Evaluation of a First-Year "Bring-Your-Own-Device"Initiative

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Introduction

Orientation to the Topic

A quick glance around a shopping mall during the Christmas season or a restaurant at dinnertime is bound to reveal not only numerous people, but likewise numerous people accessing electronic devices. From tablets to smartphones to mp3 players, individuals, it seems, are never without some sort of electronic, often internet-enabled, device. Perhaps most alarming is Hill's (2011) research that suggests at schools where cell phone usage is specifically prohibited, 65% of students still bring and access mobile devices in class each day, doing so in a stealthy manner that breaks the rules.

Accordingly, in the face of teacher furloughs, reductions-in-force, and all-around budget cuts, as well as a desire to elevate learning standards and adopt twenty-first century learning styles, school systems have decided to be finished fighting the futile battle of the cell phone and have begun to capitalize on the abundance of technology students already bring with them to school each day (Hill, 2011; Ng, 2013; Sangani, 2013). Rather than investing large sums of money into new devices that must remain in the school building, schools instead have developed wireless infrastructures and adopted more lenient electronic policies to encourage students to use personal internet-enabled devices to complete tasks during the school day (Caldwell, Zeltmann, and Griffin, 2012). Leveraging the technology students already possess and implementing Bring Your Own Device (BYOD) policies has, in many instances, fostered greater technology integration in the classroom. Bring Your Own Device (BYOD) or Bring Your Own Technology (BYOT) policies outline acceptable use guidelines for student access to personal mobile and electronic devices during the day and encourage teachers to implement greater amounts of technology in classroom lessons and assignments by reducing the burden of not having enough

computers for students to access. Ideally, students should use applications, search engines, and Web 2.0 tools on their personal mobile devices for the purposes of engagement and enhanced student learning.

However, this push for 1:1 technology, in which each student has access to a personal electronic device, while it can produce positive outcomes (Kiger, Herro, and Prunty, 2012; Kothaneth, Robinson, and Amelink, 2012; Lei and Zhao, 2008) does come with potential problems which must be addressed in order to ensure that devices are used appropriately and that teachers feel comfortable enhancing or transforming learning using technology. Hardware and network issues, equitable access for students without personal devices, possible student misbehavior, and teacher comfort levels regarding technology all stand as potential impediments to effective implementation of BYOD policies, especially when BYOD is quickly implemented with relatively little guidance or instruction for educators (Donovan; Green, ad Hartley, 2010; Donovan, Hartley, and Strudler, 2007; Dunleavy, Dextert, and Heinecke, 2007; Martin, et al, 2010; Pan and Franklin, 2011). Woodland High School, a suburban high school in Stockbridge, GA, of approximately 100 teachers and 1500 students, represents one such school who has implemented a BYOD policy and encouraged its teachers to allow students to use mobile devices in the classroom for specific educational purposes.

Purpose Statement

The purpose of this research project is to evaluate the first-year implementation of a BYOD initiative at Woodland High School by identifying how the policy has altered instructional practices and student learning and relating use of mobile devices in the classroom to potential

barriers, including network malfunctions, student access to devices, student behavior, and professional development for educators.

Research Questions

1. Have teachers integrated technology more often into lessons and student assignments with a BYOD policy in place?
2. How has BYOD changed teachers' lessons or students' assignments?
3. How do hardware and network issues influence the implementation of BYOD?
4. How does student access to personal devices influence the implementation of BYOD?
5. How has student use of personal devices influenced classroom management and off-task behaviors?
6. How does professional development influence the implementation of BYOD?

Importance of the Study

The final outcome of this study will be an action proposal of suggestions for improving the BYOD experience during the second and subsequent years of implementation at Woodland High School and other schools of similar size, socioeconomic status, and demographic composition. While current educational literature is just beginning to speak about the effect of 1:1 computer or tablet access in the classroom, definite gaps in educational literature about the integration of students' personal mobile devices currently exist. This study, therefore, will work to close these gaps by providing an illustration of a school that has implemented policies that permit students to bring personal mobile devices to school and encourage teachers to allow students to utilize these devices in the classroom. A listing of potential barriers may arise, in addition to those which literature already suggests may exist, thus providing educational

researchers with opportunities for further investigation about best practices for integrating students' personal mobile devices into the classroom learning environment.

