have indicated that teachers are more likely to use technology if they are more comfortable in their own knowledge of its applications. In addition to how comfortable teachers are with technology, Wozney, Venkatesh, and Abrami (2006) also noted that perceived success in using technology played a vital role. In addition, these authors stated that administrators who model technology applications in their role can lead to changing the perceptions of teachers in their own use of computers and other technologies.

Some studies (Li, 2007; Guerrero, Walker, & Dugdale, 2004) noted strong negative attitudes of technology use in the classroom, especially compared to the views of students. In research related to pre-service teacher perceptions of technology, Lei (2009) determined that although teachers entering the profession today are more technologically literate and have a positive attitude toward technology, they have a limited knowledge of how to incorporate it effectively in their classrooms. Some previous studies on pre-service teachers' attitudes of technology integration (Bullock, 2004; Niederhauser & Lindstom, 2007) recognized the role of early use and success of technology integration as contributing factors in shaping positive or negative perceptions. Based on an analysis of teacher views of technology integration, Liu and Szabo (2009) suggested that administrators and teachers fully understand the results and evidence of current research.

Administrator Perceptions of Technology

When it comes to technology integration in the classroom, administrators play an integral role. As new computer mediated learning opportunities present themselves, principals often decide to implement them (Brooks-Young, 2006). In a study of principal perceptions related to Project Lead the Way (PLTW), an engineering technology integration program that focuses on science, mathematics, and technology courses, Rogers (2007) found that administrators had strong positive perceptions of the impact PLTW had on the overall culture of their schools. In a similar study by Wright, Washer, Watckins, and Scott (2008), the researchers concluded that administrators perceived technology education programs more equally to other content areas. Chang and Hsu (2008) studied technology leadership among principals and concluded that when administrators embrace the technological innovations that exist, their leadership will positively impact student achievement and engagement. Another report suggested that future teachers and district level administrators are more likely to support mobile technology in the classroom ("New Teachers want Tech," 2010). McCleod (2011) recognized that effective school administrators:

> Are ensuring that powerful digital learning tools—whether laptops, netbooks, iPads, or smartphones—are frequently getting into the hands of students so that they can start learning how to use the tools of "knowledge work," the intellectual work that is already dominating in the information age. (para. 3)

Schrumm, Galizio, and Ledesma, (2011) noted that administrators who seek knowledge of technology integration, plan professional development, and set goals for their schools

have more success in implementing change in the way their school use technology. Hannafin (2008) recognized that the pressure of standardized testing also impacts how administrators view the use of technology for instructional purposes. However, Means (2010) countered that principals can support teachers who use technology by allowing providing time for teachers to observe each other using specific applications in their classrooms.

Summary

The literature review for this study discussed several components related to educational technology. As the landscape of technology evolved over the last century, especially over the last 30 years, educators began several initiatives like 1:1 computing, Bring Your Own Technology, 21st Century Skills, and Digital Literacy (Kay, 2010, Merchant, 2007; Ohler, 2009; Oliver & Corn, 2008; Ullman, 2011). Although some of these innovative plans are relatively new, schools are viewing them as playing an important role (Hamilton, 2008; Weinstock, 2010). Cell phone technology has also drastically changed since its inception and has become a useful tool for adults and students and taken on an increasingly larger role in our society (Kessler, 2010; Wordpress, 2011). Research, however, indicates that most schools ban their use although their applications in the classroom are plentiful (Nash, 2011).

Despite various obstacles, integrating technology in the classroom creates dynamic ways to educate students and prepare them for the 21st century. Professional development practices centered on technology integration have seen mixed results (Bower, 2010; Plair, 2008). Several studies have also emerged that suggest, when implemented effectively, technology integration results in higher student engagement and

achievement (Prensky, 2008; Ramaswami, 2008; Salopek, 2011). Teachers and

administrators who embrace the innovative opportunities and challenges that emerge with

new technologies see more benefit in their use (Gorder, 2008; McCleod, 2011). In the

following chapter, the researcher outlines the design of this mixed methods study.

Chapter Three: Methodology

Overview

The purpose of this study was to evaluate the perceptions of educators in the state of Missouri on cell phone use in the classroom setting and its relationship to instruction. The researcher attempted to determine the differences between perceptions of various demographics of educational stakeholders related to cell phone use and its relationship to instruction. This study analyzed the perceptions and relationships that exist among educators (teachers and counselors) and administrators in Missouri public schools. This study also investigated differences in perceptions of Missouri middle school educators (teachers/counselors and administrators) and Missouri high school educators (teachers/counselors and administrators) on cell phone use in the classroom setting and its relationship to instruction. Furthermore, this study analyzed relationships between region (rural versus suburban), education level (bachelors and masters/specialist/doctorate), teacher/counselors, and administrators and interest level in using cell phones as an instructional tool. Finally, this study analyzed current instructional practices involving mobile technology. This research provided insight into how Missouri school districts and districts across the country move forward with the integration of smartphone/cell phone technology in secondary classrooms.

The researcher selected a mixed methods approach to accomplish this task. A mixed methods approach involves combining qualitative and quantitative research (Johnson & Christensen, 2004; Creswell, 2008). According to Fraenkel and Wallen (2010), the mixed methods design in educational research has the following strengths: it

clarifies and explains in depth relationships between variables and it "can help confirm or cross-validate relationships discovered between variables" (p. 558).

All data for this study were collected from an 18 question online survey generated through Google Docs. Teachers, counselors, and administrators completed the online survey based on a stratified random sampling. The researcher disaggregated responses to the survey using the Google Docs summary of responses and analyzed these data for the quantitative aspects of this research.

The researcher also interviewed a convenience sample of the researched population based on their willingness to participate in an interview. The interview questions provided educators an opportunity to share their implementation of current instructional strategies using cell phones and provided in-depth perceptions of cell phone usage not included within the online survey. Specifically, the interviews gauged more in depth explanations of how educators regard the impact cell phones in the classroom have on student engagement and achievement. Surveys also generated perceptions of cell phone use in the classroom, including current educator use of smartphone/cell phone technology in the classroom setting. The researcher disaggregated the survey results based on several open-ended questions (e.g. "How have you incorporated a smartphone/cell phone in the classroom?") and compared these items. The researcher reviewed narrative responses collected from open-ended survey items and interview questions for emerging patterns and themes. The synthesis of this information gathered from the survey and the interview responses provided the researcher with the qualitative data necessary to address some of the research questions and triangulate the data.

In this chapter, an overview is provided along with an elaboration of the design and procedure for the research, including the population and sampling process. The researcher also discusses the various data analysis administered for the study. Finally, a complete discussion of the researcher's biases and assumptions are presented. The researcher firmly believes that analyzing the survey results and patterns from interviews provided the most accurate description of the perception of Missouri educators. In addition, the results of the survey and interviews illustrated the use of smartphone/cell phone technology in the classroom setting.

Research Questions

The following research questions were the focus of this study:

1. How do Missouri public secondary school (grades 6-12) educators (administrators and teachers/counselors) perceive the use of cell phones in the classroom?

2. What is the relationship between Missouri secondary school (grades 6-12) educators (administrators and teachers/counselors) and interest level in using a smartphone/cell phone as an instructional tool?

3. What is the relationship between the region (suburban and rural) and interest level in using a smartphone/cell phone as an instructional tool?

4. What is the relationship between the education level (bachelors and masters/specialist/doctorate) and interest level in using a smartphone/cell phone as an instructional tool?

5. In what ways do Missouri secondary school (grades 6-12) educators (administrators and teachers/counselors) utilize smartphone/cell phone technology applications in the classroom?

Independent Variables

Region. The relationship between region (rural and suburban) and interest level in using a smartphone/cell phone as an instructional tool was analyzed.

Education level. The relationship between education level (bachelors and masters/doctorate/specialist) and interest level in using a smartphone/cell phone as an instructional tool was analyzed.

Teachers/Counselors. The relationship between teachers/counselors and interest level in using a smartphone/cell phone as an instructional tool was analyzed.

Administrators. The relationship between administrators and interest level in using a smartphone/cell phone as an instructional tool was analyzed.

Dependent Variable

Interest level in using cell phones as an instructional tool. The dependent variable in this study was the interest level (defined as not very interested in allowing students to use cell phones/ moderately interested in allowing students to use cell phones/ very interested in allowing students to use cell phones) as an instructional tool. The study analyzed the relationships between the independent variables and the dependent variable.

Hypotheses

Null Hypothesis #1. There is no measurable difference between the perceptions of Missouri public school educators (teachers and counselors) and Missouri public school administrators on cell phone use in the classroom setting.

Null Hypothesis #1A. There is no measurable difference in the proportions of Missouri public educators (teachers and counselors) and Missouri public school administrators in interest level in using a smartphone/cell phone as an instructional tool.

Null Hypothesis #1B. There is no relationship between teacher/counselor and interest level in using a smartphone/cell phone as an instructional tool.

Null Hypothesis #1C. There is no relationship between administrator and interest level in using a smartphone/cell phone as an instructional tool.

Null Hypothesis #2. There is no measurable difference between the perceptions of Missouri middle school educators (teachers/counselors and administrators) and Missouri high school educators (teachers/counselors and administrators) on cell phone use in the classroom setting.

Null Hypothesis #2A. There is no measurable difference in the proportions of Missouri middle school educators (teachers/counselors and administrators) and Missouri high school educators (teachers/counselors and administrators) and interest level in using a smartphone/cell phone as an instructional tool.

Null Hypothesis #2B. There is no relationship between Missouri middle school educators (administrators and teachers/counselors) and interest level in using a smartphone/cell phone as an instructional tool.

Null Hypothesis #2C. There is no relationship between Missouri high school educators (administrators and teachers/counselors) and interest level in using a smartphone/cell phone as an instructional tool.

Null Hypothesis #3. There is no relationship between the region (suburban and rural) and interest level in using a smartphone/cell phone as an instructional tool.

