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UTILIZING CELL PHONES AS A LEARNING TOOL IN THE CLASSROOM: PREVENTING DISTRACTIONS WHILE INCREASING STUDENT ENGAGEMENT

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Abstract

Many arguments circle the debate on the role cell phones play in today's digital age classroom. The common held belief that cell phones are distractions to a student's learning and only serve to disrupt their learning and understanding is being shaken by the arising belief that cell phones can actually serve to compliment one's learning. Survey and action research has found that cell phones do not diminish or take away from a student's learning of material but rather increase student engagement in lessons as seen through fewer prompts to stay on task and decreased observations of off task behavior. When cell phones are utilized in the classroom in a positive manner, they serve to cultivate a set of skills within the students that will allow them to be successful contributors to their future marketplace.

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CHAPTER 1

INTRODUCTION

In the last decade, cell phones have become a ubiquitous technology among K-12 students. In particular, with the advancements in smartphone technologies, sales in this arena have grown from approximately less than 250 million sales in 2006 to over 1.5 billion in early 2016 (McKitterick, 2016). By these numbers, over 1.5 billion people worldwide, including K-12 students, are walking around with pocket-sized computers gaining access to an unparalleled level of information in the matter of seconds. In fact, there has been increase in ownership of cell phones among children ages 8 to 18 from 39% to 66% (Rideout, Foehr, and Roberts, 2010). Although computers are an essential component of one's everyday life and are particularly key in educating and equipping today's generation of learners with 21st century skills (Prensky, 2005), these mobile devices are still often overlooked as computers (Thomas, O'Bannon, and Bolton, 2013).

Many students use their cell phones for social purposes. When walking through the classroom, it is easy to catch students sending a quick text or checking social media. Those few moments of diverted attention are enough for them to miss out on key aspects of lessons and instruction.

Many school districts and teachers across the United States place restrictions on the use of cell phones in the classroom. It is often standard protocol to prohibit students from using their personal devices during school and some even prohibit students from bringing cell phones on campus. These policies often originate from views that cell phones and other personal devices serve as distractions to students during instructional time (Obringer & Coffey, 2007). If school

policies do not ban students from carrying cell phones onto campus then they at least restrict their use to before or after school (St. Gerard, 2006). Notwithstanding parent, teacher and administrator's view of cell phone use during instructional time, students carry the belief that such devices are less disruptive and appropriate to use (Baker, Lusk & Neuhauser, 2012). However, more recently, educators have started to embrace cell phones in the classroom as a tool to enhance students' learning.

Why Cell Phones are Important in Learning

With the advances in mobile technologies, cell phones have shifted from devices of mere verbal or text communication to ones that have access to wealth of information and resources from around the world with just a touch of the finger. Their potential use also far extends passed the built in calculator, clock or notes features or even in students ability to participate in online discussions or surveys by texting in responses to website such as PollEverywhere and Socrative.

Today, students are using cell phones to demonstrate their learning of a new language. In one study, students used a cell phone video recording feature in order to record their progress with learning a new language. This study found that contrary to many studies citing the cell phones are inappropriate learning tools, the students involved were motivated by the instructional tool. Furthermore, the students demonstrated an increase in skill of learning the new language due to students retaking and producing video they felt fully demonstrated their learning (Gromick, 2012).

As these devices continue to evolve, downloadable applications expand their potential use in a classroom setting. These applications and devices are applicable across curriculum areas and across grade levels. For example, Flash Math or Grafunc are both helpful applications in a

math classroom that allow teachers to help individualize instruction and supports so students can become proficient in solving problems or recognizing and appropriately pairing graphs with their equations. Even within primary education, cell phone applications such as PreSchool Adventures are being used in classrooms to allow students to explore sounds, shapes, and body parts (Banister, 2010).

Furthermore, downloadable applications also exist to provide students with a virtual representation of complex models or systems. For example, Elements 4D by DAQRI superimposes a simulated view of elements onto a cube students hold in their hands. In this manner, students are able to interact with elements in a manner that was previously lacking. Applications that superimpose a virtual world on top of a physical location or object is called augmented reality (AR). One study utilized an AR application on a handheld device to teach a lesson which touched on concepts from science, mathematics and language arts to secondary students. The students who participated in this lesson not only experienced increased engagement while learning, but they also utilized team collaborate and communication (Dunleavy, Dede & Mitchell, 2009).

Purpose of the Study

The goal of this study is to investigate how integrating cell phones into a science lesson on physical and chemical properties of elements enhances eighth grade students' use of cell phones in the classroom, engagement with the lesson, and understanding of the content. Rather than viewing cell phones as disruption or distraction of students' learning in the classroom, this study aims to understand how cell phones can serve as tools for increasing students' learning and promoting higher levels of engagement among students. To this end, this study utilized a pre-

and-post test design design-based research to understand and determine the effectiveness of cell phones as a learning instructional tools in the classroom as tools for engagement and student learning.

