An Analysis of the Relationship Between Bring Your Own Technology and Academic Achievement in the Middle School Environment

A Dissertation submitted
to the Graduate School
Valdosta State University

in partial fulfillment of requirements
for the degree of

DOCTOR OF EDUCATION

in Educational Leadership

in the Department of Curriculum, Leadership, and Technology
of the Dewar College of Education and Human Services

May 2016

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ABSTRACT

BYOT (Bring Your Own Technology) is the practice of students bringing their own digital devices to school to use for academic purposes. This practice has been growing since the early 2000s. BYOT has been touted as a solution for schools which may lack hardware and network resources to provide devices to all students. By allowing BYOT, schools have created a learning environment which permits assortments of tablets, phones, laptops, and smart devices. With the introduction of a miscellany of devices, teacher practices have had the opportunity to change. Despite a growing proclivity of BYOT, the question has remained of the impact these devices may have for students and teachers on achievement.

Mixed research methods were used to center on BYOT practices of middle schools with a focus on eighth grade standardized test scores. The student-to-computer ratio of school-owned technology was studied along with BYOT opportunities in schools. These two factors were examined in relation to the standardized test scores in the schools to determine if any achievement associations were found with school-owned technology or student-owned technology. In addition, a survey was utilized to determine BYOT practices in the school, hindrances to BYOT implementation, and teacher knowledge and skills to implement BYOT. BYOT and school-owned technology were not associated with academic achievement. The practice of BYOT will grow as schools continue to bring technology into classrooms, and teachers need more training to support school-owned technology as well as student-owned technology.

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ACKNOWLEDGEMENTS

Thank you to Dr. Leon Pate and the members of dissertation committee. Dr. Leader, thank you for your patience and your guidance. Dr. Truby, thanks for being an encourager throughout this process. Dr. Wiley, thank you for wisdom and insights shared.

Thank you to my friends and family for your encouragement and support throughout this process. To the Thompsons, thank you for helping me get my children everywhere they needed to be and providing some parenting along the way. I don't know what I would do without you both. Thank you to all three of my sisters. To my sisters, Jennifer, Julie and Amy, and your families, you helped me in so many ways, and I am grateful for your encouragement. Thank you, Judy Skinner, for your editing skills. Thank you to two sweet little girls who have grown up so much during this process. I love you, Ellie and Jamie. Most of all, thank you to my loving parents, Larry and Linda Smith, whose love, encouragement, work ethic examples, and praise helped me achieve so much. I am grateful to you both for all of your help in raising my girls throughout this process.

DEDICATION

This work is dedicated to Ellie and Jamie, my daughters. You both are my best cheerleaders, and I thank you for all of your love and support. I love encouraging you both as you accomplish so much, and I can't wait to cheer for you both in the future as you make life dreams into reality.

Chapter I

INTRODUCTION

Schools have been organized for learning with textbooks and paper-based resources as the norm. In the 21st century, changes have begun as students not only have brought pencils, pens, paper, and notebooks, but they have also begun to bring their own personal digital devices to school (Muller, 2014). These digital devices have potential to change the process, the learner, and the teacher (Norris & Soloway, 2010). With so much potential within a device fitting in a child's pocket, there is a strong possibility these devices can help prepare students for the digital world beyond graduation (Nielsen & Webb, 2011). Educational technology is effective according to some study results, but there are more questions regarding tools that are quickly becoming fixtures, expected tools, in the classroom. Technology appeals to a variety of ages of students from the preschooler who explores with fascination to the high school student who uses the digital device as an essential communication tool for 21st century social life (Goodwin, 2011). Yet, it is the middle schooler who bridges technology exploration with technology habits (Burton & Greenhow, 2011).

The middle school student has more technological opportunities than previous generations (Prensky, 2010). As middle school students become accustomed to using technology both inside of school and beyond, there is an expectation of increased use of technology. Increased use will affect academic achievement, according to some study results (Purcell, 2012). At the middle school setting, the student should have been getting

more and more opportunities to explore with technology, use technology for research, create products with technology, and even publish their digital products so that there is learning synthesis (Goodwin, 2011). This synthesis of digital learning activities should have been happening in the middle school setting as teachers extend concepts from elementary school as they prepare students for the high school and post-secondary setting. With digital devices permeating lives outside of the school building for many students, technological concepts as defined by the International Society for Technology in Education's (ISTE) 2007 NET-S Standards are critical: creativity and innovation; communication and collaboration; research and information fluency; critical thinking, problem solving, and decision making; digital citizenship; and technological operations and concepts (ISTE 2007).

