2014

The relationship between teachers' computer self-efficacy and technology integration in a school district's bring your own technology initiative

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THE RELATIONSHIP BETWEEN TEACHERS' COMPUTER SELF-EFFICACY AND TECHNOLOGY INTEGRATION IN A SCHOOL DISTRICT'S BRING YOUR OWN TECHNOLOGY INITIATIVE

A Dissertation

Presented to

The Faculty and Staff of the School of Education

The College of William and Mary in Virginia

In Partial Fulfillment

Of the Requirements for the Degree

Doctor of Education

By

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May 2014

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Dedication

This dissertation is dedicated to two important people in my life. To Matt, my brilliant husband without whom this journey would have been impossible. Matt, thank you for loving me, encouraging me, and knowing that I could complete this task even when I didn't believe I could. Thank you for knowing when to send me out of the house and to the library and when to make me stop to take a break. This was a challenge we *both* undertook, and for your company and support on the journey I am eternally grateful. To Connor, our wonderful son, who makes me proud every day. Connor, may you – like your Commodore taught me – grow up knowing the value of an education, develop a life-long love of learning, and never be afraid to take on a challenge. Thank you for your unconditional love and one hundred million hugs, despite long weekends at the library and late nights in class. I love you both to pieces.

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Acknowledgements

This dissertation is the result of persistence, countless hours of work, and the support of many people. I would like to first thank my dissertation committee who guided me in this process. Dr. Grant, thank you for your guidance, for being my cheerleader, and for providing clarity when I got bogged down in details. Dr. DiPaola, thank you for teaching me to have confidence in my skills, to toughen up, and to not sweat the small stuff. Dr. Staples, thank you for being a model leader, for taking the time to know my name when I was a first year teacher in your school district, and for making the time to serve on my committee so many years later.

Thank you to my husband and son for their patience in this process. Thank you to my mother, who has taught me that perseverance and a positive attitude take you far in life. Thank you to my father, for once telling me the best gift a parent could give a child is an education and for instilling in me a love of learning. Thank you to all of my family for your unconditional love and support. Amy Colley, thank you for taking a chance on hiring me for a job one size too big. Thank you for mentoring me as I grew into it and becoming a dear friend in the process. Kristi Wagner, thank you for being my dissertation buddy, sounding board, and thought partner. Thanks for persevering with me and always letting me "go first" – I'm looking forward to conversations that are not about APA formatting or statistics. Antonia Fox, thank you for being you and always, *always* being there for me. It is only fitting that we complete this task together.

Finally, I'd like to acknowledge the teachers and leaders in the school district in this study. I appreciate their dedication to the profession and the willingness of so many of them to participate in this study.

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Abstract

The purpose of this mixed methods program evaluation study was to investigate the ways in which one public school district and its teachers implemented a Bring Your Own Technology (BYOT) initiative. This study also measured teachers' computer self-efficacy, as measured by Cassidy and Eachus' (2002) Computer User Self-Efficacy Scale, and investigated the relationship between the teachers' computer self-efficacy and use of BYOT. The study sought to discover the successes and challenges the teachers in the district faced with implementation in their schools and classrooms. Participants included teachers in the four high schools in the district. The study used the CIPP model of program evaluation to guide data collection on the context, input, process, and products of the BYOT program. Both quantitative and qualitative data was collected using teacher surveys, extant student surveys conducted by the district, teacher interviews, and classroom observations. The successes teachers had included student engagement, ease of classroom research, and productivity uses of student-owned technology. The challenges teachers faced included students' inappropriate use of technology, difficulty accessing the district's wireless network, and the task of monitoring students using BYOT. The teachers in the district had high computer self-efficacy, but its relationship to successful integration of technology was unclear. Recommendations for future research and continuous program improvement include providing appropriate bandwidth for successful BYOT programs, a process for managing students' use of BYOT, and appropriate professional development to support integration of BYOT into classroom instruction.

The Relationship between Teachers' Computer Self-Efficacy and Technology Integration in a School District's Bring Your Own Technology Initiative

CHAPTER I

Background

Schools are filled with teachers and students who use technology every day, but technology also changes more quickly than schools and districts can upgrade or replace it. Likewise, school districts are expected to provide students and teachers with the latest technology resources, yet they face shrinking budgets and work with limited and declining resources. In an attempt to keep up with ever-changing technology trends in education and to combat the limited funding for technology, school districts such as the one in this study are beginning to allow students to bring their own technology devices to school (Johnson, 2012). Bring Your Own Technology (BYOT) programs, in which students and teachers bring personally-owned technology devices to school and connect to a district's wireless network are becoming popular as public schools see the need for increased student and teacher access to technology, yet face a lack of funding for it (Johnson, 2012).