Preview of Literature

With the increased use of cell phones, students are becoming progressively distracted and their attention is being diverted from the course content during class time **(**Kuznekoff & Titsworth, 2013**)**. These distractions and disruptions are occurring even with classroom and electronic device policies in place at the classroom and school level (Obringer & Coffey, 2007, St. Gerard, 2006**)**. It has been shown that as a disruptive device, cell phones can decrease student performance **(**Baker et. al, 2012, Kuznekoff and Titsworth, 2013**)**. However, teachers and students alike have also reported an increase in student engagement and motivation when cell phones were integrated into classroom as educational tools (Thomas, O'Bannon and Bolton, 2013, Pursell, 2009). Students are requesting an increase in lessons that tap into mobile technologies, not so they can become distracted, but so that they may have more experience with technologies seen in the real world and so desegregation takes place between their academic and personal lives with the "anytime, anywhere" qualities cell phones bring to a student's learning (Houser, Thorton, & Kluge, 2002, Kolb, 2011). The view that cell phones are merely a social communicative device is shifting to one that these devices are pocket sized computers that promote the development of communicative and collaborative skills that mirror what is seen in the 21st century (Shuler, 2009). Students around the world are utilizing these devices toward their learning of English and math as well as accessing course information on the go (Prensky,

2005). In today's modern classroom the discussion is shifting away from the question of "Can cell phones be used as instructional tools in the classroom" to how?

Preview of Methodology

In order to ascertain the role of cell phones as educational tools on student learning and engagement, the researcher conducted an experiment to determine the effectiveness of such devices. The researcher conducted a pre-assessment to determine student prior knowledge of the content addressed in the lesson. Also incorporated in the pre-assessment were questions to elicit student opinions and thoughts on cell phones as instructional tools as well as how often students access their phones for nonacademic purposes, such as texting, social media, etc., during the course of a lesson. The pre-assessment included questions that allowed to students to rank their answers their answers in terms of cell phone use or level of importance. The researcher then conducted a lesson which utilized cell phones as a central component of the activity. During the course of the lesson, the researcher observed students affective level of engagement as well as any off task behavior. Following the completion of the lesson, the researcher administered the same pre-assessment as a post-assessment to measure student learning and any potential changes in students opinion or use of cell phones in the classroom.

Significance of the Study

With advances in educational technology and an increase in their accessibility and use, teachers have the continuous need to be on the forefront of academic advances. Since cell phones entered into mainstream use, they have often been overlooked as tools of classroom instruction. While the rules in educational institutions have tightened to restrict cell phone use in academic

settings, cell phones have gained in popularity, accessibility and function. Technology tools have become available for student use in the classroom and while many are successful, no technological tool has been quite as successful at integrating into a student's everyday life as the cell phone. This study contributes to our understanding on how utilizing cell phones as instructional tools in the classroom impacts student engagement and learning by implementing a lesson plan where a cell phone is used to support students' learning. This study explores not only how students learning may change over the course of the lesson, but also assesses students' perceptions of cell phone use in the classroom. The results of this study provides teachers knowledge about how cell phones can support students' learning in the classroom.

Summary

As students are already using their cell phones to learn what interests them including looking up on YouTube how to play a musical instrument or researching an answer to a question on Google, a research study utilizing a pre- and post-test design was created to investigate the impact these devices would have on student learning and engagement in a classroom setting. While these devices have the ability to impact educational technology in today's modern world and classroom, the results of this study must first be examined. This project will focus on how cell phones influence student engagement and learning within the classroom, by performing a lesson that utilizes cell phones as central to their learning.

CHAPTER 2

LITERATURE REVIEW

This literature review focuses on the effect of cell phone integration and utilization on student learning in a middle school classroom. With the decreased costs and increased accessibility, cell phone penetration is continually increasing. However, rules that ban or limit cell phone use in classrooms persist. Plenty of research exists on the negative effects of cell phones, caused by their ringing and other distractions, in the classroom including decreased academic skills and performance. However, an increasing amount of research is developing on the benefits of utilizing mobile technologies, and all they have to offer, as a component to classroom instruction.

In what follows, I will first discuss the viewpoint that cell phones and other aspects of mobile technologies serve as distractions to student's education. From there, I describe the new research developing that addresses positive repercussions of integrating cell phones and their available tools within the classroom. I will provide a thorough review of articles that demonstrate that such devices not only equip students to be contributors to a technology based marketplace with up to date 21st century skills but also advocate for student learning outside the confines of a classroom but disintegrate the barrier between a student's personal and academic world and cultivate a classroom environment that not only allows but fosters an environment where students feel engaged and motivated in their learning. .