Null Hypothesis #4. There is no relationship between the education level (bachelors, masters, and doctorate/specialist) and interest level in using a smartphone/cell phone as an instructional tool.

Alternative Hypothesis #1. There is a measurable difference between the perceptions of Missouri public school educators (teachers and counselors) and Missouri public school administrators on cell phone use in the classroom setting.

Alternative Hypothesis #1A. There is a measurable difference in the proportions of Missouri public educators (teachers and counselors) and Missouri public school administrators in interest level in using a smartphone/cell phone as an instructional tool.

Alternative Hypothesis #1B. There is a relationship between teacher/counselor and interest level in using a smartphone/cell phone as an instructional tool.

Alternative Hypothesis #1C. There is a relationship between administrator and interest level in using a smartphone/cell phone as an instructional tool.

Alternative Hypothesis #2. There is a measurable difference between the perceptions of Missouri middle school educators (teachers/counselors and administrators) and Missouri high school educators (teachers/counselors and administrators) on cell phone use in the classroom setting.

Alternative Hypothesis #2A. There is a measurable difference in the proportions of Missouri middle school educators (teachers/counselors and administrators) and Missouri high school educators (teachers/counselors and administrators) and interest level in using a smartphone/cell phone as an instructional tool.

Alternative Hypothesis #2B. There is a relationship between Missouri middle school educators (administrators and teachers/counselors) and interest level in using a smartphone/cell phone as an instructional tool.

Alternative Hypothesis #2C. There is a relationship between Missouri high school educators (administrators and teachers/counselors) and interest level in using a smartphone/cell phone as an instructional tool.

Alternative Hypothesis #3. There is a relationship between the region (suburban and rural) and interest level in using a smartphone/cell phone as an instructional tool.

Alternative Hypothesis #4. There is a relationship between the education level (bachelors, masters, and doctorate/specialist) and interest level in using a smartphone/cell phone as an instructional tool.

Research Design

The research design was mixed methods: quantitative in the collection and analysis of specific data gathered from the electronic cross-sectional surveys and qualitative in the information gathered within the survey as well as interviews with various participants. Creswell (2008) explained that quantitative research involves collecting quantifiable data and analyzing the results using statistical measures. Fraenkel and Wallen (2010) and Merriam (2009) described qualitative research as studies that investigate qualities in relationships, including discussing the perceptions of individuals.

Population and Sampling Procedure

The population for this study included all public and charter K-12 Missouri educators (defined as counselors, teachers, and administrators) and was limited to educators in Missouri. The population of the study was intended to be all K-12 educators

in the state of Missouri; however, the researcher's expectation was that roughly 20% of all teachers contacted via email would actually participate. The intent was to obtain permission through Missouri school district superintendents via email and to send an electronic survey to as many K-12 Missouri educators as possible through the individual teacher's district email account. The procedure included an initial email to superintendents with a full explanation of the survey along with an electronic consent letter. The consent letter (see Appendix C) was created so that any participant interested needed to click on the accept link to begin completion of the survey. Once superintendents forwarded the initial survey link to their employees, educators across the state were able to complete the online survey. The anticipated timeline for the research began in August of 2011 when the email clarifying the study was sent to superintendents across the state. As consents and permissions were granted, the survey was then emailed to teachers within those districts that were allowed to participate. A second request for permission to launch the survey was sent in November of 2011. Although the researcher's intent was to gather input from every Missouri public educator (roughly 22,000 Missouri educators), the actual number of respondents was 319.

A stratified sample of those participants willing to participate in a telephone or face-to-face interview was completed after gathering the initial survey results. Interviews were conducted at various locations based on convenience for the participant. Interviews of seven teachers, two counselors, and four administrators were conducted. One rural educator interviewed taught both middle and high school. The researcher conducted seven telephone interviews and seven interviews at a suburban high school in the St. Louis area due to the convenience of respondents who expressed interest in being

interviewed. All interviews were transcribed by the researcher and all participants

responded to the same questions. The researcher requested each respondent to elaborate

on the open-ended questions and provide any additional information. All data collected

was secured by the researcher in a locked environment. Because of the large number of

public educators in the state of Missouri, the researcher believed an electronic survey to

be more effective in producing the necessary data for the study. The researcher also

knew some of the participants professionally, however, had no relationship with most of

the participants.

Instrumentation

Fraenkel and Wallen (2010) stated that "in educational research, the most

common descriptive methodology is the survey, as when researchers summarize the

characteristics abilities, preferences, behaviors, and so on) of individuals" (p. 14). This

study focused on educator perceptions of smartphone/cell phone technology in the

classroom setting at a specific moment in time, the researcher selected a cross-sectional

survey tool as the main instrument for gathering data. The researcher was responsible for

the creation of the survey, and the survey was developed specifically for this research

through a process of revisions based on feedback from the researcher's colleagues and

members of the dissertation committee. The survey questions (see Appendix A) included

a combination of 18 open and closed-ended items. Questions 1-4, 6, and 8-9 clarified

some demographic information for comparison (e.g. gender, grade level taught, specific

title, and region in the state where they teach). Perceptions of smartphone/cell phone

technology were reflected in questions 5, 11, 16-18. These included how teachers

perceive cell phones can be used in the classroom and what advantages and/or

disadvantages exist. Utilization of mobile technology was addressed in questions 6-7, 10, 12, and 14-15. Several questions had multiple options to choose from in terms of various applications of cell phones that can be integrated into the classroom and whether or not the teacher/educator would use mobile technology if it was allowed.

The initial interview questions (see Appendix B) specified demographical information (e.g., educational level, setting, and role); however, the last three questions were more open ended in nature and intended to gather specific details about each participant's perception of the impact cell phones have on student engagement and achievement. Similarities and differences in responses on the open ended items of both the survey and interview were explored and analyzed. This data was used for triangulation, which involves collecting information from multiple sources (Fraenkel & Wallen, 2010). Maxwell (2005) concluded that triangulation reduces the risk of various threats to the validity of a study.

Reliability

Fraenkel and Wallen (2010) explained that reliability refers to how consistent scores are obtained from the administration of one instrument to another. Since the researcher sent the same request to complete the survey instrument twice over a three-month period and no test-retest methods were used, the reliability of the survey may have been threatened due to the possibility of the same participant completing the survey during both requested intervals of time. While the Google Docs program included a timestamp to illustrate when each participant responded, there was no way of determining if the same respondent completed the survey multiple times (i.e. once in August and again in November). In addition, the researcher downloaded the Google Docs survey

results into a spreadsheet using Microsoft Excel and individually coded responses to question 18 ("How would you characterize your interest level in using a smartphone/cell phone as an instructional tool?"). These responses were coded in the following manner: 1=Not interested, 2=Moderately interested, and 3=Very interested, and the researcher may have incorrectly coded some cells within the Excel document.

Reliability was supported by the number of participants who completed the survey. Fraenkel and Wallen (2010) concluded that if more than 100 people are surveyed, reliability may improve. During the three-month interval when the survey was open, 319 individuals responded. However, the small number of interviews (13) may have threatened the reliability.

Threats to Internal Validity

Johnson and Christensen (2004) defined validity as "the appropriateness of the interpretations, inferences, and actions" drawn from analyzing results (p. 140). Creswell (2008) described threats to internal validity as "problems that threaten our ability to draw correct cause-and-effect inferences that arise because of the experimental procedures or the experiences of participants" (p. 308). Several threats exist in educational research; however, each independent design has its own categorical threats. The researcher noted that the following threats to internal validity could exist in this study: maturation, location, instrumentation, subject characteristics, and attitude of subjects.

A maturation threat to internal validity was possible. The survey instrument was administered twice during the first semester of the 2011-12 school year. Educators had an initial opportunity to complete the online survey in August and a second opportunity in November. An educator's perspective on cell phone use could change within a

specific timeframe, and therefore, the same individual may have had different responses based on the time in the semester when they took the survey. However, because the window for survey completion was within four months, it is unlikely a respondent's perspective would change, in the researcher's opinion.

The location threat to internal validity may have existed as well, especially in the interviewing process of the study. The researcher conducted interviews at various locations, including at a few suburban high schools and a college library. In addition, some interviews were conducted on the phone, and the educators being interviewed could have experienced some unknown distractions; however, the researcher addressed this threat by scheduling the interviews at the most convenient time for each participant.

Another potential threat was the subject characteristics. The study was limited to Missouri educators and originally meant for representation from all school districts in the state, ranging in regional categories of suburban, urban, and rural. If the proportion of regional responses is not aligned with the actual proportions of the state, then the validity of responses may be threatened. However, the researcher accepted the values as they naturally arrived since every Missouri public educator had the possibility of participating in the study.

Instrumentation may be an additional threat to the internal validity of the study, especially in the design of the survey. However, the survey was initially validated through a test run to some subjects, including the researcher's dissertation chairperson and other educators the educator knew. Fraenkel and Wallen (2010) recommended this strategy as a potential to limit the threat of instrumentation. The researcher also did not

deviate from the specific questions asked during each interview and presented evidence that emerged from interviews even if it conflicted with the researcher's perspective.

The attitude of the subjects may have been a potential threat to internal validity as well, particularly during the interviewing process. Those educators interviewed could have embellished their perspectives based on the notion of being a part of a study on cell phone use in the classroom setting. The researcher attempted to maintain internal validity by keeping accurate transcriptions of interviews. Furthermore, the researcher fostered validity and accuracy through triangulation of all data and information.

Threats to External Validity

Creswell (2008) defined threats to external validity as those "problems that threaten our ability to draw correct inferences from the sample data to other persons, settings, and past and future situations" (p. 310). One potential threat is interaction of selection and treatment. While the researcher attempted to increase generalization of participants to include all demographics, some may be under represented and vice versa. Another possible threat to external validity is interaction of setting and treatment. The researcher attempted to gain perspective of Missouri secondary (grades 6-12) educators for the purposes of this study. Some generalizations may apply more appropriately to higher grades than lower grades. However, the researcher attempted to disaggregate the data and run some statistical measures based on specific levels (e.g. middle school setting vs. high school setting).