Middle school teachers were expected to teach these critical educational technology standards while addressing academic standards using school-owned technology (Goodwin, 2011). Until recently, students were not to bring their mobile devices to most schools (Ribeiro, 2013). Cell phones were confiscated, and students faced possible punishment for bringing a cell phone to school (Campbell et al., 2010). Phones and other digital devices were viewed as distractions from the learning, and suspension and other punishments were allowable because of personal device use (Wheeler, 2015). As more and more students have the devices, schools have not been able to keep them out of the classroom, so many institutions have accepted the devices rather than ban them (Taylor, 2015). With the rising cost of digital devices as well as the proliferation of these tools in society, schools have realized the student's device has as much potential as the classroom computer (Vanderark, 2011). The rationale has been

that mobile devices are familiar to students; thus, they may hold learning opportunities greater than the school-owned devices may provide. In response to this, vendors have made sure textbooks have moved to electronic format, and mobile applications have become more sophisticated for learning. Schools have realized there is opportunity in the devices the students have brought to school (Fletcher, Levin, & Schaffhauser, 2012).

Statement of the Problem

This new wave of technology, *Bring Your Own Technology* (BYOT) or *Bring Your Own Device* (BYOD), has created readily accessible information (Prensky, 2010). Schools have considered the entry of these devices into classrooms as a way to satisfy parents and students in their quest to have learning tools (Levinson, 2013). With a signed permission form, the parent or guardian allows for the digital device to go to school with the student. With that permission, digital devices are coming to school that outperform some school technology and access resources that are better than some outdated textbooks still found in many classrooms (Catapano, 2014). As students have been allowed to bring devices to school, there has been little known information about how those tools may associate with academic achievement. Proponents of BYOT have asserted that personal digital devices are essential for students to learn to navigate the electronic world beyond school (Cuban, 2013). Others state that technology tool access will also improve academic skills such as Gleason and Greenhow (2012) who have made the connection of technological literacy – a student's ability to utilize and navigate technology as well as make digital products – increases overall literacy.

Levinson (2013) stated, *tweens*, mainly the average seventh graders, are entranced with digital empowerment, a feeling of power to make digital choices as Cohen and

Schmidt (2011) have chronicled. Even as students have brought their own devices to school, there has been much to be learned about how they will use those devices. A study is needed to determine if the presence of those personal devices is associated with academic achievement, specifically relationships between technological prevalence in middle schools and standardized assessments. The intent of this study was to explore the relationship between technological access and middle school academic achievement.

Conceptual Framework

The time has passed to debate the merit of technology in schools, "Today's teachers need to be sure that, no matter what subject they are teaching, they are teaching it with the future in mind" (Prensky, 2010, p. 5). The teacher and the traditional textbook have lost their importance as the most efficient conduit for knowledge and skills, and "the use of technology in schools has not met its full potential in preparing 21st century-citizens for this new world" (Blomeyer & Cavanaugh, 2007, p. 16). The proliferation of social media, instant access to information, and the ability to create, publish, and share information has changed the world outside of schools (Commonsense Media, 2009). Many students, regardless of socioeconomic status, location, or other demographics, are participating in that online world outside of the school setting (Goodwin, 2011). Ahn (2011) has shared high numbers of students, regardless of socioeconomic status, have participated in social networking, so school staff are dealing with the opportunities and the demands to change the pedagogical experience so that students are getting a quality education that has technology experiences infused throughout the grades and subjects. "High-quality digital learning has the power to customize learning for each student's

unique needs, ensuring an education that is challenging, engaging, and relevant" (Bailey & Myslinski, 2012, p. 7).

In a survey published in 2014, middle schoolers were observed to be immersed in technology in and out of school (Harper, 2014). In the survey commissioned by the Verizon Foundation and published in Educator Studio, Harper (2014) reported results indicating one out of three middle school students share they have used smartphones and tablets to do their homework. Hispanic and African American students are more likely to use mobile phones versus tablets, laptops, and desktops to complete their homework. Even with the high use of devices being used for homework, the number of students allowed to bring their devices to school has been significantly lower, with one-fifth of the 750 respondents reporting they have BYOT in their schools. Harper concluded from the survey results that "a significant opportunity appears to exist for middle schools to engage students by allowing them to bring their own devices into the classroom" (Harper, 2014, p. 22).