The Challenges to Mobile Device Use

Distractions to Student Learning

This research study cannot proceed without the acknowledgement of the common held belief that cell phones can pose many distractions to students in the learning environment. While cell phones can offer an abundance of beneficial tools, many educators and administrators today still believe they serve a great distraction to the students operating them. Within a single mobile device, students have access to social media, the web, games as well as email and messaging. In a classroom setting, accessing any of these tools when not directed can lead to a distraction in their learning and a disruption in their content knowledge. Recent statistics demonstrate that students have increased the amount they text from 60 texts a day to 100 per day. Furthermore, teens have admitted to sending text messages during class, regardless of the cell phone limitations their classrooms may hold (Kuznekoff & Titsworth, 2013). While many may argue that student texting is more than likely higher than these statistics show, what these numbers do illuminate is that cell phone usage is on the rise and at risk of being a distraction to their studies.

An increase in student texting during class time not only means that their attention is not focused on the content they are to be learning, but further increases their opportunity for cheating during assessments. This division in their attention can significantly impact their learning. With their attention drawn elsewhere, the information they are gathering may often be incomplete or inaccurate. This can then lead to the long-term memory storage of incomplete and inaccurate information (Kuznekoff & Titsworth, 2013). Ultimately, their divided attention can impact their performance not only in the class they are enrolled, but subsequent classes that build on that knowledge. During testing, students may be tempted to cheat by texting during assessments or taking pictures of certain test questions (Pursell, 2009). With the ease and accessibility of cell phones, the opportunity to cheat is a valid concern of most educators. Many have, in fact, developed protocols of cell phone or bag placement in a class while a test is being taken.

Usefulness and Accessibility

While a disruption to student learning and the potential of cheating is a serious concern, much of the concern from educators pertaining to mobile technology in the classroom falls into the usefulness and ease of the devices. With technologies quickly advancing, even from one year to the next, many educators are concerned about the usefulness of the tools or technologies in the coming years (Motiwalla, 2007). Due to the increased speed in advancement of these technologies, what is a useful tool or device today will soon be outdated. This leads many districts to be hesitant to adopt extensive technology for their students or to significantly invest in any one tool. Furthermore, students have expressed frustration over the use of cell phones in the classroom. Many students have complained about apps not working, as well as, due to the size of the keyboard on their phone, the amount of time spent typing while attempting to submit a discussion response (Gikas & Grant, 2013). Technology may at times be unreliable and frustrating in that what an educator may expect to work in the classroom one period, may not work the next period. Whether due to issues in Wifi or cell phone storage, many educators find themselves hesitant to utilize not only mobile technologies, but technologies in general, in their classrooms due to the need to plan for the potential malfunctions. Student frustration over the ease of use of cellphones, may also deter some students from using them as frequently as others.

Certain studies have shown that with cell phone use, student performance and grades drop in class (Baker et. al, 2012, Kuznekoff and Titsworth, 2013). Many teachers believe that students are losing critical skills due to technology immersion and overuse (McCoy, 2013). Furthermore, technology use always works in concert with the conversation of accessibility to all socioeconomic statuses, ages, gender, etc. While there still exists differences in accessibility,

many believe that cell phones are becoming more accessible with cheaper costs, allowing them to be more functional within the classroom (Prensky, 2005, Thomas et. al, 2013, Shuler, 2009). Additionally, concerns such as student performance and learning are addressed in this chapter.

Equitability

Conceivably, the biggest concern many educators, district officials and parents have is that technology may not be equitable in access. Technology tools are not always feasible for many households to own. However, S. Craig Watkins stated in his paper, "Digital Divide: Navigating the Digital Edge" that the digital divide is no longer pertaining to having access to technological devices outside of the school but rather on the ways that those devices are being used. He argues that participation is then more important than access for closing the achievement gap of students (Watkins, 2012). Furthermore, today's modern mobile technologies are often more prevalent in homes of disadvantaged socioeconomic groups than home computers. As mobile technologies advance, prices to such devices lower making them more feasible and decrease the digital equity margin (Shuler, 2009). While the concern has not been entirely eliminated, it has significantly lessened in recent years allowing teachers to explore more options of cell phone integration in the classroom.

Even still, there are researchers and authors who believe that the digital divide does not necessarily pertain to participation with technologies or access to technological devices. Wendy Sutherland-Smith, Ilana Snyder and Lawrence Angus, in their article, "The Digital Divide: Differences in Computer Use Between Home and School in Low Socio-Economic Households," believe the digital divide pertains to home access to the Internet and other devices that enable communication or the gathering of information. One of the issues they identified with their

definition of "digital divide" is that there is a gap between technologies used at home compared to in school. According the authors, there are no attempts by the schools to utilize technology skills implemented in the classroom at home. Students in the families that were studied stated that although they may learn something in their classroom, they never utilize those skills outside of that environment (Sutherland-Smith et al, 2003 p. 12).