Researcher Bias and Assumptions

The intent of this study was to determine if a notable difference exists between Missouri teachers/counselors and administrators in the perception of cell phone/smart

phone use in the classroom. The researcher has served as an administrator in a Missouri public high school where cell phones for classroom use was permitted. The researcher believes that cell phones are useful educational tools with limited use in the classroom and assumes that all interview participants were consistently forthright and honest in their responses.

Data Analysis

The researcher was the only responsible party in collecting and analyzing data as well as preparing all discussion related to the study. The data was analyzed using various statistical measures. Descriptive frequencies and percentages from the survey questions were generated as well. A z-test for difference in means was used for the following hypotheses: 1, 1A, 2, 2A. The z-test for difference in means is used in instances when researchers compare two samples of means (Bluman, 2010). A z-test for proportions was utilized to address hypotheses 1A and 2A. The z-test for proportions involves testing the two samples of data that are independent of one another (Bluman, 2010). The researcher conducted Pearson Product Moment Correlation Coefficients for hypotheses 1B, 1C, 2B, 2C, 3, and 4. The correlation coefficient (symbolized by r) measures the relationship between two variables with a range from -1 to +1 (Bluman, 2010). The value of r close to +1 indicates a strong positive relationship while a value of r close to -1 indicates a strong negative relationship (Fraenkel & Wallen, 2010). In addition, Chi-square tests for independence were administered to address hypotheses 1, 2, 3, and 4. Bluman (2010) explained that the Chi-square test measures the independence of two variables and is used to show "whether the variables are independent of or related to each other when a single sample is selected" (p. 586).

The researcher also synthesized the interview responses and analyzed patterns in responses to the final three questions:

1. Why do you feel students should or should not be allowed to use cell phones in the classroom?

2. How do you feel cell phones can impact student engagement?

3. How do you feel cell phones can impact student achievement?

These responses, along with information gathered from the open-ended survey responses to questions 11-18, helped to address the first and final research question.

Summary

In this study, the researcher intended to evaluate the perceptions of educators in the state of Missouri on cell phone use in the classroom setting and its relationship to instruction. In addition, this investigation analyzed current instructional practices involving mobile technology and determined how educators perceive smartphone/cell phones can impact student engagement and achievement. This research could provide insight into how Missouri school districts and districts across the country move forward with the integration of smartphone/cell phone technology in secondary classrooms.

This mixed method approach involved quantitative data from an analysis of the data gathered in the electronic survey and qualitative data collected from various open ended items on the surveys and interviews of a convenience sample of specific participants. The research was intended to collect information from a cross-section of Missouri educators across the state. This chapter includes a description of the research questions and corresponding hypotheses required for this study and illustrates the variables as well. In addition, the researcher discussed the research design, reliability,

sampling, and various threats to internal and external validity as well as a description of researcher bias and assumptions. Finally, this chapter examines how the data was analyzed, including what specific statistical measurements were used. The findings from this study guide future research as it relates to cell phone use in the classroom. The following chapter provides the results of the statistical tests and all significant results of the collected data from the surveys and interviews.

Chapter Four: Results

Introduction

This study determined whether or not differences in perceptions related to cell phone use and its impact on student achievement and engagement exist among educators (teachers and counselors) and administrators in Missouri public schools and determined whether or not differences in perceptions of Missouri middle school educators (teachers/counselors and administrators) and Missouri high school educators (teachers/counselors and administrators) on cell phone use in the classroom setting and its impact on student achievement and engagement exist. Furthermore, this study analyzed relationships between region (rural vs. suburban), education level (bachelors and masters/specialist/doctorate), teacher/counselors, and administrators and interest level in using cell phones as an instructional tool. The results of this research provided insight into how Missouri school districts move forward with the integration of smartphone/cell phone technology in secondary classrooms.

In this chapter, the researcher presents the results of the research, beginning with an overview of the survey results followed by an analysis of the data that relates to each research question and its corresponding hypotheses. This analysis includes results from Pearson Product Moment Correlation Coefficients, Chi-square test for independence, z-test for difference in means, and z-tests for difference in proportion, as well as any pertinent information gathered from survey questions and/or interviews. The researcher believed that framing the chapter in this manner allows readers to fully understand how the data collected and analyzed addresses the research questions and hypotheses of this study.

Overview of Survey Results

The specific data gathered from the electronic cross-sectional survey questions clarified some demographical information (e.g. gender, grade level taught, specific title, and region in the state where they teach). The surveys also specified how teachers perceive cell phones can be used in the classroom and what advantages and/or disadvantages exist. Several questions had multiple options to choose from in terms of various applications of cell phones that can be integrated into the classroom and whether or not the teacher/educator would use these if allowed to. A total of 319 educators completed the survey. The following demographics of respondents are illustrated in Tables 1-5.

Table 1

Education Level of Respondent

Level	Number of Respondents	Percentage
Bachelors	75	24%
Masters	196	61%
Specialist	29	9%
Doctorate	19	6%

The researcher combined the Specialist and Doctorate categories when conducting the z-tests and Chi-square analyses for this topic and used this data for research question four (What is the relationship between the education level [bachelors and masters/specialist/doctorate] and interest level in using a smartphone/cell phone as an instructional tool?) and null hypothesis four (There is no relationship between the

education level [bachelors, masters, and doctorate/specialist] and interest level in using a smartphone/cell phone as an instructional tool). The results presented in Table 1 also provided the random sample required to perform a Pearson Product Moment Correlation Coefficient and Chi-square test for independence in order to address research question four and null hypothesis four.

Table 2

Region of Respondent

Region	Number of Respondents	Percentage
Rural	145	45%
Suburban	166	52%
Urban	8	3%

The results presented in Table 2 provided the random sample required to perform a Pearson Product Moment Correlation Coefficient and Chi-square test for independence in order to address research question three (What is the relationship between the region [suburban and rural] and interest level in using a smartphone/cell phone as an instructional tool?) and hypothesis three (There is no relationship between the region [suburban and rural] and interest level in using a smartphone/cell phone as an instructional tool). The researcher combined the Suburban and Urban categories when conducting all statistical tests using this data.

Table 3

School Setting of Respondent

Setting	Number of Respondents	Percentage
Middle School	113	35%
High School	206	65%

The researcher used the data from Table 3 when addressing research questions one (How do Missouri public secondary school educators perceive the use of cell phones in the classroom?) and two (What is the relationship between Missouri secondary school educators and interest level in using a smartphone/cell phone as an instructional tool?). The results presented in Table 3 provided the random sample required to perform a z-test for difference of means, a z-test for difference in proportions, a Pearson Product Moment Correlation Coefficient and Chi-square test for independence in order to address the research questions and corresponding hypotheses.

Table 4

Role of Respondent

Role	Number of Respondents	Percentage
Teacher	241	76%
Counselor	18	6%
Administrator	40	13%
Other	20	6%

The researcher analyzed the specific responses to the category marked other and combined all of them within the appropriate role (e.g., one respondent put their role as supervisor and it was moved to the role of administrator). In addition, several librarian/media specialists completed the survey, and their responses were transferred to the teacher category for statistical testing purposes. The results presented in Table 4 provided all the random samples for data analysis.

Table 5

Interest Level in Using Cell Phone in Classroom Setting

Interest	Number of Respondents	Percentage
Not interested in allowing students to use cell phones	135	42%
Moderately interested in allowing students to use cell phones	116	36%
Very interested in allowing students to use cell phones	68	21%

The data from Table 5 were utilized in several random sample analyses to address hypotheses one through four. The categories of moderately interested and very interested were combined for the purposes of the analysis to indicate any interest in using cell phones in the educational setting.

Research Question One and Corresponding Hypotheses

How do Missouri public secondary school (grades 6-12) educators (administrators and teachers/counselors) perceive the use of cell phones in the classroom?

Null Hypothesis #1. There is no measurable difference between the perceptions of Missouri public school educators (teachers and counselors) and Missouri public school administrators on cell phone use in the classroom setting.

For this null hypothesis, the researcher conducted a z-test for the difference in means, using a random sample of 30 teachers/counselors' and 30 administrators' responses to question 18 (How would you characterize your interest level in using a smartphone/cell phone as an instructional tool?). Table 6 illustrates the descriptive statistics of the random samples. Responses were coded in the following manner: Not

interested=1, Moderately interested=2, and Very interested=3, and the researcher grouped

the Moderately interested and Very interested responses as an indicator of a positive

interest level.

Table 6

Descriptive Statistics of Random Sample of Educators

Administrator		Teacher/Counselor	
Mean	1.8	Mean	1.4
Standard Deviation	0.8051558	Standard Deviation	0.621455
Not Interested	13	Not Interested	20
Moderately Interested	10	Moderately Interested	8
Very Interested	7	Very Interested	2
Count	30	Count	30

At an alpha value of 0.05, the critical value was ±1.96 and the calculation

produced a z-test value of +2.155, which falls within the critical region. Therefore, the

researcher rejected null hypothesis one. There is enough evidence to support the claim

that there is a difference between the perceptions of Missouri public school educators

(teachers and counselors) and Missouri public school administrators on cell phone use in

the classroom setting.

In an attempt to measure the independence of the role of the educator and the

agreement in the use of cell phones in the classroom, the researcher applied a Chi-square

test for independence using the same random sample. The null hypothesis for this

analysis was as follows: The perception of cell phone use in the classroom is

independent of the type of position held (teacher/counselor or administrator). The Chi-

square critical value for the samples was 5.991 at α=0.05. The Chi-square test value was

3.734, which indicates that the null hypothesis is not rejected, and the strength of agreement is not dependent on the role of the educator.