Definition of Terms

1. "BYOD" will be used in this paper as an acronym for Bring-Your-Own-Device. BYOD describes a general policy adopted by a school that allows students to bring personal electronic devices to school and use them in the classroom when the teacher allows. BYOD is interchangeable with BYOT, an acronym for Bring-Your-Own-Technology.
2. "Electronic device" includes all personal electronic devices students may use as learning aids, including laptop computers, smartphones, tablets, e-readers, and mp3 players. These devices may or may not have Internet access capabilities, but the individual student, not the school, supplies each.
3. 1:1 (One-to-one) is a ratio that suggests each student in the classroom has personal access to an electronic device, rather than having to access an electronic device in a small group or with a partner. For 1:1 to be achieved, a classroom of 30 students should have access to 30 devices so that all students can individually access the Internet or other electronically enabled activities.

Literature Review

The Benefits of 1:1 Computing in the Classroom

1:1 computing is a growing trend in educational settings so data is beginning to surface to suggest that such technology richness can promote positive outcomes in the classroom. Lei and Zhao (2008) credited 1:1 computing with increased student technology proficiency and increased

parental involvement. Increased access in the form of 1:1 computing has also led to greater focus on student-centered learning (Mouza, 2008) and more emphasis on teacher's facilitating student learning, a constructivist philosophy, rather than imparting knowledge. Furthermore, Dunleavy, Dextert and Heinecke (2007) suggest 1:1 technology has the potential to add value to the learning environment by increasing a teacher's ability to formatively assess her students and individualize instruction as well as increasing a student's ability to self-pace instruction, access online resources, and communicate and collaborate with peers in and out of the classroom. When iPads or other tablet devices are used in a 1:1 classroom, students and teachers have access to a wide variety of engaging apps, especially designed for educational purposes, which allows for differentiation in the learning environment, and permits teachers to address different learning styles of students (Hutchison, Beschorner, and Schmidt-Crawford, 2012; Kothaneth, Robinson, and Amelink, 2012). For learners with disabilities, 1:1 devices have facilitated great improvements, including helping students with Attention Deficit Hyperactivity Disorder to focus attention on a single task and to increase metacognition while reading (McClanahan, Williams, Kennedy, and Tate, 2012).

Still, the current focus on data-driven instruction suggests that for technology integration to continue, it must lead to real increases in student achievement. Kiger, Herro, and Prunty (2012) conducted a study in which experimental groups of third grade students were allowed 10 minutes a day of classroom time to perform multiplication practice through various iPad applications, while non-experimental groups practiced multiplication facts 10 minutes a day using "business as usual" techniques, such as flashcards and other forms of drill practice. Initial instruction involved responsible use of mobile devices, as well as how to use each application implemented in the study and its educational purpose. On some days, students were assigned

specific multiplication facts to practice or specific applications to use, while on other occasions students were given choice in deciding how to use the iPads to practice their multiplication facts. Pre-test scores measured students' mathematic abilities before experimentation, and on average, those students engaged in the mobile learning initiative using the iPads, scored higher on the post-test than did students using more traditional methods of practice (Kiger, Herro, and Prunty, 2012).

Similarly, Looi, et al. (2011) considered the effect of a mobile learning environment and a learning management system in a 1:1 environment. One mixed ability third grade science class was taught using mobile devices, while another 5 classes implemented traditional forms of instruction. Students in the experimental group accessed information via mobile devices in class and through at home assignments. The lessons, Looi, et al. found, were student-centered, took advantage of resources accessible on the student's mobile devices, archived information for formative assessment, and facilitated collaboration among students and between students and teachers. Final course scores were higher for student participating in the mobile learning experience than those who were not.

The Benefits of Mobile Learning and BYOD

Yet, large amounts of capital are needed for schools to purchase enough devices to provide for students a 1:1 computer-based learning environment. Therefore, following the trends of many businesses, schools have begun to adopt Bring Your Own Device (BYOD) policies that encourage students to bring their own mobile, handheld, or laptop devices to school for use in the classroom.