Because students are using technology outside of school and there is not enough school-owned technology in schools, schools have considered BYOT as an alternative to expensive hardware purchases (Cuban, 2013). BYOT is often viewed as a practical way to assist school systems with limited budgets and limited hardware (Goodwin, 2011). Schools have not purchased technology at the rate vendors have introduced new innovations (Harris, 2014). The entire premise of BYOT has been a fairly new endeavor with few studies focusing on this area. Many schools have simply allowed the student-owned technology rather than try to monitor or manage banning the devices (Taylor, 2015). Russell (2012) conducted a study to determine if Missouri schools have allowed

BYOT and if it was a benefit for students and teachers. Russell indicated policy and professional development have been crucial for BYOT to be successful, but findings indicated no clear academic benefits for students or teachers. Schaffhauser (2011) explored BYOT in a study of middle school student technology use. Findings indicated student motivation has been a benefit of BYOT. Students have also considered BYOT as a personal benefit because they have not had to carry as many physical books. O'Sullivan-Donnell (2013) focused on BYOT in a 2013 single-district case study. She found BYOT promoted collaboration and project-based learning. When teachers have had professional learning to accommodate students' BYOT devices in their lesson implementations, then BYOT has been more successful, but no clear results showed that BYOT is associated with academic achievement. O'Sullivan-Donnell indicated that limitations of BYOT are due to security and lack of clear, applicable policies for administrators, students, and teachers.

The introduction of BYOT can be traced to the overall lack of school-owned technology for students and teachers (Goodwin, 2011). According to the GADOE Technology Inventory, (2013) there has not been enough technology in schools with most school systems reporting that there were as many as six students for every one computer. Limited technology was reflected in recent national studies (Burton & Greenhow, 2011). Few Georgia school systems have owned enough up-to-date, adequate classroom technology even with counts that included laptops, desktops, Chromebooks, and tablets (GADOE Technology Inventory, 2013). Because of the lack of school-owned technology, Georgia school systems and other institutions across the nation have engaged in BYOT with network provisions made for separate traffic for separating BYOT traffic.

In turn, teachers have allowed students to use those BYOT devices in the classroom (Ribeiro, 2013). Those personal device allowances have been made without clear knowledge of the technical and academic implications that these devices will produce (Goodwin, 2011).

The conceptual framework has its premise based on motivation and expectancy theory (Wigfield & Eccles, 2002). Today's students have turned to technology to communicate, to be informed, and to make connections. Technology motivates students as they explore social media, play the latest games, share text messages and pictures, and become very familiar with the devices despite no specific organized instruction in the use of the tool (Cuban, 2013). Personal technology has motivated students without the direction of a teacher (Sharples, 2014). Students have seen their personal digital device as a communication tool. For the middle schooler, the smart phone has connected to a world beyond the home setting (Persaud, 2014). The student has been intrinsically motivated to fulfill a goal and pursue fulfillment without the external influence or motivation of expectancy provided in the traditional classroom (Sharples, 2014). Often, academic knowledge to attain achievement on standardized assessments has driven extrinsic motivation (Lepper, Sethi, Dialdin, & Drake, 1997). Students have performed academically because of the external values our society has placed upon education. Based in the theory that fulfillment of an intrinsically motivated tool in the hands of a middle schooler may be associated with academic achievement, this work is grounded in the socio-technical systems theory of acceptance focuses on user autonomy, the user's organization and its structures, and innovation acceptance (Dillon & Morris, 1996). The

theory has basis in the notion technological device use is connected to the willingness of users to employ it for meaningful work (Dillon & Morris, 1996).

Purpose of the Study

Any association of BYOT with eighth graders' academic achievement will be measured against annually administered criterion-referenced assessments. Georgia school systems have struggled with the decision of whether or not to allow students' personal devices into the academic setting, so this has been a timely endeavor which should contribute to this innovation's implications for schools. At a time when BYOT has been considered, schools have also been increasing the amount of hardware and access in the schools (Goodwin, 2011).

School systems have made these investments of technology to lower the student-to-computer ratio to impact achievement positively (Gielniak et al., 2010). Findings were based on one-to-one computing provided by the school or an outside entity. Gielniak and colleagues did not include student-owned devices, and BYOT was not a consideration in the schools of the 2010 study. School-owned technology has impacted achievement positively according to international studies, so schools around the world are increasing hardware and access. (Lee, Waxman, Wy, Michko, & Lin, 2013). The focus of this study was on Southeastern public school eighth grade students, in an attempt to make connections between BYOT, school-owned technology, and academic achievement as defined by the Criterion Referenced Competency Test (CRCT) administered to all Georgia public school students (Fincher, 2013).