The Benefits to Mobile Learning and Device Use

Notwithstanding challenges to cell phone integration, more research is arising today expressing the benefits of cell phone integration in the classroom. Of the benefits, described in more detail below, includes the realism to student lives that cell phone use provides. Many students believe that without technology use in the classroom, the learning is “unrealistic and artificial” to that of their everyday lives (Baker et. al, 2012). Using cell phones in the classroom bridges the gap between a student’s life in the classroom and the one they live the second they walk out (Shuler, 2009). Furthermore, studies have actually shown to contradict teacher opinion of diminished writing or communicative skills due to cell phone use as students are able to code-switch between language relating to cell phone use and academic language (Thomas and McGee, 2012, Thomas et. al, 2013).

Cultivation of 21st Century Skills

The foundation behind educational institutions is that they are to prepare their students for the world they are about to enter. This not only includes important interpersonal skills such as communication and collaboration, but technical skills such as researching, creating and analyzing complex concepts and scenarios. Today’s marketplace is becoming increasingly

technology based. Businesses that have locations in various countries require their employees to collaborate and communicate across distances. Aside from needing basic technical skills such as computer and word processing, employees of various job markets are required to perform research and create presentations, products and proposals. With this being the marketplace that the current generation of students are entering, it is imperative that the educational institutions they are attending are equipping them with the necessary knowledge and skills to be successful. In order to provide these knowledge and skills sets, educators must then incorporate mobile devices and technologies into their curriculum.

Utilizing a variety of technologies and modalities for learning in the classroom is beneficial for students in general. Not every student learns in the same manner or through the same mediums. Incorporating various forms of instruction in the classroom ensures that all student's needs are met. Many educators have found that by incorporating visual aids in their classroom, students create a deeper understanding of the key concepts (Escalada, 1995). Furthermore, utilizing the Internet strengthens course lessons and magnifies student learning (Motiwalla, 2007). These findings illuminate that various forms of exposure of content to students, particularly in the form of technology, can enhance a student's educational experience and, therefore, their learning.

Furthermore, teaching students through the use of technology and imagery allows educators to teach "nature as it is, rather than in idealized form" (Escalada, 1995). This is becoming significantly more important to consider as the integration of mobile devices into people's everyday lives expands. As stated previously, if the world students are engaged in and destined to be a part of is rich in technology that enables them access to information once difficult to obtain, it would be arguably foolish to block or limit their exposure and experiences

with the content through those mediums. Many students can identify specific forms of technology which would require proficient skills in future jobs thus rendering the need to develop these skills in school. From working with digital video cameras to word processing, students recognize the need for these technological skills in the professional world and have an interest in seeing these devices used in a classroom setting (Spires, Lee & Turner, 2008). In this manner, students are no longer limited to engaging with the content through a book or pen and paper, but can rather experience the content in an engaging form.

With the use of cell phones and mobile devices in the classroom, students can gain many beneficial skills that will allow them to be competitive contributors in the global marketplace. Through the utilization of cell phones in the classroom, students will learn how to collaborate with their peers through a multimodal fashion. Furthermore, cell phone utilization allows communication to expand to a global realm that allows students to build their learning through conversations with others (Shuler, 2009). Shuler goes on to explain "mobile technologies facilitate what researchers call 'conversational learning,' in that they naturally support an environment where people 'can converse with each other, by interrogating and sharing their descriptions of the world.'" Mobile technologies, such as cell phones, promote an environment that allows students to communicate with each other in a manner that further develops an essential life skill. These devices further allow students to communicate with others in ways beyond the traditional sense of the word with both their educators and peers alike (Shuler, 2009).

Perhaps one of the most beneficial aspects of integrating mobile devices into education relates to the longevity of the knowledge and skills this integration presents. Researchers have found that when students utilize mobile devices in their class activities, they not only develop higher order thinking skills as well as higher-level intellectual skills, but they develop an

improved perspective toward their learning which in turn fosters a deeper understanding on content (Escalada, 1995). Lawrence Todd Escalada demonstrates in his paper that cell phones are no longer restricted to sending text messages or engaging in social media, but can be used to cultivate refined 21st century skills that are applicable across all content areas and fields. With skills such as these that are cultivated through the use of mobile technologies in a classroom setting, students are set up for greater success in their future educational endeavors and beyond.