Null Hypothesis #1A. There is no measurable difference in the proportions of Missouri public educators (teachers and counselors) and Missouri public school administrators in interest level in using a smartphone/cell phone as an instructional tool.

To address null hypothesis 1A, the researcher took the same random sample of 30 teachers/counselors and 30 administrators from Table 4 and conducted a z-test for difference in proportions based on responses to question 18 (How would you characterize your interest level in using a smartphone/cell phone as an instructional tool?).

At an alpha value of 0.05, the critical value was ±1.96 and the calculation produced a z-test value of +1.868, which did not fall within the critical region. Therefore, the researcher did not reject null hypothesis 1A. There is not enough evidence to support the claim that there is a difference in the proportions of Missouri public educators (teachers and counselors) and Missouri public school administrators in interest level in using a smartphone/cell phone as an instructional tool.

Null Hypothesis #2. There is no measurable difference between the perceptions of Missouri middle school educators (teachers/counselors and administrators) and Missouri high school educators (teachers/counselors and administrators) on cell phone use in the classroom setting.

For this hypothesis, the researcher conducted a z-test for the difference in means, using a random sample of 50 middle school educator and 50 high school educator responses to question 18 (How would you characterize your interest level in using a smartphone/cell phone as an instructional tool?). Table 7 illustrates the descriptive

statistics of the random samples. Responses were coded in the following manner: Not

interested=1, Moderately interested=2, and Very interested=3, and the researcher grouped

the Moderately interested and Very interested responses as an indicator of a positive

interest level.

Table 7

Descriptive Statistics of Random Sample of High School and Middle School Educators

High School		*Middle School*	
Mean	1.68	Mean	1.6
Standard Deviation	0.712569366	Standard Deviation	0.670059
Not Interested	23	Not Interested	25
Somewhat Interested	20	Somewhat Interested	20
Very Interested	7	Very Interested	5
Count	50	Count	50

At an alpha value of 0.05, the critical value was ±1.96 and the calculation produced a z-

test value of +0.578, which does not fall within the critical region. Therefore, the

researcher did not reject null hypothesis two. There is not enough evidence to support the

claim that there is a difference between the perceptions of Missouri middle school

educators (teachers/counselors and administrators) and Missouri high school educators

(teachers/counselors and administrators) on cell phone use in the classroom setting.

In an attempt to measure the independence of the school setting and the

agreement in the use of cell phones in the classroom, the researcher ran a Chi-square test

for independence using the same random sample. The null hypothesis for this analysis

was: The perception of cell phone use in the classroom is independent of the age level

with which the educator works (middle school or high school). The Chi-square critical

value for the samples was 5.991 at α=0.05. The Chi-square test value was 9.798, which indicates that the null hypothesis is rejected, and the strength of agreement is dependent on the educational setting.

Null Hypothesis #2A. There is no measurable difference in the proportions of Missouri middle school educators (teachers/counselors and administrators) and Missouri high school educators (teachers/counselors and administrators) and interest level in using a smartphone/cell phone as an instructional tool.

To address hypothesis 2A, the researcher took the same random sample of 50 middle school educators and 50 high school educators as presented in Table 7 and conducted a z-test for difference in proportions based on responses to question 18 (How would you characterize your interest level in using a smartphone/cell phone as an instructional tool?).

At an alpha value of 0.05, the critical value was ±1.96 and the calculation produced a z-test value of +0.4, which did not fall within the critical region. Therefore, the researcher did not reject null hypothesis 2A. There is not enough evidence to support the claim that there is a difference in the proportions of Missouri middle school educators (teachers/counselors and administrators) and Missouri high school educators (teachers/counselors and administrators) and interest level in using a smartphone/cell phone as an instructional tool.

In addition to the statistical data provided, the researcher also found results from the survey items to be useful in addressing the first research question. A total of 411 educators responded to question 8 (What is the smartphone/cell phone policy of the school or district where you are currently employed?), and 307 (74.7%) responded that

these devices were either not allowed at all and/or not allowed during instructional time (see Table 8), yet 57% of all respondents noted that they were either moderately interested or very interested in allowing students to use cell phones as an instructional tool.

Table 8

Smart Phone Policy Results

Response	Number of Respondents	Percentage
No smartphone/cell phones are allowed on campus	50	16%
Students can use a smartphone/cell phone before or after school	174	55%
Students can use a smartphone/cell phone before or after school and during passing periods and lunch	84	26%
Students can use a smartphone/cell phone in classroom per teacher's discretion	91	29%
Students are allowed to use a smartphone/cell phone whenever they like	1	0%
Other	12	4%

Note: People may select more than one checkbox, so percentages may add up to more than 100%.

Themes in questions 16 (How would you describe the advantages of using a smartphone/cell phone in the classroom?) and question 17 (How would you describe the disadvantages of using a smartphone/cell phones in the classroom?) emerged as well.

The respondents described the advantages as being more engaging to students and being able to apply specific applications within the classroom. For example, one respondent commented that "the students are more engaged in reading when on an

electronic device. For my struggling readers, this is very important." Another replied that:

> It (cell phone use) allows students the opportunity to teach the appropriateness of using technology in social situations. Kids need to be taught what is appropriate from an early age so that by the time they are in high school, they understand the how when, where and why's of smartphones.

In addition, several respondents addressed specific applications that can be integrated into the classroom such as accessing the Internet and savings in cost. One respondent stated "there are many free applications of tuners and metronomes on the Internet. It could cost at least 20 dollars to purchase an actual tuner or metronome. This gets valuable tools in many more students' hands."

The researcher also noted the following patterns in responses related to disadvantages: distractions, cheating, difficulty in monitoring their use, and equity. Several educators noted that students are distracted by their use. Some specific responses that reflect this notion are "texting to friends in other classes" and "too many temptations to do things/go places not related to class." In addition, many educators raised concerns over the ease in which students can cheat, stating "can take pictures of tests, answers, . . . and send them to other students." Another issue mentioned was the difficulty in monitoring their use; one respondent commented: "less control over what students are doing with their time . . . they are masters of the sneaky." Finally, educators discussed issues of not all students having access to the same mobile technology, which can be dependent on the specific data plan a student has. For example, one educator expressed that it "could create a divide in social classes." Concerns over access were also

discussed when responding to question 14 (Why do you not allow them to use them?). In addition to numerous responses noting that use violates school/district policy, educators brought up issues of equity as well.

Responses from the interviews, specifically question 7 (Why do you feel students should or should not be allowed to use cell phones in the classroom?), also reflected similar themes. The researcher interviewed 14 Missouri educators, and the majority (12) favored their use in the classroom. The educators interviewed who favored cell phone use indicated that it can be used to supplement instruction and learning. One high school administrator noted that students should "because of the educational benefits they can gain under the instruction". Those who disagreed with cell phone use cited concerns over distractions and academic dishonesty.

Research Question Two and Corresponding Hypotheses

What is the relationship between Missouri secondary school (grades 6-12) educators (administrators and teachers/counselors) and interest level in using a smartphone/cell phone as an instructional tool?

Null Hypothesis #1B. There is no relationship between type of position held (teacher/counselor) and interest level in using a smartphone/cell phone as an instructional tool.

The results of the Pearson Product Moment Correlation Coefficient for this hypothesis produced a coefficient (r) of -0.964. This indicates a strong negative linear relationship between the variables, since it is close to -1. Therefore, the researcher did not reject null hypothesis 1B. The evidence supports that there is a significant, strong

negative relationship between teacher/counselor and interest level in using a smartphone/cell phone as an instructional tool.

Null Hypothesis #1C. There is no relationship between administrator and interest level in using a smartphone/cell phone as an instructional tool.

The results of the Pearson Product Moment Correlation Coefficient for this hypothesis produced a coefficient (*r*) of -0.866. This indicates a strong negative linear relationship between the variables, since it is close to -1. Therefore, the researcher did not reject null hypothesis 1C. The evidence suggests that there is a significant, strong negative relationship between administrator and interest level in using a smartphone/cell phone as an instructional tool.

The Chi-square test for independence involving the random samples of administrators and teachers/counselors and interest level in using a cell phone as an instructional tool resulted in a Chi square value (X^2) of 3.734. At α=0.05, the critical value is 5.991. The hypothesis for this analysis was: The interest level in using a smartphone/cell phone as an instructional tool is independent of the type of position (teacher/counselor or administrator). The Chi-square test value indicates that the null hypothesis is not rejected and the strength of agreement is not dependent on the role of the educator.

Null Hypothesis #2B. There is no relationship between Missouri middle school educators (administrators and teachers/counselors) and interest level in using a smartphone/cell phone as an instructional tool.

The results of the Pearson Product Moment Correlation Coefficient for this hypothesis produced a coefficient (*r*) of -0.998. This indicates a strong negative linear

relationship between the variables, since it is close to -1. Therefore, the researcher did not reject null hypothesis 2B. The evidence suggests that there is a significant, strong negative relationship between Missouri middle school educators (administrators and teachers/counselors) and interest level in using a smartphone/cell phone as an instructional tool.

Null Hypothesis #2C. There is no relationship between Missouri high school educators (administrators and teachers/counselors) and interest level in using a smartphone/cell phone as an instructional tool.

The results of the Pearson Product Moment Correlation Coefficient for this hypothesis produced a coefficient (r) of -0.826. This indicates a strong negative linear relationship between the variables, since it is close to -1. Therefore, the researcher did not reject null hypothesis 2C. The evidence suggests that there is a significant, strong negative relationship between Missouri high school educators (administrators and teachers/counselors) and interest level in using a smartphone/cell phone as an instructional tool.