Caldwell, Zeltmann, and Griffin (2012) reported that outside the schoolhouse, businesses are adopting BYOD policies for the purposes of improving the productivity of their employees, who find it easier to access a device with which they are familiar and have access to at any time. Furthermore, Ng's (2013) survey respondents, who participated in BYOD work policies, identified flexibility in working hours, creativity, speed, innovation, and collaboration as key benefits to a BYOD policy. Each of these qualities is also recognized as a possible benefit of technology integration in the classroom, and educators are beginning to adopt business' "Bring Your Own Device" trend to capitalize on the range of benefits it purports both academically and financially. While companies benefit from reduced costs and reduced liability, since maintenance and care for devices is relegated to the employee, school systems reap the same benefits in terms of lower initial capital, a move important in today's cash-strapped school buildings. Information communication technologies vendors have recognized this growing trend in education by developing agnostic software platforms that can function on the multiple operating systems students possess (Sangani, 2013), and schools have responded with BYOD policies outlining acceptable terms of use of school-level wireless networks and classroom-based instruction that incorporates technology.

Still it should be noted that in both the study by Looi, et al (2011) and Kiger, Herro, and Prunty (2012), student devices were provided in a 1:1 ratio by the school, not by the individual students or their parents. Further, in these studies, all students used the same type of device, even though each student had his or her own device to use. Accordingly, there is a dearth of research about the effectiveness of mobile learning environments in which students use personal devices supplied by their parents and where students may be accessing multiple device types.

Therefore, additional research should be conducted as related to the effect of a BYOD policy and students' use of personal mobile devices in the classroom.

Potential Barriers to the Effectiveness of BYOD

Technology integration is not simply about access to or the presence of new devices, but rather about implementation—how those devices are actually used by teachers and students and how parents and administrators perceive their uses. Crichton, Pegler and White (2012) suggested that while students are generally enthusiastic about the incorporation of handheld devices in the classroom, it is teachers who are more critical of their implementation.

While technology has the potential to increase student engagement and broaden the scope of learning, it also introduces a host of other issues regarding classroom management (Dunleavy, Dextert, and Heinecke, 2007). Donovan, Green, and Hartley (2010) found that when teachers do not receive the proper technology and pedagogical training, off-task behavior could result. Further, teachers continue to suggest that a BYOD policy may alienate some students who do not have access to personal devices. The research, here, however, is not in favor of teacher concerns. In fact, the digital divide is closing and analysts estimate that by 2015 all students will have a smart phone; in fact, families are finding internet-enabled mobile devices to be more cost efficient than at-home computers (Hill, 2011). As smart phones continue to be produced, prices will continue to drop, which will likely lead to a reduction in the number of students without personal devices.

Perhaps teachers' greatest barrier, however, in technology implementation is confidence in their own abilities to use technology. Teachers have real concerns about their own abilities to operate technology as well as their abilities to blend traditional teacher education and teaching

styles with technology to form a new pedagogy, one for which many of them were not prepared at the post-secondary level (Donovan, Hartley, and Strudler, 2007). For example, Pan and Franklin's (2011) study suggested that teachers cite their own unfamiliarity with specific Web 2.0 tools as the primary reason for not implementing technology in the classroom. Without the requisite self-efficacy, what Pan and Franklin (2011) posit is the "primary predictor of Web 2.0 tools integration in school classrooms," teachers simply did not demonstrate the desire to implement a new tool which they themselves did not utilize confidently (p. 35).

Still, even when teachers are comfortable with the technology, its implementation does not always result in transformative changed to the learning environment. After all, research suggests that the teacher's role in a mobile device-enhanced classroom should change from a dispenser of knowledge to one who helps students to synthesize and evaluate findings, an approach that is more congruent with constructivist, student-centered learning theories; indeed, teachers may have less control of student learning, which means that student learning can deepen and broaden itself beyond the limitations of the teacher. Walls & Palak (2011) conducted a study to determine if technology implementation in the classroom was also accompanied by a shift toward a student-centered approach to learning, or if technology continued to reinforce possibly less effective, teacher-centered modes of instruction. Despite examining technology-rich schools in which technology integration was considered an integral component of a teacher's performance evaluation and teachers were well versed in how to operate various instructional technologies, Walls & Palak (2011) found that access to technology did not necessarily "mediate changes in the way [teachers] taught in the classroom" (p. 435). Even though teachers may have exhibited positive attitudes toward technology, this did not necessarily translate to the implementation of student-centered instructional strategies; instead, technology was merely a

support to the teaching approach already being employed by the teacher and a clear illustration of technology for technology's sake. Walls & Palak (2011) did suggest possible reasons for this failure to use technology within a student-centered paradigm for learning which included (1) the lack of models of technology being used to support student-centered instructional strategies, and (2) teacher beliefs about class sizes and student ability levels.