Cell Phones Promote Anywhere, Anytime Learning

Many of today's mobile devices can perform many of the same functions as standard computers do. This includes web research, document writing and editing, etc. Due to these devices being transportable, people are no longer restricted to work at a desk but can rather take their work with them (Houser, Thorton, & Kluge, 2002). With this "anywhere, anytime" take on education and learning, students have an increase in their autonomy and control over their education. With content utilizing these forms of technology, students can access their course information whenever they feel they need to. A study that was done in Japan comparing the use of lessons accessed over computers and cell phones found that after fifteen days 90% of cell phone users were still returning the lessons and accessing course information. This compares to only 50% of computer users returning to review course work (Prensky, 2005). One could further argue that with the increase in accessibility and subsequent access to course content, retention of that information would increase as well.

With the increased capabilities of cell phones, students are able to perform a multitude of tasks on mobile devices that were previously unavailable. These uses include internet access, voice recordings, media creation, taking/sharing notes, use of dynamic applications, etc. With

content utilizing these forms of technology, students can access their course information whenever they feel they need to including accessing video and audio recordings, lessons and activities on their phones, enabling them to work on classroom activities outside of the classroom (Kolb, 2011).

As a result of cell phones always with the students, they have the unique ability to access course content and information while on the go, as opposed to strictly in the classroom or chained to a textbook. They comment that because their phone is always with them, they can review for a test while they are driving in a car or in the bathroom. This allows education to meet the needs of the current generation of students (Pursell, 2009, Shuler, 2009, Thomas and Orthober, 2011). Students have further remarked that through an increase in cell phone use in their coursework, their classes become more intertwined into their daily lives (Gikas & Grant, 2013). Having content imbedded into the lives of students is important for retention of that knowledge. The more school work can permeate into a student's average day, it could be expected that they would then be more likely to be successful in their classes. With mobile device sales projected to surpass that of computer sales in the United States, many countries are already selling more mobile devices than PCs, the accessibility of schooling can also be projected to trend upward with the sales (Motiwalla, 2007).

The Impact of Cell Phones on Students' Motivation

The integration of cell phones in classrooms has the unique ability to increase student engagement (Pursell, 2009). With increased engagement through a tool that may be otherwise restricted, teachers will then see an increase in student's intrinsic motivation and productivity (Graham, 2014). In one study that utilized PDAs or other smart mobile devices through multiple

mediums including AR and the Internet in order to enhance student learning of English, researchers found that students were more motivated, confident and satisfied by the content and their learning after the use of the devices in the lesson (Liu & Chu, 2010). The impact this has on student learning is that once students are home, they are more included to voluntarily access the same learning apps they used in the classroom (Ciampa, 2013).

It can be argued that the motivation and excitement students experience from lessons that utilized cell phone technology and applications stems from student's current inclination and propensity to use such devices in their everyday lives. Students have the desire for their school life to mirror that of their real life - including the technologies they use. This desire translates into a classroom that can engage and motivate a student to learn. Students admit that utilizing technology makes learning more engaging and that they have the particular desire to see cell phones utilized more in the classroom (Spires, Lee & Turner, 2008). When learning utilizes devices, apps and technology that they use in their everyday life, the line of separation between their academic and personal lives thins. With this, they were able to take their learning outside of the classroom and in whatever location best suits them thus increasing their engagement with their learning and content (Ivala & Gachago, 2012).

The premise behind increasing the utilization of mobile devices in the classroom is so that student learning will be enhanced and deepened. Studies and statistics have illuminated that employing the use of cell phones will strengthen student learning and understanding. Educators have found the quality of student responses as well as participation to discussions and questions have increased (Motiwalla, 2007). Coupled with their ability to provide a voice to students who may otherwise withdraw from class, cell phones can be a powerful learning tool and instructional tool in the classroom. Students who are shy utilize texting in responses in the classroom, or

online discussion posts, share what they are thinking without speaking in front of the class (Thomas and Orthober, 2011).

Conclusion

From analyzing these sources, one may come to find that nearly every source acknowledges the possibility of cell phones as a disruptive device in the classroom. However, many authors counter with the benefits they offer in the way of student engagement, motivation and development of 21st century skills. Research has shown that not only are students more motivated and engaged in lessons that utilize mobile technologies, but students have the desire to learn from these devices. These devices bridge the gap between a student's personal and academic life as well as set them up for a success in a future environment that will seek out those with skills on such devices. With student drive in place, it becomes the educators and administrators responsibility to cultivate an environment in which students feel engaged and equipped in their learning. This responsibility includes developing and implementing lessons that use mobile devices, such as cell phones, as a component in the learning of the content. Such lessons will not only increase student engagement, but enhance their learning as well. In the next chapter I discuss a lesson that seeks to do just that.