The Chi-square test for independence involving the random samples of high school and middle school educators and interest level in using a cell phone as an instructional tool resulted in a Chi square value (X^2) of 9.798. At α=0.05, the critical value is 5.991. The hypothesis for this analysis was: The interest level in using a smartphone/cell phone as an instructional tool is independent of the age level with which the educator works. The Chi-square test value indicates that the null hypothesis not rejected and the strength of agreement is dependent on the role of the educator. Since

9.798 >5.991, the data supports that there is a relationship between the school setting and interest level in cell phone use as an instructional tool.

Research Question Three and Corresponding Hypotheses

What is the relationship between the region (suburban and rural) and interest level in using a smartphone/cell phone as an instructional tool?

Null Hypothesis #3. There is no relationship between the region (suburban and rural) and interest level in using a smartphone/cell phone as an instructional tool.

The results of the Pearson Product Moment Correlation Coefficient for this hypothesis produced a coefficient (*r*) of -0.998 for rural educators and a coefficient (*r)* of -0.345 for suburban educators. This indicates a significant, strong negative linear relationship between the variables of rural region and interest level, since it is close to -1. However, the suburban coefficient result, which suggests a weak negative relationship, is not significant. The null hypothesis for the rural region is not rejected; however, the relationship found was negative. The null hypothesis for the rural region is rejected; the weak, negative relationship was not significant in comparison to critical value of 0.349.

The Chi-square test for independence involving these random samples resulted in a Chi square value (X^2) of 19.094. At α=0.05, the critical value is 5.991. The null hypothesis for this analysis was the following: The interest level in using a smartphone/cell phone as an instructional tool is independent of the region in which the educator works. Since 19.09 >5.991, the decision was to reject the null hypothesis. The Chi-square test value indicates that the strength of agreement is dependent on the region level of the educator. The data supports the claim that interest level in cell phone use as an instructional tool is dependent on the region.

Research Question Four and Corresponding Hypotheses

What is the relationship between the education level (bachelors and masters/specialist/doctorate) and interest level in using a smartphone/cell phone as an instructional tool?

Null Hypothesis #4. There is no relationship between the education level (bachelors, masters, and doctorate/specialist) and interest level in using a smartphone/cell phone as an instructional tool.

The results of the Pearson Product Moment Correlation Coefficient for this hypothesis produced a coefficient (*r*) of -0.994 for educators with a bachelors degree, a coefficient (*r*) of -0.946 for educators with a masters degree, and a coefficient (*r*) of -0.5 for educators with a doctorate or specialist degree. This indicates a strong negative linear relationship between the variables of bachelors and masters and interest level, since it is close to -1. However, the suburban doctorate/specialist result suggests a moderate negative relationship. The Chi-square independence test involving these random samples resulted in a Chi square value (X^2) of 5.36. At α=0.05, the critical value is 5.991. The hypothesis for this analysis was the following: The interest level in using a smartphone/cell phone as an instructional tool is independent of the education level attained by the educator. Since 5.36<5.991, the decision was to not reject the null hypothesis. The Chi-square test value indicates that the strength of agreement is not dependent on the education level of the educator. The conclusion suggests there is not enough evidence to support the claim that interest level in cell phone use as an instructional tool is dependent on the education level.

Research Question Five

In what ways do Missouri secondary school (grades 6-12) educators (administrators and teachers/counselors) utilize smartphone/cell phone technology applications in the classroom?

Several components of the survey instrument and the interviews addressed this question. Question number 15 on the survey asked for what purposes educators would use cell phones, and the results are listed in Table 9. With 319 total educators responding a total of 751 times on this particular item, the majority of educators (189 out of 319 or 59.4%) noted researching information as an applicable use for cell phones in the classroom. Table 9 also shows that almost half of the educators (156 out of 319 or 49.1%) selected accessing the Internet. In addition, a third of the respondents (106 out of 319) chose listening to music as a potential application for cell phone use.

Table 9

Results of Purposes of Cell Phone Use in the Classroom Setting

Response	Number of Respondents	Percentage
Texting	37	5%
Accessing the Internet	156	21%
Listening to music	106	14%
Creating podcasts	81	11%
Researching information	189	25%
Accessing email	66	9%
Other	116	15%
Total	751	

Note: People may select more than one checkbox, so percentages may add up to more than 100%.

The interviews also revealed multiple ways to integrate cell phone technology in the classroom. One particular theme that emerged was its use as an organizational tool; applications mentioned that fall under this category included the use of the calendar feature for homework assignments, video- taping lectures, and storing information from lessons. For example, one rural middle/high school teacher discussed how he has students store music for a Music Appreciation class and students use camera features to photograph sheet music for rehearsing at home. Another theme for use was as a communication device. Some examples in interviews that reflected this category included creating podcasts, emailing, and "connecting with peers and others outside of their area." Another educator noted that "it (cell phones) can give them different ways to express themselves academically other than paper/pencil." Finally, some educators discussed the way a cell phone can serve as a clicker for surveying and providing students with "instantaneous feedback."

Those interviewed also expressed how cell phones can impact engagement and achievement. One common theme reflected in the interviews was that cell phones allow students to use their own tools for learning, which can be motivating. Some responses included: "they're going to enjoy coming to school it they are using the tools they're already using" and "it gets me into their world. They perceive it as Oh, this is cool and they will give it [instruction] an attempt." In addition, many educators in the interviews suggested that the multiple applications of cell phones can have a positive impact on student achievement. Some comments included the following: "they [cell phones] have so many different apps that they can keep track of assignments to help them keep

focused" and "it can help impact positively raise it [achievement] when they are used as a learning tool to let them search for something that they need more knowledge on."

Summary

Chapter four presents the data from the survey instrument and interview responses for this study. The researcher addressed each research question and the corresponding null hypotheses based on various statistical measures and themes that emerged from survey and interview responses. The results show that Missouri administrators have a different perception of cell phones for classroom use than their teacher counterparts. In addition, a significant relationship exists between the region and interest level in using a cell phone as an instructional tool. The chapter also explains how Missouri educators would and do use some of the educational applications of cellular devices in the classroom. The final chapter discusses the conclusions, educational implications, as well as limitations of this study and recommendations for further research.

Chapter Five: Discussion

Introduction

This study analyzed the perceptions and relationships that exist among educators (teachers and counselors) and administrators in Missouri public schools. This study also intended to determine that differences in perceptions of Missouri middle school educators (teachers/counselors and administrators) and Missouri high school educators (teachers/counselors and administrators) on cell phone use in the classroom setting exist. Furthermore, this study analyzed relationships between region (rural versus suburban), education level (bachelors and masters/specialist/doctorate), teacher/counselors, and administrators and interest level in using cell phones as an instructional tool. Finally the intent of this research was to provide insight in the ways smartphone/cell phone technology can be utilized in the classroom.

The researcher used a cross-sectional survey instrument completed by 319 educators across the state of Missouri. In addition, the researcher interviewed 14 educators in various roles and settings and triangulated the data to answer the research questions for this study. This chapter includes a discussion of the conclusions, educational implications, recommendations for further research, and limitations of the study.

Conclusions

In this section, the researcher addresses each research question and discusses the conclusions based on the research results. The research questions allowed the researcher to conduct a thorough analysis of Missouri educator perceptions of cell phone use in the

classroom and their impact on student achievement and engagement and were the focus of this study.

Research Question One

How do Missouri public secondary school (grades 6-12) educators (administrators and teachers/counselors) perceive the use of cell phones in the classroom?

The researcher rejected null hypothesis one that administrators do not have different perceptions than teachers/counselors based on the z-test for difference in means. However, the Chi-square results indicate that the strength of agreement related to interest level was not dependent on the role of the educator. The results of the z-test for proportions of difference in administrator and teachers/counselors (1.868) did not fall within the critical region. This result suggested that there may be a slight difference in perceptions of administrators compared to teachers/counselors. The researcher was expecting a smaller difference in the administrator and teacher/counselor interest in using cell phone technology in the classroom.

Likewise, the z-test for difference in means results based on school setting (middle school vs. high school) also showed no difference; however, the Chi-square test for independence results based on school setting showed that the strength of agreement is dependent on school setting. The researcher concluded there is a difference in perceptions of middle school and high school educators.

Almost three-fourths of the survey participants (74.7%) responded that cell phones are not allowed at all and/or not allowed during instructional time, yet 57% noted that they were either moderately or very interested in allowing students to use cell phones as an instructional tool. This suggests that Missouri public secondary school educators

have a favorable opinion of allowing cell phones in the classroom. In addition, the qualitative data suggested that educators perceive cell phone use as engaging and that cell phones have several applications for classroom use. The data also showed that educators have reservations about allowing students to use cell phones because they can be a distraction, can be difficult to monitor, can provide opportunities for cheating, and can raise concerns over equity. Professional development, as Palak and Walls (2009) and Goos and Benninson (2008) noted, may assist in alleviating these concerns. These results also suggest that while some educators may not perceive cell phones have a place in the classroom, more educational professionals are willing to invest in giving them a try. Perhaps this is because more educators are aware of the technology that exists in mobile technology, and other studies (Ertmer et al., 2000; Talbert & Oberlander, 2007) have indicated that teachers are more likely to use technology when they have knowledge of its uses and applications.

Research Question Two

What is the relationship between Missouri secondary school (grades 6-12) educators (administrators and teachers/counselors) and interest level in using a smartphone/cell phone as an instructional tool?

Overall, the results indicate that a negative relationship may exist between the role of the educator and their interest level in using a smartphone/cell phone as an instructional tool. Based on the statistical data, teachers/counselors have a stronger negative relationship than administrators and the strength of agreement is not dependent on the role of the educator. Some studies (McCleod, 2011; Wright, Washer, Watckins, & Scott, 2008) have also suggested administrators desire more technology in the classroom.

Brooks-Young (2006) also noted that administrators often take the initiative to introduce new technologies. In addition, middle school educators have a stronger negative relationship than high school educators and the strength of agreement is dependent on the school setting. The researcher did not expect administrators to have a lower negative relationship.