Moreover, Storz & Hoffman (2013) examined the early results of a one-to-one computing initiative in a middle school. The altered teaching format did present new demands on the teachers in terms of delivery of information for previous teacher-centered approaches reliant on lecture, book reading, and worksheets. However, student and teacher-reported results indicated that some teachers adopted a more student-centered model involving collaboration, individualized and small-group instruction, and interactive demonstrations, while others simply used the computers to teach the same way they had always taught, simply requiring students to type papers, rather than handwrite them, and make KeyNote presentation as opposed to hand-drawn graphic organizers (Storz & Hoffman, 2013). Similarly, some students felt the one-to-one initiative increased their overall learning, while others did not and felt they were learning the same things in the same ways, just using a computer (Storz & Hoffman, 2013). As expected, professional development was cited as a factor in both the successful and unsuccessful implementation of technology in a student-centered paradigm.

It should be noted that research related to the implications for specific professional development regarding BYOD policies seems to be nonexistent. Yet, studies focused on professional development related to implementing instructional technologies in the classroom continue to suggest the need for sustained, collaborative, content-specific, student-centered

professional development that extends beyond merely demonstrating for teachers how to operate specific technologies.

Alternative Approaches to Technology-Related Professional Development

Several educational researchers have offered evidence-based suggestions for alternatives to the traditional one-day training sessions typically used for professional development. The general consensus in research related to technology-based professional development correlates professional development fidelity, defined simply as professional development that aligns with teachers' actual instructional practices, and increased teacher and student outcomes (Martin, et al., 2010). For example, Potter and Rockinson-Szapkiw (2012) noted that behaviorist practices do not support adult learning and instead recognized the need for collaborative practice to replace traditional forms of professional development, which have succeeded in increasing use of technology for classroom administrative purposes, like email, test creation, and grade books, but not significantly altered instructional practices (Potter & Rockinson-Szapkiw (2012). These professional learning sessions lack fidelity because they do not directly connect with teachers' instructional practices. Accordingly, Potter and Rockinson-Szapkiw (2012) offered a three-fold model of effective technology-related professional development: technology operation, technology application, and technology integration and mentoring, noting that current models of technology-related professional development typically stop at technology operation.

Allan, et al's (2010) proposition for a collaborative curriculum approach to technology-related professional development, seems to be congruent with Potter and Robinson-Szapkiw's (2012) suggestions. Rather than teach the elements of TPACK (technological, pedagogical, and content knowledge) separately, selected Maine science teachers immersed themselves in project

creation; reflecting on their experience, teachers deepened their TPACK through learner-centered professional development practices (Allan, et. al, 2010). Their TPACK deepened as an "outgrowth of teachers becoming involved in the project's tasks" (Allan, et. al, 2010, p. 37). Yet, many professional development models still rely on behaviorist, teacher-centered approaches concerned with delivering information to passive students when teachers themselves are acting as the students. In addition to improving their TPACK, teachers who participated in the content-specific professional development also transitioned their classrooms to technology-enhanced student-centered learning environments. Additionally, Harris & Hofer's interpretivist study emphasized the importance of content-specific technology professional development, rather than broad topical sessions attended by large groups of teachers from different levels and content areas. Harris & Hofer (2011) concluded "a content-based, activity-types approach to technologically inclusive instructional planning is compatible with existing approaches to teaching" (p. 226).