Research Questions

1. What is the prevalence of Georgia public middle schools accommodating student-owned technology in the classroom?
2. In schools that incorporate BYOT, what is the prevalence of school-owned technology?
3. How have academic assessment scores in schools with a low device-to-student ratio of school owned technology compare to those which have allowed students to have BYOT opportunities?
4. What have been teacher perceptions of BYOT and its prevalence in the classroom?

Definition of Terms

Academic Assessment Scores: Public middle schools in Georgia have administered a yearly criterion-referenced standardized test known as the CRCT (Criterion-Referenced Comprehensive Test) until the 2014-2015 school year. Assessment data are published annually for each school, the district, and the state (GADOE, 2013).

BYOT, BYOD, BYOL: Bring your own device, bring your own technology, or bring your own learning has been the practice of allowing students to bring their own technology to school to utilize for learning. The devices allowed have included: cellular phones, tablets, laptops, gaming systems, and any other device that is Internet capable (Rouse, 2011).

School-owned Technology: A device, typically a desktop computer, tablet, or laptop computer that is the property of the school the student attends. This school-owned

technology has been referred to as instructional technology which is utilized for teaching and learning (Galindo, 2013).

Student-owned Technology: This device is possessed by the student, purchased by the family, guardian, or the student, and is not the property of the school the student attends (Galindo, 2013).

Technology Inventory: This initiative, conducted annually by GADOE, has collected hardware, Wi-Fi access information, BYOT, and other related data for technology in Georgia public schools. All data are public and published annually on the GADOE website.

Research Design

Mixed methods were utilized (Creswell & Plano Clark, 2011). The focus for analysis was school data rather than individual student data. The majority of data were archival comprised of statewide technological inventory data, school-based data reported to the state, and historical test score data. In addition, qualitative data from a survey of teachers were collected (Patton, 2002). This was to identify which schools allowed BYOT, and data collected were for eighth grade aggregated CRCT data in 2012-2013 and 2013-2014 school years. School technological data were collected from the annual GADOE Technology Inventory. The student-to-computer ratio was a data point provided by each school system in each May. CRCT data have been publicly released, so the 2012-2013 and 2013-2014 data are available for review and analysis. These data were analyzed for any associations among the assessment scores, the school-owned technological inventory ratio, and the BYOT status of the school. A survey was

administered to determine teacher perceptions of BYOT in their classrooms. Survey questions addressed BYOT related training opportunities for the teachers.

Sampling Techniques

Public middle school eighth graders were the sampling, specifically middle schoolers of Southeastern United States. These students represented the majority of middle Georgia with suburban, urban, and rural representation. This variety of schools in the systems provided demographic diversity for ethnicity and technology integration. Varied student-to-computer ratios throughout the school systems were represented. Schools included had diverse geographic areas, range of socioeconomic status, diverse race and ethnicity, and a range of achievement levels.

Significance of the Study

BYOT has been a topic discussed online and at conferences in technological leadership (Clark, 2013a), and the innovation has been a consideration for information technological professionals to address in the corporate setting (Navetta, 2012). Much of leadership's focus has involved security or the capabilities of the school system's network because BYOT brings new implications and new security requirements for school systems. Achievement has not been a topic of most of those discussions centered on benefits of BYOT (Harris, 2014). The innovation has stirred some to consider BYOT as a possible answer to access and educational technology voids (Cuban, 2013). "Beware of the mythos of technology. BYOD is not a panacea. Smartphones won't make kids any smarter unless the devices are used to their full potential" (Harris, 2014, para. 10). Will students use their personal devices for learning if they have access to their own devices in school, and will schools see a change in academic achievement? Additionally,

in those schools having BYOT, the question has been what is the prevalence of school-owned technology? With a mixture of personal digital devices and school-owned technology, the connections have been made that schools may finally have the saturation of digital tools in order to change the classroom setting to a technology-focused environment versus the traditional paper-based, textbook focused environment (Goodwin, 2011). Meta-analysis has shown there is a relationship between one-to-one computing and academic achievement (Gielniak et al., 2010). BYOT has been ready for study as students in some school environments are not required to use school-based technology, and they can use their own devices.