Research Question Three

What is the relationship between the region (suburban and rural) and interest level in using a smartphone/cell phone as an instructional tool?

While a negative relationship existed between both regions, the vast difference in the correlation (-0.998 for rural and -0.345 for suburban educators) suggested that suburban/urban educators have a higher interest level. Furthermore, the statistical data revealed that interest level in cell phone use as an instructional tool is dependent on the region. The researcher concluded that suburban/urban educators view cell phones as an instructional tool more favorably, which contradicts the findings of Howley, Wood, and Hough (2011), who noted that rural teachers had more significantly positive associations with technology integration than their non-rural counterparts.

Research Question Four

What is the relationship between the education level (bachelors, masters, and specialist/doctorate) and interest level in using a smartphone/cell phone as an instructional tool?

Both the bachelors and masters categories had stronger negative correlations, and the specialist/doctorate had a non-significant, weak negative relationship. In addition, the interest level in using a smartphone/cell phone as an instructional tool was not dependent

on the education level of the survey respondents. Since most administrators have advanced degrees, the conclusion may suggest that administrators are more interested in allowing cell phones in the classroom. These results also differ from Gorder (2008), who suggested that little difference exists in educators based on demographics.

Research Question Five

In what ways do Missouri secondary school (grades 6-12) educators (administrators and teachers/counselors) utilize smartphone/cell phone technology applications in the classroom?

The researcher concluded that educators use smartphone/cell phone technology in three major ways: as an organizational tool, a communication device, and as a way to provide feedback to students. Murphrey, Miller, and Roberts (2009) also recognized specific mobile devices assist students with organization. Applications mentioned in interviews that reflect organization included the use of the calendar feature for homework assignments and storing information from lessons. For example, one suburban high school teacher discussed how she has students set up reminders in their smartphones of upcoming projects and/or assessments. In the researcher's experience, educators have used smartphone/cell phones as a communication device. Some examples in interviews that reflected this category included creating podcasts, emailing, and "connecting with peers and others outside of their area." Another educator noted that "it [cell phones] can give them different ways to express themselves academically other than paper/pencil." Finally, some educators discussed the way a cell phone can serve as a clicker for surveying and providing students with "instantaneous feedback."

Furthermore, educators believe that using them in the classroom can positively impact student engagement and achievement. Several studies (Mize & Gibbons, 2000; Page, 2002; Waxman, Connell, & Gray, 2002) also acknowledged that technology allows students to play a more active role in their learning (as cited in Pitler, Hubbell, Kuhn, & Malenoski, 2007). In addition, Ramaswami (2008) and Hsieh, Cho, Liu, and Schallert (2008) noted an increase in student achievement when educators utilized smartphone/cell phones for classroom use. Those interviewed also expressed how cell phones can impact engagement and achievement. One common theme reflected throughout the interviews was that cell phones allow students to use their own tools for learning, which can be motivating. Some responses included: "they're going to enjoy coming to school it they are using the tools they're already using" and "it gets me into their world. They perceive it as Oh, this is cool and they will give it [instruction] an attempt." In addition, many educators in the interviews suggested that the multiple applications of cell phones can have a positive impact on student achievement. Some comments included the following: "they [cell phones] have so many different apps that they can keep track of assignments to help them keep focused" and "it can help impact positively raise it [achievement] when they are used as a learning tool to let them search for something that they need more knowledge on."

Educational Implications

The pattern of negative correlations within each relationship suggested that at this time, educators may not be ready to fully integrate cell phones in the classroom as a learning tool, even though more respondents indicated a moderate or high interest in allowing students to use them. Current policies across most schools and districts also

prohibit student use during instructional time. Nash (2011) indicated that 62% of all schools in the country do not allow students to use cell phones in class, and this study revealed that 78% of schools do not allow them for classroom use.

Because of the increasing use and technology of smartphones/cell phones, they may become more prevalent among secondary age students. As a result, smartphones/cell phone applications could become ever more relevant to classroom and instructional purposes. As educators prepare for the inevitable role this technology plays, they need to consider ways to implement professional development initiatives that allow teachers to explore this medium, especially an understanding of cell phone applications. Schrumm, Galizio, and Ledesma (2011) and Means (2010) noted effective professional development strategies that may work for mobile technology integration.

Recommendations for Further Research

There are a number of recommendations for further study based on this research. One suggestion is that years of experience in education be analyzed to determine if it plays a role in the way educators perceive smartphone/cell phone technology and its possible applications in the classroom. In addition, research on the perceptions of middle school versus high school educators could yield more specific reasons as to why a stronger negative relationship exists. Future studies should also allow educators to clarify specific and current uses and applications that they are utilizing, especially with the opportunity to do so in the survey instrument. Studies that analyze educators' cell phone knowledge and interest may lead to more understanding of overall perceptions. Finally, further research that combines educator role and region with interest may prove insightful.

Limiting Factors

This study was limited to educators in Missouri and although the researcher's intent was to gather input from every Missouri public educator (roughly 22,000 Missouri educators), the actual number of respondents was 319. In addition, only eight urban respondents participated, giving little insight into what perceptions may exist for educators in the urban setting. A larger random sample may have also produced more accurate results, especially when administering statistical measurements. The researcher also did not address any connection between educators' personal knowledge of cell phone/smartphone technology and their interest level in using mobile technology in the classroom.

Another drawback was in the creation of the survey instrument itself. Specifically, educators originally had the opportunity to elaborate on their interest level (question 18), but this was not included in the final instrument. In addition, although the researcher was able to launch the survey to all Missouri superintendents, there was no tracking or response measure established to determine which specific districts moved forward with allowing their educators to complete the survey, nor did the researcher have an item on the instrument where educators could indicate the specific district in which they worked. Finally, the researcher believes that cell phones are useful educational tools with limited use in the classroom.

Summary

This study examined perceptions that exist in the Missouri public educational community and their beliefs of smartphone/cell phone technology for instructional purposes and the ways they are currently being used in the classroom. The results of the

research indicate that educators have a negative perception of cell phone use as an instructional tool; however, the perception varies widely among region and educational role. Several applications exist for mobile technology in the classroom and many Missouri educators are utilizing them for instruction. This research will provide educators with an understanding of reasonable ways to integrate this specific tool; it is imperative that students learn to communicate effectively using a range of media, technology, and environments.

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Appendix A

Survey Instrument

Missouri Educator Perceptions of Cell Phones and their Impact on Instruction,

Engagement, and Achievement

Survey Questions

Thank you for participating in the following research study. Please complete all

numbered items below and comment in sections where these are suggested.

1. What is your education level?
   a. Bachelors
   b. Masters
   c. Doctorate

2. What is your gender?
   a. Male
   b. Female

3. How would you characterize the school districts region?
   a. Rural
   b. Suburban
   c. Urban

4. In what type of school setting are you employed?
   a. Middle School
   b. High school

5. At what level would you perceive your own knowledge of cell phones and their application:
   a. Beginner
   b. Novice
   c. Expert

6. Do you own a cell phone?
   a. Yes
   b. No

7. If you own a cell phone, what applications do you use on your cell phone (check all that apply):
   a. Voicemail
   b. Email

    c. Texting
    d. Calendar/appointment features
    e. Accessing the Internet
    f. Other

8. What is the cell phone policy of the school or district where you are currently employed (please check all that apply)?
    a. No cell phones allowed on campus
    b. Students can use cell phones before or after school
    c. Students can use cell phones before or after school and during passing periods and lunch
    d. Students can use cell phones in classroom per teacher's discretion
    e. Students are allowed to use cell phones whenever they like
    f. Other

9. What is your current educational role?
    a. Teacher
    b. Counselor
    c. Administrator
    d. Other

10. As a teacher/counselor, if your students were allowed to use cell phones in the classroom, would you have students use them?
    a. Yes (go to question 11)
    b. No (go to question 14)
    c. Not applicable (You are an administrator—go to question 15)

11. Why do you have students use them (continue to question 12)?

12. How have you incorporated a smartphone/cell phone in the classroom (continue to question 13)?

13. Please provide contact information if you are willing to participate in an interview (continue to question 15).

14. Why do you not allow students to use them?

15. For what purposes would you have students use their phones in the classroom (please check all that apply):
    a. Texting
    b. Accessing the Internet
    c. Listening to music
    d. Creating podcasts
    e. Researching information
    f. Accessing email
    g. Other

16. How would you describe the advantages of using a smartphone/cell phone in the classroom?

17. How would you describe the disadvantages of using a smartphone/cell phones in the classroom?

18. How would you characterize your interest level in teaching with cell phones?
    a. Not interested in allowing students to use cell phones
    b. Moderately interested in using cell phones
    c. Very interested in using cell phones

Appendix B

Interview Questions

Missouri Educator Perceptions of Cell Phones and their Impact on Instruction,

Engagement, and Achievement

Interview Questions

1. What is your education level?
    a. Bachelors
    b. Masters
    c. Doctorate
2. What is your current educational role?
    a. Teacher
    b. Counselor
    c. Administrator
    d. Other
3. What is your gender?
    a. Male
    b. Female
4. How would you characterize the school districts region?
    a. Rural
    b. Suburban
    c. Urban
5. In what type of school setting are you employed?
    a. Elementary
    b. Intermediate
    c. Middle
    d. High school
6. At what level would you perceive your own knowledge of cell phones and their application:
    a. Beginner
    b. Novice
    c. Expert

7. Why do you feel students should or should not be allowed to use cell phones in the classroom?

8. How do you feel cell phones can impact student engagement?

9. How do you feel cell phones can impact student achievement?

Appendix C

Consent Letter

Missouri Educator Perceptions of Smartphones/cell phones: Their Relationship to

Instruction

Consent Letter

Dear Missouri educator,

I am currently a doctoral student at Lindenwood University in St. Charles,
Missouri and am conducting a study on Missouri Educator Perceptions of Smartphones in
a secondary setting. I will be collecting data through the completion of an electronic
survey that assesses your perceptions of smartphone/cell phone use in the classroom.