Simply put, teachers cannot teach what they themselves do not know; therefore, professional development of instructional technology must examine the entirety of the TPACK model, ensuring that teachers not only develop and continue growing their technological knowledge of how to operate specific technologies, and their technological pedagogical knowledge of how to use technologies for instructional purposes, but also their technological pedagogical content knowledge, which ensures they use technology in such a manner as to assist student in achieving content-related aims. Without a strong foundation in each domain of TPACK, teachers typically lack the confidence to implement technology in the classroom, or do so in a manner that is ineffective and continues to reinforce teacher-centered paradigms of instruction.

Implications

The proposed research study will examine Woodland High School's first year-implementation of BYOD with regards to teacher's perceptions of its effectiveness. This study fills a void in the current literature concerning a school's implementation of BYOD with an emphasis on students' personal mobile devices. Previous studies of 1:1 computing have focused on schools where personal devices were purchased by schools and provided to students, rather than purchased by students' themselves. The research study will emphasize how a BYOD initiative has affected technology usage in the classroom, altered teacher/student activities, and been influenced by commonly-known barriers, such as network issues, student access, misbehavior, and professional development.

Methodology

Overview of Research Design

The research design will consist of a cross-sectional survey administered to teachers near the end of the 2013-2014 school year (estimated April 2014). The survey will be available in both an electronic and paper form and will be completed as a component of a professional learning session in order to ensure greater teacher participation. Each month, Woodland High School teachers participate in a mandatory professional learning session during their planning periods. At regular intervals, the school's technology focus team assumes responsibility for these professional learning sessions in order to introduce or demonstrate specific technologies for the classroom. A technology-led professional learning session has been scheduled for April 2014. The electronic survey will be created as a Google Form and linked to a spreadsheet for data analysis. Participants will access the form using a QR reader or a shortened URL.

Alternately, a paper copy of the survey will be provided for those teachers without a personal electronic device. All results from paper-based surveys will be entered by hand into the Google spreadsheet for data analysis. Although the survey will be administered during a professional learning session which teachers are required to attend, completing the survey will be optional and anonymous; teachers will not be penalized for failure to complete the survey. Consent will be stated in the instructions of the online survey; an implied consent cover letter will be included with all paper-based surveys.

Participants

The sample will include all regular education and special education teachers at Woodland High School, approximately 100 in total. The faculty represents much variety in terms of gender, years of experience, levels of education, and experience with technology, which should ensure that the results of this study are generalizable to other school populations. The goal is to collect survey responses from at least 50% of teachers.

Data Sources/Instrumentation/Procedures

A survey with supplemental optional open-ended questions will be used to collect data. The researcher, in conjunction with the school's technology focus team, developed the survey. Survey results will be anonymous, but teachers will be asked to identify their subject area, regular or special education, and their years of experience. The survey will consist of 10 questions and will ask teachers to consider how often they use BYOD, in what ways they use BYOD, how hardware or network issues have influenced their ability to implement BYOD, how student access to devices has influenced their ability to implement BYOD, how student behavior

has been affected by BYOD, how professional development has influenced their ability to implement BYOD, and any other factors that have influenced their ability to implemented BYOD. All survey questions will be closed-ended, multiple choice, with spaces for optional open-ended clarification on specific questions. Some questions will be measured using a 5-level Likert scale: 1 Strongly disagree, 2 Disagree; 3 Neither agree nor disagree, 4 Agree, 5 Strongly agree. Other questions will have specific choices that delineate time periods such as daily, 1-2 times per week, 1-2 times a month, 1-2 times during the school year, never.

Reliability/Validity or Credibility

School level officials have examined the survey for its appropriateness and clarity. The survey will be field-tested with teachers on the school-wide technology focus team to ensure that the questions are clear and that the options provided are adequate.

Proposed Analysis

Survey results will first be analyzed in order to determine how often technology is being used; this may be compared with data taken from a similar survey already administered near the beginning of the school year in order to determine any trends. Results will then be analyzed to determine if particular areas—network issues, student access to devices, student behavior or misbehavior, professional development—pose greater impediments or stronger influences concerning BYOD implementation. Results from optional open-ended responses will provide clarification for some of these answers. An action proposal for the school's technology focus team will be created after analyzing all data.

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Appendix A—Online Survey with Consent Form

Evaluating Our First Year BYOD Initiative-Survey

Title: Evaluating Our First Year BYOD Initiative at Woodland High School

Researcher: Please contact Sarah Barnett (sarah.barnett@henry.k12.ga.us) should you have any questions about this survey.