Any connections between BYOT and academic achievement have implications for Georgia school systems and possibly to other entities (Purcell, 2012). If there is any specific substantiation BYOT use is an indicator factoring into academic achievement, this research will provide trends which can be studied as individual schools make decisions regarding BYOT. College and university chief technology officers demonstrated interested in BYOT and its postsecondary setting implications in a 2011 study conducted to determine attitudes regarding social media (Delaney, 2011).

Organization of the Study

This dissertation is divided into five chapters. Chapter 1 is a synopsis including the problem statement, study purpose, a conceptual framework to support, and a brief narrative of the methodology engaged. Chapter 2 is a review of the relevant literature for technology and academic achievement including the history of technology in schools, BYOT acceptance in the corporate settings, BYOT in schools, BYOT in the classroom, technology in the student's home and in the backpack, BYOT benefits for students, and a

description of the BYOT student. Chapter 2 concludes with a description of considerations and challenges of BYOT and the future of BYOT. Chapter 3 is an outline of the design methodology, sampling population, the instruments utilized for analysis, and the data analysis methods. Chapter 4 is the compilation of findings. Chapter 5 is the summary with discoveries, a discussion of study limitations, and possible opportunities for extending the results to other settings of research prospects.

Chapter II

REVIEW OF LITERATURE

The following is a synopsis of literature on the evolving role of technology in K12 education and the emerging role of BYOT. The history of technology in education, and technology's role in the classroom are surveyed. The evolution of BYOT in the corporate world is presented. Also included are a review of literature related to BYOT appearance in schools in the last 5 years, and advantages and disadvantages of BYOT. A portrait of the BYOT student and how BYOT technology has influenced education of today's student are presented. Finally, the future of BYOT in schools is shared.

The History: Reaching BYOT Capable Status in Schools

American schools have made efforts to move away from basic books and rote-based learning from the 1700s (Dunn, 2011).

> Education is now to develop a type of wisdom that can grow only out of participation in the living experiences of men, and never out of mere memorization of verbal statements of facts. It must, therefore, train thought and judgment in connection with actual life-situations, a task distinctly different from the cloistral activities of the past. (Bobbitt, 1929, p. 15 as cited in Flinders, 1997).

As education has evolved, many teaching and learning tools have been introduced in the classroom. Teaching tools from the 1600s began with a *hornbook,* which consisted of wooden paddles with printed lessons so students had references for writing and reading (Nadworny, 2014). Another significant tool was the *Magic Lantern*, an

implement showing images on classroom walls. This was followed by the father of the *Viewmaster*, the stereoscope, which projected images by peering into deep goggles. Even with the stereoscope, hornbook, and slate, classrooms consisted of the classic human teachers and their students using paper and pencil into the 20th century (Dunn, 2011). Thomas Edison hypothesized the film projector would overtake the book in the classroom in 1922 (Dunn, 2011). Edison predicted the movie would change education, but it did not. The traditional paper-based and book-based classroom continued to be the norm. In fact, the textbook became a major influence in what was taught throughout the 20th century and now into the 21st century (Dunn, 2011). The textbook survived along with the overhead projector, which debuted in 1930 (Lewin, 2009).

With the introduction and use of these historic tools and the late 20th century debut of the computer in the classroom, the textbook continued to thrive and serve as basis of much of the classroom instruction (Pahomov, 2014). Despite increases of ebook sales and the decline of paper-based magazines and newspapers (Pew Research Center Project for Excellence in Journalism Annual Report on The State of the News Media Report, 2013), textbooks have been a definitive part of American education and the preferred reference tool for most classrooms well into the 21st century (Green, 2015). There has been a proliferation of paper-based textbooks and an infusion of other tools in the classroom (Lewin, 2009). Yet technology tools in the classroom are not the norm; rather, they are a contrast of the norm (Dunn, 2011).

There have been inventions designed to replace the textbook. Inventors have explored possible digital tools for the huge educational market since the early 1960s and 1970s (Dunn, 2011). In 1972, McKay envisioned the *Dynabook*, a mobile two pound

tablet for children would contain all of their curricula and could be easily transported. McKay's dream was ahead of its time and has never been realized as an active product on the market. Elements of his invention exist today as some of the calculators and tools of the 1970s and 1980s had the basic tenets McKay drafted on paper (Sharples, 2014). One of these tools, the calculator, has proliferated classrooms as an ancillary tool (Dunn, 2011).