Your participation in this survey is voluntary and being requested due to your
experience as an educator in the state of Missouri. If you choose to participate in this
study, your identity as a participant will remain confidential and your name will never be
publicly associated with any data or answers you provide. Results will only be reported
collectively at the conclusion of the study.

There is no risk of physical injury from participation in this survey and no penalty
should you decide not to participate. Thank you for your assistance in this research.
Sincerely,

Christopher Birch

Lindenwood University Doctoral Student

Please click one of the links below to begin the survey.

Missouri Educator Survey

or

https://spreadsheets.google.com/spreadsheet/viewform?formkey=dGhlTGdXSG1zUDQx

ODkwUGNlYVRJbXc6MQ

Appendix D

Letter to Superintendents

Dear Missouri superintendent,

I am currently a doctoral student at Lindenwood University in St. Charles, Missouri and am conducting a study on Missouri Educator Perceptions of Smartphones in a secondary setting. I will be collecting data through the completion of an electronic survey that assesses perceptions of smartphone/cell phone use in the classroom. I am requesting permission to send the electronic survey to your district's certified staff. If you approve of your staff participation, please forward this email with the attached consent letter to your district's certified personnel or to your district's technology director to begin the distribution of the email with the survey link. Thank you very much for your time and I wish you a successful 2011-2012 school year!

Christopher Birch

Assistant Principal

McCluer North High School

Florissant, Missouri

Appendix E

IRB

LINDENWOOD UNIVERSITY

Application for Expedited Review

Proposal #_____

1. Title of Project: Missouri Educator Perceptions on the use of Smartphones/Cell phones in a Secondary Setting: Their Relationship to Instruction

2. Dissertation Chair/Faculty Advisor: Dr. Leavitt   Department: Education   Extension: 4756   e-mail: lleavitt@lindenwood.edu

3. Primary Investigator(s): Christopher Birch   Department: Education   Local phone:
        636 448-1136   e-mail: Christopher.birch@fhsdschools.org

4.   Anticipated starting date for this project:_Upon IRB approval__ ending date:__December 2012___

   (collection of *primary* data – data you collect yourself - <u>cannot</u> begin without IRB approval)

5.   State the purpose of the proposed project (*what do you want to accomplish?*):

        This mixed methods study will determine the perceptions and the possible difference in perception(s) between Missouri Educators, defined as teachers, counselors and building administrators, on the use of smart phones/cell phones in a secondary educational setting.

6. State the rationale for the proposed project (*why is this worth accomplishing?*):

Integrating smart phone/cell phone technology in the public school classroom remains

very limited (Obringer and Coffey, 2007; Kolb, 2007; Common Sense Media, 2009;

Meer, 2004). Through an intensive review of literature, the investigator has discovered

that several studies have researched teacher and administrator perceptions of technology

(Gorder, 2008; Murphrey, Miller, and Roberts, 2009; Palak and Walls, 2009; Li, 2007;

Guerrero, Walker, & Dugdale, 2004; Chang and Hsu, 2008). However, limited research

exists on the perceptions of Missouri educators and the use of smart phones/cell phones

in an educational setting and any relationship these electronic devices may have on

instruction (Brown, 2008; McConatha, Praul, and Lynch, 2007; Roberson and Hagevik,

2008; Kinsella, 2009). This study will provide insight into the perceptions of smart

phones/cell phones that exist and, due to their capabilities, may determine new

instructional strategies for integrating smart phones technology into the classroom.

7. State the hypothesis(es) or research question(s) of the proposed project:

- **Hypothesis:** There is a difference as measured by the survey between the perceptions of Missouri public secondary school educators (teachers and counselors) and administrators on smart phone/cell phone use in the classroom setting.
- **Null:** There is no difference as measured by the survey between the perceptions of Missouri public secondary school educators (teachers and counselors) and administrators on smart phone/cell phone use in the classroom setting.
- **Research Question(s):** How do Missouri secondary school (7-12) educators (teachers, counselors and administrators) in a public school setting perceive the use of smart phones/cell phones in the classroom? In what ways are Missouri secondary educators (teachers, counselors and administrators) utilizing smart phone/cell phone technology applications in the classroom?

8. Is this proposal under review by another IRB?   NO   If so, where? _____

9. Participants involved in the study:

a. Indicate <u>how</u> <u>many</u> persons, of what type, will be recruited as participants in this study.

LU participants   _____   Undergraduate students (Lindenwood Participant Pool)

                                         _____   Graduate students

                                         _____   Faculty and/or staff

Non-LU participants   _____   Children / Adolescents [need guardian's consent]

                                         __Up to 60,000__   Adults

                                         _____   Persons with diminished autonomy (e.g. seniors, medical

                                                  patients, persons in correctional facilities, etc.)

                                         _____   Other (specify):

b. From what source(s) will the potential participants be recruited? (specify):

The total population will be taken from the current identified list of 60,000+ Missouri school district secondary educators as noted by the Missouri Department of Elementary and Secondary Education website (DESE, 2011). A random sample will then be selected from the total population and will be contacted via email after their district superintendent has given his/her approval. Initially, superintendents will be contacted using the Missouri directory of school districts located on the Missouri Department of Elementary and Secondary Education website (DESE, 2011).

c. Describe the process of participant recruitment.

<u>Provide a copy</u> of any materials to be used for recruitment (e.g. posters, flyers,

 advertisements, letters, telephone and other verbal scripts).

d. If any persons within the selected group(s) are being excluded, please explain who is

being excluded and why. (Note: LU Participant Pool students must be allowed to

participate, though they may be excluded when analyzing data.)

None

e. Where will the study take place?

_____   On campus – Explain: __X___Off campus – Explain: School

Districts in the state of Missouri

10. Methodology/procedures:

a. Provide a sequential description of the procedures to be used in this study.

1. Superintendents will be contacted using the Missouri directory of school districts located on the Missouri Department of Elementary and Secondary Education website to obtain permission for teachers and administrators in their district to participate. The procedure included an initial email to superintendents with a full explanation of the survey along with an electronic consent letter, which was created so that any participant interested only needed to click on the accept link to begin completion of the survey.
2. Public and charter K-12 Missouri educators (teachers, counselors and administrators),will be contacted via email after their district superintendent's approval. Two reminder emails will be sent to participants to complete the survey on a monthly basis as well.
3. Teachers, counselors and administrators will complete an online survey found on GoogleDocs based on a stratified (urban, rural and county) random sampling. The survey questions clarify specific demographical information (e.g. gender, grade level taught, specific title, and region in the state where they teach). The survey also specifies how teachers perceive a smartphone/cell phone can be used in the classroom. Several questions have multiple options to choose from in terms of various applications of smartphones/cell phones that can be integrated into the classroom and whether or not the teacher/educator would use these if they were allowed to.
4. All participants in the initial survey will have an opportunity to provide the researcher with their phone number and email address if they are interested in an interview.
5. The researcher will interview a convenience sample of the researched population based on their response to participate in an interview. Interview questions allow for open-ended responses and are intended to gather specific details related to instructional practice not accessible through the survey. Upon completion of interviews, the researcher will transcribe interview responses.
6. The anticipated timeline for the research is August of 2011 when the email clarifying the study will be sent to superintendents across the state. The researcher will send reminders on a monthly basis, and final survey data will be collected after 8 weeks.
7. This study involves quantitative data from an analysis of the data gathered in the electronic survey and qualitative data collected from interviews of specific

participants. The data will be analyzed using all the proper statistical measures including z-tests for validity and confidence intervals. Descriptive frequencies and percentages from the survey questions will be generated as well. Qualitative responses will be analyzed through a content analysis for patterns of instructional design and implementation.

8. The research is intended to collect information from a cross-section of Missouri educators across the state. The results of the study will guide future research as it relates to smartphone/cell phone use in the classroom.

b. Which of the following data-gathering procedures will be used?

Provide a copy of all materials to be used in this study with application.

_____ Observing participants (i.e. in a classroom, playground, school board meeting etc)

__X___   Survey / questionnaire: ___ (paper) ___ (email) ___ (web based)

Source of survey: Researcher will put survey on GoogleDocs

__X___ Interview(s) ___ (in person) ___ (by telephone) ___ Focus group(s)

_X____ Audiotaping   _____   Videotaping

_____ Analysis of secondary data - **specify source:**

_____   Other (specify):

11. Will the results of this research be made accessible to participants?

If so, please explain .

Yes. The results will be posted on the researcher's website at the conclusion of the study, and the researcher will contact DESE to post the results on its website as well.

12. Potential Benefits and Compensation from the Study:

a. Identify and describe any known or anticipated benefits to the participants (perhaps academic, psychological, or social) from their involvement in the project.

None

b. Identify and describe any known or anticipated benefits to society from this study.

Society will gain a better understanding of the perceptions of Missouri educators

regarding the use of smart phones/cell phones in the learning environment.

c. Describe any anticipated compensation to participants (money, grades, extra credit).

None

13. Potential Risks from the Study:

a. Identify and describe any known or anticipated risks (i.e. physical, psychological, social, economic, legal, etc) to participants involved in this study.

None

b. Describe, in detail, how your research design addresses these potential risks:

c. Will deception be used in this study? If so, explain the rationale.

No

d. Does this project involve gathering information about *sensitive topics*? No
   If so, **expedited review is not an option**.

   {Sensitive topics include: political affiliations; psychological disorders of participants or their

   families; sexual behavior or attitudes; illegal, antisocial, self-incriminating or demeaning

   behavior; critical appraisals of participants' families or employers; legally recognized

   privileged relationships (lawyers, doctors, ministers); income; religious beliefs and practices.}

e. If you are gathering information from sources other than anonymous publicly available databases - Explain the procedures to be used to ensure anonymity of participants and confidentiality of data both during the data gathering phase of the research, in the storage of data, and in the release of the findings.