You are being asked to complete a survey evaluating Woodland High School's first year implementation of BYOD. This survey is also part of a research study conducted by Sarah Barnett at Kennesaw State University. Before you complete the survey, please read the instructions and ask any questions needed. The purpose of the survey is to create an action plan for next year's technology focus team. You will complete the online survey at the link provided. The survey should take you approximately 10 minutes to complete. All participant s should be current classroom (regular or special education) teachers at Woodland High School. Anonymity will be guaranteed since no IP addresses will be collected; therefore, there should be no risks in taking the survey. Although you may experience no direct benefits from taking the survey, you will provide the technology focus team with valuable data to create an action plan for future technology implementation.

By completing this survey, you are agreeing that the purpose has been explained at that your participation is voluntary. You have the right to stop the survey at any time without penalty. You understand that the research has no known risks and that your data will be anonymous. By completing the survey you are agreeing to participate in the research project.

Research at Kennesaw State University that involves human participants is carried out under the oversight of the Institutional Review Board. Questions or problems regarding these activities should be addressed to the Institutional Review Board, Kennesaw State University, 1000 Chastain Road, #0112, Kennesaw, GA, 30144-5591, 678-797-2268.

1. For how long have you been teaching?
    a. 0-4 years
    b. 5-8 years
    c. 9-14 years
    d. 15-20 years
    e. 20+ years

2. In what department do you spend most of your teaching day?
    a. CTAE
    b. English
    c. Math
    d. Science
    e. Social Studies
    f. World Languages

3. Are you a regular education or special education teacher?
    a. Regular Education
    b. Special Education

4. How often do you teach a lesson for which students should use personal mobile devices?
    a. Each day
    b. 1-2 times each week
    c. 1 time each month
    d. 1 time each year
    e. Never

5. What types of activities do you have students complete using their personal mobile devices? Please select all that apply.
    a. Using calculators, dictionaries, thesauri, time, etc.
    b. Finding resources (Internet searches)
    c. Completing drill-type practice activities
    d. Taking pictures, filming video
    e. Viewing content related videos
    f. Submitting responses for formative assessment (polls/surveys)
    g. Creating products (documents, presentations, videos, etc.)
    h. Collaborating with peers inside or outside the classroom

For each of the following statements, choose your level of agreement using the following scale:
1—Strongly disagree
2—Disagree
3—Neither agree nor disagree
4—Agree
5—Strongly agree
Please provide explanations of your answers, especially if you choose "5--strongly agree."

1. Network issues prevented me from regularly using technology in the classroom.
    a. (Optional) Can you explain your answer?

2. Hardware issues (computer/device malfunctions) regularly prevented me from using technology in the classroom.
    a. (Optional) Can you explain your answer?

3. Students without their own personal devices regularly prevented me from using technology in the classroom.
    a. (Optional) Can you explain your answer?

4. Student misbehavior (off-task) using personal mobile devices regularly prevented me from using technology in the classroom.
    a. (Optional) Can you explain your answer?

For each of the following questions, choose the answer that most describes you from the options provided. Please provide explanation of your answers if you choose.

5. In terms of helpfulness, how would you rate professional development sessions related to technology that you have attended this year?
    a. Not helpful at all because I do not care to use technology in the classroom
    b. Not helpful because they did not provide me with tools I could use in the classroom
    c. Helpful but I did not get to use many of the tools this year in the classroom
    d. Helpful and I used some of the tools this year in the classroom
    e. Other (Please explain your answer.)

    (Optional) Can you explain your answer?

6. How prepared did you feel at the beginning of the year to integrate technology in your classroom?
    a. Not prepared
    b. Somewhat prepared
    c. Adequately prepared
    d. Extremely prepared

    (Optional) Can you explain your answer?

7. How prepared do you currently feel to integrate technology in your classroom next year?
    a. Not prepared
    b. Somewhat prepared
    c. Adequately prepared
    d. Extremely prepared

    (Optional) Can you explain your answer?

8. What do you need in order to integrate technology to a greater extent in your classroom next year? Please consider all questions from the survey in providing your answer.