In some cases, the ancillary digital tool became a part of the classroom joining the traditional textbook. The 1970s decade was the era of the handheld calculator. Texas Instruments marketed a tool which brought quick problem solving to the masses (Dunn, 2011). A pivotal year was 1985 when Texas Instruments introduced the handheld graphing calculator, a staple in today's math classroom (Dunn, 2011). In the 1990s and 2000s, the computer gained ground in classrooms leading to the introduction of computer labs. The year 2006 brought about the first instance of the laptop being marketed as one for every child was recorded (Pahomov, 2014). During this time, the price point for computers fell, and schools began to consider them for every classroom – not just the computer lab (Dunn, 2011). The computer became a staple in business and industry as spreadsheets, presentations, word processing became the norm. More and more processes such as shopping and communication moved to the Internet. As technology became more and more powerful, technology became pocket sized with Palm devices and the personal assistants found in products by Palm and Blackberry in the 2000s.

Isaacson (2013) explained the evolution of smaller and smaller computing in Apple products in his biography of Steve Jobs. Apple introduced the iPhone in 2007 and the iPad in 2010 (Isaacson, 2013). Both of those products were sold to millions of

consumers, and each changed communication dramatically (Cuban, 2013). The tablet, first envisioned by McKay back in 1972, came to the forefront in the technological adoption process as school systems weighed the possible uses for these portable devices after over a decade of purchasing desktop computers (Johnson et al., 2014). Devices have gotten smaller, and the scope of the Internet and searching throughout the vast cloud of knowledge and information became broader (Hein, 2015).

Other corporate entities had great influence over the digital devices and their use in modern life. Google has been the dominant search engine as it came to the web browsing scene in the mid-1990s (About Google, 2014). Later, Google introduced tools such as its own brand of email, mass storage, spreadsheets, and calendar (Pahomov, 2014). This led to more and more reliance on Google's products in the corporate marketplace (About Google, 2014). Google first got into the hardware business with smartphones (About Google, 2014). Google introduced the Android mobile operating system in 2009, and it became a direct competitor to Apple with millions of Google Chromebooks making their way into school classrooms across the United States (Weldon, 2013).

Device sizes decreased, computing power increased, and there has been a major change in communication methods in education (Pahomov, 2014). As noted by the Hobbes Internet Timeline (1993-2010), modern society has taken many of our interactions online. From the first online pizza ordering through Pizza Hut's website back in 1994 to the first major virus attacks in 1999 and 2000, our society has changed (Zakon, 2010). The Hobbes Internet Timeline chronicles technological changes now commonplace in our lives. Blogging first came into popularity in 2001, and now has

become a common part of our vocabulary (Zakon, 2010). MySpace and other social networks proliferated in the early 2000s. Facebook came into our lives in 2004 and reached most of the world's population as of 2010 (Zakon, 2010). Social media, electronic communication, and all of electronic commerce changed our society (Langer, 2014).

Yet through this evolution of tools, the computing device existed as an addition rather than an essential part of the teaching and learning process (Prensky, 2010). The slate and the chalkboard were paramount for the learner and teacher at the beginning of organized schools. Later, paper and pencil were adopted as fundamental parts of education. The paper textbook was the dominant reference and teaching tool throughout the 20th century (Prensky, 2010). The devices – the tablet, the smartphone, and the computer – though fundamental to so much of society – have not been mission critical, fundamental elements of the classroom (Blomeyer & Cavanaugh, 2007). In *What Works in K-12 Online Learning*, the authors noted students today are growing up "in a digital age, with unprecedented access to information and ideas through the Internet, they expect to obtain the latest information instantly and flourish in an interactive, multimedia, multitasking environment" (Blomeyer & Cavanaugh, 2007, p. 1). In the digital age, students sit in desks reading paper-based textbooks, or visit a media center with a dominance of paper-based materials which are more than ten years old. When many of the same students arrive in their homes or use their personal electronic devices outside of school, these students access any information needed within seconds (Prensky, 2010).

BYOT in the Corporate World

BYOT is interchangeable with *bring your own device* (BYOD) in the corporate world (Rouse, 2011). In 2009, Intel coined the phrase BYOT/BYOD when the company recognized and began to address the onslaught of personal devices employees brought to work or utilized at home as they accessed company network resources via their personal devices (Johnson, et al., 2014). Intel noted the positive fiscal impact of the practice; however, the company more importantly became more aware of the time saving and increased productivity the practice provided to Intel. A 2013 study conducted by the Cisco Partner Network has found BYOT permeated the corporate work setting, and it has the possibility of becoming dominant in the education field as well. The Gartner Group (2013) predicted over half of the world's employers will expect employees to utilize personal devices for work-related activities by 2020.