Participants who complete the online survey do not have to provide contact

information.

f. How will confidentiality be explained to participants?

Your participation in this survey is voluntary and being requested due to your

experience as an educator in the state of Missouri. If you choose to participate in this

study, your identity as a participant will remain confidential and your name will never

be publicly associated with any data or answers you provide. Results will only be

reported collectively at the conclusion of the study.

g. Indicate the duration and location of secure data storage and the method to be used
for final disposition of the data.

Paper Records

___X__   Data will be retained until completion of project and then destroyed.

_____   Data will be retained indefinitely in a secure location.

Where? _____

Audio/video Recordings

___X__   Audio/video tapes will be erased after completion of project.

_____   Data will be retained indefinitely in a secure location.

Where? _____

Electronic Data (computer files)

__X___   Electronic data will be erased after completion of project.

_____   Data will be retained indefinitely in a secure location.

Where? _____

14. Informed Consent Process: If you are using non-database sources (i.e. real people),

a. a. What process will be used to inform the potential participants about the study
details and (if necessary) to obtain their written consent for participation?

___X__   An information letter / written consent form for participants or their

legally authorized agents will be used; <u>include a copy with application</u>.

_____   An information letter from director of institution involved will be provided;

<u>include a copy with application</u>.

_____ Other (specify):

{Will participants be able to understand what you are telling them? If any participants in your

study sample are not fluent in English, or otherwise might be unable to understand to what they

are agreeing, **then full IRB review must be sought**.}

15. All supporting materials/documentation for this application are to be submitted electronically

with the application to <u>IRB@lindenwood.edu</u>. Please indicate which appendices are included with

your application. Submission of an incomplete application package will result in the application

being returned to you unevaluated.

_____ Recruitment materials: A copy of any posters, fliers, advertisements, letters, telephone or

other verbal scripts used to recruit/gain access to participants.

___X__ Data gathering materials: A copy of all surveys, questionnaires, interview questions,

focus

group questions, or any standardized tests used to collect data.

__X___ Information letter for participants.

___X__ Informed Consent Form : Adult

_____ Informed Consent Form: guardian to sign consent for minor to participate

_____ Informed Assent Form for minors

_____ Information/Cover letters used in studies involving surveys or questionnaires.

_____ Permission letter from research site

_____ Other:

Missouri Educator Perceptions of Smartphones/Cell Phones: Their Relationship to

Instruction

Survey

Thank you for participating in the following research study. Please complete all

numbered items below and comment in sections where these are suggested.

1. What is your education level?
    a. Bachelors
    b. Masters
    c. Doctorate

2.   What is your current educational role?
    a. Teacher
    b. Counselor
    c. Administrator
    d. Other

3. What is your gender?
    a. Male
    b. Female

4. How would you characterize the school districts region?
    a. Rural
    b. Suburban
    c. Urban

5. In what type of school setting are you employed?
    a. Middle
    b. High school

6. At what level would you perceive your own knowledge of smart phones (i.e. phones that have advanced computing capabilities like Internet access) and their application:
    a. Beginner (have used or seen used less than five times)
    b. Novice (have used or seen used at least weekly)
    c. Expert (have used or seen used at least daily)

7. Do you own a cell phone?
   a. Yes
   b. No
8. If you own a smart phone/cell phone, what apps do you use on your cell phone (check all that apply):
   a. Voicemail
   b. Email
   c. Texting
   d. Calendar/appointment features
   e. Accessing the Internet

9. What is the smartphone/cell phone policy of the school or district where you are currently employed (please check all that apply)?
   a. No smartphone/cell phones are allowed on campus
   b. Students can use a smartphone/cell phone before or after school
   c. Students can use a smartphone/cell phone before or after school and during passing periods and lunch
   d. Students can use a smartphone/cell phone in classroom per teacher's discretion
   e. Students are allowed to use a smartphone/cell phone whenever they like
   f. Other/list

10. If your schools allow a smartphone/cell phone in the classroom, do you have students use them?
    a. Yes
       i. Why
       ii. How have you incorporated a smart phone/cell phone in the classroom?
       iii. Please provide contact information if you are willing to participate in an interview
          1. Phone Number
          2. E-mail address
    b. No
       i. Why not

11. For what purposes would you have students use their smartphone/cell phone in the classroom (please check all that apply):
    a. Texting
    b. Accessing the Internet
    c. Utilizing the calendar/scheduling feature
    d. Listening to music
    e. Creating podcasts
    f. Researching information

      g. Accessing email

      h. Other

12. How would you describe the advantages of using a smartphone/cell phone in the classroom?

13. How would you describe the disadvantages of using a smartphone/cell phone in the classroom?

14. How would you characterize your interest level in using a smartphone/cell phone as an instructional tool?

      a. Not interested in allowing students to use cell phones

      b. Moderately interested in using cell phones

      c. Very interested in using cell phones

      d. Describe in more detail

Missouri Educator Perceptions of Smartphones/Cell Phones: Their Relationship to

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Interview Questions

1. What is your education level?

      a. Bachelors

      b. Masters

      c. Doctorate

2. What is your current educational role?

      a. Teacher

      b. Counselor

      c. Administrator

3. What is your gender?

      a. Male

      b. Female

4. How would you characterize the school districts region?

      a. Rural

      b. Suburban

      c.   Urban

5. In what type of school setting are you employed?
      a.   Middle
      b.   High school

6. At what level would you perceive your own knowledge of smartphone/cell phone and its application:
      a.   Beginner
      b.   Novice
      c.   Expert

7. How do you personally utilize your smartphone/cell phone during everyday activities?

8. Why do you think students should or should not be allowed to use a smartphone/cell phone in the classroom?

9. How have you used a smartphone/cell phone as an instructional tools?
      a.   Do you think it has had any impact on student engagement or achievement? Explain
      b.   What data do you have to support your perception of the increase in engagement or achievement?
      c.   How did your Superintendent, Building Principal or Colleagues perceive the student use of a smartphone/cell phone?
      d.   Were you required to gain special permission by the Superintendent or Building Principal to use a smartphone/cell phone during instruction? Why/Why not?

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Consent Letter

Dear Missouri educator,

I am currently a doctoral student at Lindenwood University in St. Charles, Missouri and am conducting a study on Missouri Educator Perceptions of Smartphones in a secondary setting. I will be collecting data through the completion of an electronic survey that assesses your perceptions of smartphone/cell phone use in the classroom.

Your participation in this survey is voluntary and being requested due to your experience as an educator in the state of Missouri. If you choose to participate in this study, your identity as a participant will remain confidential and your name will never be publicly associated with any data or answers you provide. Results will only be reported collectively at the conclusion of the study.

There is no risk of physical injury from participation in this survey and no penalty should you decide not to participate. Thank you for your assistance in this research. Sincerely,

Christopher Birch

Lindenwood University Doctoral Student

*To electronically sign this consent form and continue with the survey, please enter

the signature ID contained in the email you received.

In submitting this application the Principle Investigator certifies the information in this

proposal is complete and accurate.

Categories of research eligible for expedited review process:

Highlight and make **bold** either **1(a), (b)** and/or **(d)** to indicate which categories apply:

I. Exempt research includes:
   a.   Research conducted in ESTABLISHED or COMMONLY ACCEPTED EDUCATIONAL SETTINGS, involving normal educational practices, such as:
        i. research on regular and special education instructional strategies, or
        ii. research on the effectiveness of or the comparison among instructional techniques, curricula, or classroom management methods.

   b.   Research involving the use of EDUCATIONAL TESTS (cognitive, diagnostic, aptitude, or achievement), SURVEY procedures, INTERVIEW procedures, or OBSERVATION OF PUBLIC BEHAVIOR, unless:
        i. information obtained is recorded in such a manner that human subjects can be identified, directly or through identifiers linked to the subjects; AND
        ii. any disclosure of the human subjects' responses outside the research reasonably could place the subjects at risk of criminal or civil liability or could be damaging to the subjects' financial standing, employability, or reputation.

   c.   Research involving the use of EDUCATIONAL TESTS (cognitive, diagnostic, aptitude, or achievement), SURVEY procedures, INTERVIEW procedures, or OBSERVATION OF PUBLIC BEHAVIOR, that is NOT exempt under (b) above if:
        i.   the human subjects are elected or appointed public officials or candidates for public office; **or**
        ii. federal status requires, without exception, that the confidentiality of the personally identifiable information will be maintained throughout the research and thereafter.

   d.   Research involving the collection or study of EXISTING DATA DOCUMENTS, RECORDS, PATHOLOGICAL SPECIMENS, or DIAGNOSTIC SPECIMENS, if these sources are publicly available or if the information is recorded by the investigator in such a manner that subjects cannot be identified directly or through identifiers linked to the subjects.

If subjects are under age 18, research using SURVEY or INTERVIEW PROCEDURES is NOT eligible for exemption.

If subjects are under age 18, research involving OBSERVATION OF PUBLIC BEHAVIOR is eligible for exemption ONLY when the investigator does not participate in or manipulate the activities being observed.

Adapted, in part, from LU Ethics Form 8/03
Revised 9/08 Revised 3/09 Revised 1/21/2010

Vitae

Christopher Birch was born and raised in St. Charles, Missouri, attending public schools within that community. After receiving his Bachelor of Arts in English and Master of Arts in English Education from Truman State University, he began his professional career teaching middle school language arts for four years and teaching high school English for eight years. He also served as an adjunct professor at Lindenwood University for over 12 years.

Mr. Birch's administrative experience includes Dean of Students at Francis Howell High School for three years and currently Assistant Principal at McCluer North High School in the St. Louis suburban area. His professional interests include educational technology and professional learning communities. He has previously published articles for *Principal Leadership* and *American Journal of Education.*