CHAPTER 3

METHODOLOGY

This study was conducted with a pre- and post-test design in order to understand the influence of the educational use of cell phones on student learning and engagement. Results of these assessments will allow the researcher to develop insights into student perception of cell phones as learning tools, student use of cell phones for educational and social purposes, and cell phones influence on student learning in a classroom setting. Pre- and post-test design was an appropriate method as the researcher was examining how a modification to a learning process (integration of cell phone technologies) influences educational outcomes (student engagement and understanding). This method, commonly used in educational research, decreases the potential for error and increasing the likelihood of evident statistical impact when coupled with both forms of assessment (Dugard & Todman, 1995).

Participants and Setting

The school this study took place in serves 535 students of which 73.9% are Caucasian, 16.5% Hispanic or Latino, 6.4% Asian, 1.7% two or more races, 0.7% Filipino, 0.5% Black or African American, and 0.3% American Indian or Alaska Native. 12.4% of the students are socioeconomically disadvantaged, 13.9% have disabilities, and 4.4% are English learners.

The participants of this study included 124 eighth grade students in a middle school. 16 students are on an IEP or 504 plan, 5 students are English learners, 13 are reclassified fluent English proficient, and included 71 students are male and 53 females.

Data Collection

Data collection took place by the researcher within four separate, but similar, eighth grade science classes over the course of one week. Each class session was two block periods, lasting a duration of 140 minutes. Each class is similar in size, ranging from thirty-two and thirty-four students, and each classroom contained students classified as English learners and/or who have an IEP/504 plan. Selecting classes that were similar in demographic and time helped to ensure that any differences in data could be associated with the variable being tested - effect of cell phones as in instructional tool on student learning and engagement.

The role of the teacher in the research was to teach a lesson which utilized cell phones as a primary component in the completion of the lesson. The use of the cell phones as an instructional tool was decided on by the teacher and was dependent upon the content of the lesson. For the purpose of this lesson, an application was utilized on the smart devices in order for students to explore the properties of elements on a periodic table, patterns within the construct of a periodic table, and properties of compounds after bonding of atoms. The role of the students was to complete the lesson through the use of the instructional tool.

For this study, the researcher conducted pre- and -post-tests with all four classes of students. The pre-test was a survey was taken prior the the beginning of the lesson and was given electronically using Google Forms. The posttest was given under the same conditions with exception to being taken at the end of the lesson. The students filled out the surveys anonymously. On the surveys, students were asked about their use of cell phones in and out of the classroom, their perception of cell phones and their potential educational uses. Students were also asked content based questions that were covered through the lesson. Content questions

included observations regarding the construct of the periodic table, the purpose of bonding and which atoms will bond.

Instruments

The survey used in this study assessed student's current use of cell phones during class time. The survey included questions such as "How often do you access your cell phone during class time? , "Do you view your cell phone as an educational tool?", and "Approximately, how many hours a day do you spend on your cell phone?" Observations were also conducted throughout the course of the lesson. The researcher conducted classroom observations and documented students' level of task engagement, ranking of student engagement and the number and content of student questions and comments. Finally, students were surveyed again at the end of the lesson where they were asked questions such as, "How often did you access your cell phone during class time?" and "Do you view your cell phone as an educational tool?"

Data Analysis

Pre-and- post-test data from the two classrooms participating in the study were collected. From these assessments, descriptive statistics were utilized to analyze student responses. Percentages of student responses to questions addressing their use of cell phones during class time, the frequency with which cell phones are accessed in a class setting, and student perception of cell phones in an educational setting were analyzed to observe trends as well as understand student perception. Additionally, percentages of student responses to content based questions were analyzed for growth in student understanding. A paired t-test was also used to evaluate if

there was a statistically significant difference between the pre and the post test with respect to students' understanding of the content.

Summary

A pre- and post-test design study was created to understand the influence cell phones have on a student's engagement and ability to learn and comprehend content in a classroom setting is essential to lesson planning and equipping students for success. The study incorporated the use of cell phones as a key instructional tool and data on student perceptions of cell phones, their use of cell phones in and out of the classroom, and their understanding of the content addressed in the lesson.

CHAPTER 4

RESULTS

The goal of this study was to determine the effects of cell phone educational applications on student engagement and understanding. In what follows, I share the results of student's social and educational use of cell phones during class. This cell phone use is in lessons with and without the incorporation of cell phone devices as instructional tools. I then provide results on student perception on the impact cell phones have on their ability to focus in a classroom setting followed by how often their teachers request that they access their phones for learning purposes. I conclude this chapter with data on student performance and demonstration of understanding on the content from the pre-test and the post-test.