With the advent of the Apple iPhone in 2007 and the introduction of Google-based Android tablets and phones, technology changed the consumer market starting in 2008 and 2009 (Jones, 2013). Consumer use of information technology (IT) has been the metamorphosis of consumer-based devices which were primarily used for entertainment and communication. The flux of new devices spearheaded by the iPhone created a consumer device which can be used in the work setting, at home, or to bridge the two, and this brought about the emergence of BYOT (Jones, 2013). In less than 10 years, companies and organizations across the globe had to understand these new devices quickly and make decisions about opening the corporate and schoolhouse doors to them or keep them out. The corporate world has been quick to analyze the situation and determine cost savings, notwithstanding the risk of security and control, could be

manifested for the business welcoming BYOT (Jones, 2013). The overwhelming determination was BYOT can be a positive for corporations' finances (Ackerman, 2013). According to Cisco's Internet Business Solutions Group, companies can save as much as $3,150 per employee per year if they implement a comprehensive BYOT program basically giving employees access to all information they need to do their jobs from their personal devices (Bradley, 2012). Over 89% of CISCO's clients worldwide have BYOT solutions for their employees. In addition to cost savings on a per employee basis, the CISCO BYOT study indicated productivity time increases on a global average of 37 minutes per week (Bradley, 2012).

Some areas of the world have not embraced BYOT yet. Germany was not open to employees bringing their own devices to work (Bradley, 2012). Corporations around the world may eventually have to answer the BYOT question as more and more devices bridge the personal and business world. This is a time when more devices are connected to the Internet than there are people everywhere (Mislan & Oh, 2013). Despite continued trends of paper-based textbook dominance in education, mobile devices have dominated in the corporate world, a world where there is more technology than ever. According to a United Nations study released in March 2013, this is a time when there are more mobile devices in the world than functioning toilets in the world (Wang, 2013). ICT Facts and Figures (2014) have shown there are more mobile cell phones than there are people on earth – approximately seven billion (Hepburn, 2013).

BYOT Appears in Schools

With the rise of personal cell phones in the 1990s, students acquired these devices exponentially (Dunn, 2011). In the early 2000s, the majority of American schools did not

allow students to bring their electronic devices to school (Commonsense Media, 2012). In fact, the majority of student discipline handbooks of the early 2000s referenced cell phones, pagers, and other electronic devices as contraband resulting in a student's punishment ranging from detention, confiscation of the device, law enforcement charges for disruption of a public school, in-school suspension, or out of school suspension (Griffin-Spalding County Schools Student Discipline Handbook, 2007). After the devices were no longer considered contraband, many of the same institutions allowed students to have them in their possession if the device did not disrupt school. School administrations simply declared students could not use the devices despite having those devices in their pockets or backpacks. Administrators were fighting a constant battle of trying to control an influx of devices (Dunn, 2011). Schwartz (2014) suggested in 2010 that schools begin to consider the devices tools to utilize in the classroom. St. Mary's Intermediate School in St. Mary's, Ohio, allowed BYOT to be brought to school for instructional purposes (Schwartz, 2014). In Texas, the Katy Independent School District allowed students to bring their own devices to school. Publicity of the trend began to filter throughout the nation as administrators began to consider the devices as possible tools rather than items to confiscate (Schwartz, 2014).

However, BYOT has been not allowed in many schools across the United States through 2016. In fact, Cortesi et al. (2014), reported some students utilized their phones despite specific school policies banning them. Others reported their phones have been taken at the start of the day and were returned at the end of the day. Still others have kept phones out of sight unless the teacher explicitly has announced the phone or mobile device is allowed for use. Not all participants reported they comply with the restrictions

imposed by their schools. In the same study, participants reported they were often without access due to the lack of reliable Internet access in their schools, even if they have their own devices. Participants reported Wi-Fi access has been inconsistent in the schools. Even when Internet access was available, schools often blocked content the students have wanted access to or had the need to access for their schoolwork (Cortesi et al., 2014).