Student Social Use of Cell Phones

On the pretest, 41.9% of students reported that they never use their cell phones for social purposes, 43.5% of students reported that they used their cell phones 1 to 3 times per class per day, 8.1% of students reported that they used their cell phones 4 to 6 times per class per day, 4% of students reported that they used their cell phones 7 to 9 times per class per day, and 2.4% of students reported that they used their cell phones 10 times or more per class per day for social purposes.

On the posttest, when specifically asked about the lesson during which they were using cell phones for content learning in the classroom, 57.3% of students reported that they never used their cell phones for social purposes, 29% of students reported that they used their cell phones 1 to 3 times, 8.1% of students reported that they used their cell phones 4 to 6 times, 1.6%

of students reported that they used their cell phones 7 to 9 times, 4% of students reported that they used their cell phones 10 times or more for social purposes during the lesson. This suggests that students used their cell phones less for social purposes during the lesson than they usually do during regular class time.

Student Educational Use of Cell Phones

On the pretest, 18.5% of students reported that they never use cell phones for learning purposes in class, 68.5% of students reported that they use cell phones 1 to 3 times per class per day, 9.7% of students reported that they use cell phones 4 to 6 times per class per day, 3.2% of students reported that they use cell phones 7 to 9 times per class per day for learning purposes in class. When asked about how often their teachers ask them to use cell phones in class for learning purposes, 15.3% of students reported that their teachers never ask them to use their cell phones in class, 53.2% of students reported that their teachers almost never ask them to use their cell phones in class, 26.6% of students reported that their teachers sometimes ask them to use their cell phones in class, and 4.8% of students reported that their teachers ask them to use their cell phones in class all the time.

On the posttest, when specifically asked about the lesson during which they were using cell phones for content learning in the classroom, 12.9% of students reported that they never used cell phones for learning purposes during the lesson, 43.5% of students reported that they used cell phones 1 to 3 times, 19.4% of students reported that they used their cell phones 4 to 6 times, 10.5% of students reported that they used their cell phones 7 to 9 times, and 13.7% of students reported that they used their cell phones 10 times or more for learning purposes during the lesson. Overall, while 81.5% of students reported using cell phones for learning purposes in

class on the pretest, 87.1% of students reported using cell phones for learning purposes during the lesson on the posttest.

Students' Perceptions of Cell Phones

Students were asked three questions about their perceptions of cell phones on a 4-point Likert scale (1 = completely disagree, 4 = completely agree). Table 1 summarizes students' responses on the pretest and the posttest.

Table 1. Summary of students' responses to the survey questions on their perception of cell phone use

	1		2		3		4	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post
I believe cell phones are more for social purposes than for learning purposes	10.5%	12.9%	33.9%	24.2%	37.9%	35.5%	17.7%	27.4%
I believe cell phones can be used for learning purposes	6.5%	4.8%	13.7%	16.1%	24.2%	22.6%	55.6%	56.5%
I get distracted by my phone in class and use it even when it's not allowed.	60.5%	50%	25%	30.6%	9.7%	12.1%	4.8%	7.3%

Students' Understanding of the Content

A paired t-test was conducted to measure a change in students' understanding of the content from pretest to posttest. The questions on the pre-and-posttest were the same. These questions include: (1) What patterns are observable by looking at the periodic table? (2) Looking

at your periodic, which of the following atoms are most likely to bond together? (3) Why are the atoms you selected in the previous question most likely to bond together? (4) Which is true about characteristics of elements after a chemical bond formed? There was a statistically significant difference between students' pretest and posttest scores (see Table 2).

Table 2. Summary of paired t-test results

Pretest		Posttest				
M	*SD*	*M*	*SD*	*df*	*t*	*Sig.*
1.3509	.87610	2.4035	1.19313	56	-4.810	.000*

CHAPTER 5

DISCUSSION

With advancements in cell phones, mobile technologies are increasingly infiltrating the lives of students and the population alike. The benefits that mobile technologies offer to the academic experience of students far outweigh any potential distraction or disruption they may cause in the classroom. With their ability to engage and motivate students in their learning as well as cultivate and develop 21st century skills, these devices and the tools they offer, enable students to be equipped and successful contributors to their future marketplace. Lessons that utilize mobile technologies have shown to increase student engagement and have a positive impact on student learning. It is clear that the students who participated in this research, just as ones in other research conducted, have a desire to utilize cell phones as instructional tools in the classroom and do not feel they serve as distractions in their education. Cell phone and mobile technology policies and lessons that support their use should be designed and implemented that allow students access and use of devices that can support their education.

Study Overview

A pre- and post-test research design was created and implemented in order to unveil the effect cell phones as instructional tools on student learning and engagement. This research method was selected as it easily highlights how a modification to a learning practice and influence academic results (Dugard & Todman, 1995). The pre- and post-tests consisted of questions pertaining to student use of cell phones in and out of the classroom, their perception of cell phones and their potential educational uses. The assessments also contained content based

questions regarding the construct of the periodic table, the purpose of bonding and which atoms will bond. The assessments were given in conjunction with a lesson that utilized cell phones as a central instructional tool. Students in four 8th grade Physical Science classes took the tests anonymously over the course of one week.

Summary of Findings

The pre- and post-tests confirmed that student learning improves with the implementation of cell phones as instructional tools. Students showed a visible increase in understanding of the content over the course of the lesson. Furthermore, cell phones have shown to have no significant adverse impact on student engagement as students were actively participating and engaged throughout the lesson. Students overall reported that cell phones did not serve as distractions to their learning and that they perceive them to be instructional tools rather than strictly for social purposes. Despite this perception, the majority students reported that their teachers almost never request them to use their phones for academic purposes during class time.

Educational Implications

The findings of this study suggest that students are engaged and motivated to learn when cell phones are used as instructional tools. The findings also show that cell phones do not serve as great or deleterious distractions as once believed but rather help support student learning and understanding of course content. This supports previous research with similar conclusions (Escalada, 1995, Ivala & Gachago, 2012, Motiwalla, 2007, Pursell, 2009). Instead of finding that students are consistently distracted by their cell phones in class, students actually view their mobile devices as potential tools for instruction. This unexpected finding leads the researcher to

two potential conclusions. It is possible that students mislead their social use of cell phones during class instruction as they did not want to displease their teacher. Despite the pre- and post-tests being anonymous, they may have felt that saying that they rarely access their phones for social purposes during class time would be the answer the researcher would want to see. Regardless of this possible conclusion, observation of student engagement and data analysis from student understanding of content show that any potential distraction was not great enough to deter a student from engaging with the content and comprehension thereof.

The second potential conclusion the researcher may come to based on the unexpected low social use of cell phones during class time is that students are ready and prepared to use these devices as educational tools. This mirrors previous research that shows an interest and desire of students to utilize devices such as these more often in their studies (Spires, Lee & Turner, 2008). With this conclusion, it then becomes imperative that school policies and classroom instruction steer from the negative perception of these devices and seek to design and implement lessons that utilize a tool which students are seeking to use appropriately. With these results, teachers should be strategically placing themselves ahead of the curve for mobile technology implementation. Teachers and administrators should set aside any negative perceptions of cell phones and begin gearing lessons and activities towards tools and devices that students are not just interested in, but a device that is readily available due to their mass infiltration into people's everyday lives.

With cell phones gaining in popularity and prevalence, students have access to a device that has nearly unlimited resources and uses. With the many ways students access their cell phones for nonacademic purposes throughout the day, student engagement and learning can be improved by their use as educational tools. Additionally, students will become equipped with

21st century skills with increasing technology use in the classroom that will allow them to be fierce competitors in the marketplace. When technology is utilized in the classroom, students will develop communicative, critical thinking and problem solving skills that will be critical skills to develop in their futures. When students can access their education in a way that relates to their personal lives, there will be no cap on what students may learn.

Limitations and Future Research

Despite the findings that state otherwise from this research study, students could have potentially experienced a negative impact if the cell phone use as an instructional tool had an adverse effect on student learning and engagement. This could be corrected through the reteaching of the lesson either with or without the utilization of cell phones. In addition, because the surveys are anonymous and observations aren't including personal student information and assessments are not including student names, the concern over the risk of student personal information being released is unlikely.

Further studies should be conducted over an extended period of time to assess student engagement and learning with the use of cell phones across multiple lessons and activities. Additional studies and research should take place to observe the effects of specific uses of cell phones on student learning and engagement. For example, how an application accessed over a cell phone influences student learning and engagement compared to a website accessed over the device. This would help shed light on the impact of if the way cell phones are used influences student engagement and learning and not solely the use of cell phones in general.

Additional research would be beneficial to determine what training, and what forms of training, teachers would need in order to design and implement lessons with the successful use of

cell phones as instructional tools. It would be beneficial to know what experience, if any, teachers have with the utilization of cell phones as educational tools in the classroom. With this knowledge, professional development can be geared toward equipping teachers with necessary resources. Without the understanding on what sized gap exists in teacher's preparedness to implement such lessons exist, it will be difficult to expect teachers to move forward with the utilizing cell phones as instructional tools despite the positive findings of this study.

Conclusion

Cell phones carry the potential to significantly impact and revolutionize the way students learn and their experiences within a classroom. Students are ready and prepared to use a device they commonly carry as an educational tool as they positively impact student learning and engagement. With the increase in accessibility and development of various applications, the possibilities on the ways these devices may be used within the classroom is endless.

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