Schools blocked social media platforms as well as pornographic and inappropriate content due to requirements of the Children's Internet Protection Act passed by the United States Congress in 1996 (Cortesi et al., 2014). This law states if a school or library wishes to receive discounted Internet access, the institution must filter content (CIPA, 1996). Cortesi et al. reported students indicated social media is often blocked because it supposedly promotes inappropriate behavior and could distract the students. Of public school students, 92% have reported restrictions. Of the charter school students, 84% of them reported social media platform restrictions. Those reports were higher than the 53% of private school students who have reported they had restrictions placed upon their Internet access. The students disclosed the most often blocked sites have been Facebook, Instagram, Tumblr, YouTube, and Pinterest (Cortesi et al., 2014).

Increased theft possibilities and safety concerns continued to thread through surveys of teachers, teacher candidates, administrators, and even parents (Project Tomorrow, 2014). Burns-Sardone (2014) pointed to teacher candidate concerns that personal mobile devices may be a hindrance to learning. The Project Tomorrow annual survey indicated 70% of the principals surveyed expressed concerns BYOT enhanced the possibility of students engaging in cyberbullying or being the victim of such instances.

In addition, administrators in the survey responded with 73% indicating they are concerned about theft prospects.

As BYOT became more accepted in the corporate environment, it has been accepted in the education environment as well. A 2013 survey by the Center for Digital Education and the National School Board Association indicated approximately 56% of school districts have implemented BYOT acceptance and use. The 2014 National Survey on Mobile Technology for K-12 Education surveyed more than 300 school district leaders to determine mobile technological needs and how mobile technology fits into the teaching and learning process. Approximately 70.8% of district leaders said mobile technology has been adopted in at least a quarter of their schools, with another 9.8% saying BYOT is likely to happen in the next couple of years (Ash, 2011). Approximately 20% of the districts have had 1:1 deployments with the districts providing the hardware and also offering the opportunity for students to take their own devices to school (Ash, 2011).

Traditional textbooks have lost some momentum (Jacobs, 2010). Stronger questions have evolved challenging the future of the textbook.

> Thanks to technology and to the Internet, all children now are children of the globe, not just children of the neighborhood where they live. Today's tech savvy kids already have the tools for global learning at their fingertips. Gone is the day when education was synonymous with a building housing a teacher and a blackboard. Today, the opportunities for learning beyond the school walls and beyond the school day abound, enabling students to connect the local to the global and back again. (Stewart, 2010, p. 107)

*The New York Time*s reported in 2009 traditional textbooks may no longer be used in the classroom. The future of publishing changed rapidly (Lewin, 2009). "As more technology enters the classroom; as the creation, distribution, acquisition, use, and reuse of content becomes more flexible; as we move more fully into an iTunes world and out of one in which state boards of education pick winners and losers, will there still be a place for today's comprehensive textbooks?" (Fletcher, 2012, p. 22) The use of traditional textbooks has been in limbo because of the adoption of more electronic devices and more eBooks. The NMC Horizon Report: 2014 K-12 Edition reported BYOD has huge implications for education because it allows for student-centered learning to take precedence (Becker, Estrada, & Freeman, 2014). A 2013 report sponsored by Google for Education and Edutopia, a nonprofit education think tank, has indicated common core state standards require to develop digital media and technological skills and suggested one way to help students to be successful was to incorporate gadgets they were already familiar with, their personal devices (Robledo, 2012).

The Georgia Digital Learning Act, signed by Governor Nathan Deal in July of 2012, began its way through the Georgia legislature in 2011 as Senate Bill 289. The legislation took effect in the 2013-2014 school year. The summary follows:

> A BILL to be entitled an Act to amend Chapter 2 of Title 20 of the Official Code of Georgia Annotated, relating to elementary and secondary education, so as to require students to take one course containing online learning; to provide for the online administration of end-of-course assessments; to require local school systems to provide opportunities for participation in part-time and full-time virtual instruction programs; to establish a list of providers; to provide requirements for

providers; to provide for a report by the Department of Education on digital learning methods; to provide for blended learning courses in charter schools which include online instruction; to provide for related matters; to repeal conflicting laws; and for other purposes. (First Reading Summary from Georgia Legislature, 2012, p. 12)

The original intent of the bill was to provide online learning opportunities for all students in Georgia. The bill passed with two additional provisions for education. The bill required all end-of-year core subject assessments to be administered online by the 2014-2015 school year. The passage of this act allowed local school systems to enter into contracts with virtual learning providers approved by GADOE.

In the 2012 legislative session, the Georgia General Assembly passed the *Online Clearinghouse Act.* The bill was first introduced in February of 2011. This bill contained nineteen specific actions recorded in the bill's history (Georgia Legislature, 2012). The