After over a decade of teaching and learning in the 21st century, technology integration has now become common in secondary classrooms (Gray, Thomas & Lewis, 2010). Rather than determining *if* teachers are integrating technology, the question has become *how* they are integrating it (Gray et al., 2010). If one were to walk into a public high school and observe teachers using technology in their classrooms, one would likely see teachers on a broad continuum of technology use; however, the prevalence of technology in schools does not necessarily equate to appropriate use of it. Some teachers use technology proficiently in their daily instruction, while others struggle to integrate it even when required to do so. The success or failure of the implementation of any educational program, including a technology program such as BYOT, is often influenced by the efficacy beliefs and experiences of the individuals participating, including, in the case of technology integration, new teachers—familiar and comfortable with technology—and more experienced teachers—who may not have had the practice or success with it in their classrooms (Mundy, Kupczynski & Kee, 2012; Windschitl & Sahl, 2002). Additionally, teacher perception of technology and its usefulness in the classroom impacts integration of technology in the classroom (Potter & Rockinson-Szapkiw, 2012).

Technology has been integrated into classrooms in a variety of ways and for different purposes. Some studies show that technology integration can increase student achievement, and there is an extensive body of research on the varying effects of technology integration on student achievement (Hew & Brush, 2007; Tamin, Bernard, Borokhovski, Abrami, & Schmid, 2011). However, more recent studies cite student-centered learning, increased student engagement, and preparation for a technology-rich world as the most significant purposes of technology integration (Argueta, Huff, Tingen, & Corn, 2011; Zucker & McGhee, 2005). Technology is now a permanent fixture in K-12 public schools, and no matter the reasons for integration, teachers and school leaders should determine *how* to implement rather than *whether* to implement (Cuban, 2001).

There is research on teachers' adoption of technology, their beliefs regarding technology, and integration of it into their classrooms (Gray et al., 2010; Straub, 2009). Although teacher and student access to technology has increased through the sheer number of devices available, implementation has not increased at the same rate. Research indicates this lag in classroom implementation could be for multiple reasons. Teachers report having access to technology but not always knowing what to do with the devices or how to use them for instructional purposes (Gray et al., 2010; Mundy et al., 2012). Recent studies address the implementation and success of ubiquitous computing such as one-to-one initiatives in which each student and teacher is provided a laptop or other mobile technology (Lei & Zhao, 2008; Oliver, 2010; Zucker & McGhee, 2005). BYOT programs are another way school districts are handling a push for ubiquitous access to technology, but little research has been done on the efficacy of BYOT programs. There is also lack of research that examines the implementation of BYOT programs in secondary classrooms and the beliefs and classroom practices of the teachers involved in the programs. This study of a BYOT program in four high schools in a Virginia school district seeks to provide clarity on BYOT implementation and inform school leaders as to how to best support teachers in their endeavors to use BYOT to integrate technology successfully.

Program Theory

Programs such as BYOT initiatives rely on teachers implementing such initiatives in their classrooms. The teachers' beliefs and experiences influence how they approach the implementation of such initiatives (Ertmer, 2007). Computer self-efficacy (CSE) is one construct that helps researchers define teachers' beliefs about their personal success with technology and the success they have in their classrooms. Teachers' individual beliefs and prior experiences help shape their understanding of and success with an initiative like BYOT (Ertmer, 2007; Tschannen-Moran, Woolfolk Hoy, & Hoy, 1998). Teacher beliefs are not easily understood, but they are very powerful in changing classroom practice (Ertmer, 2007). Beliefs are formed in a variety of ways, and teachers are more inclined to be influenced and change their beliefs based on what they see and do rather than on a particular educational theory or instructional strategy (Ertmer, 2005; Windschitl & Sahl, 2002).

One form of teacher belief that influences a teacher's effectiveness is teacher self-efficacy. Teacher self-efficacy is a teacher's belief in his/her capability to organize and complete courses of action to successfully accomplish a specific teaching task in a particular context (Tschannen-Moran, et al., 1998). There are several factors that impact teacher self-efficacy, including school context, the students or class a teacher works with, the leadership of the school, and even the collective efficacy of a faculty (Tschannen-Moran et al., 1998). Teacher self-efficacy is an important consideration in implementing BYOT because self-efficacy is context-specific and has been found to be related not only to student achievement, but also to the motivation, effort, persistence, and commitment of the teacher (Guskey & Passaro, 1994; Tschannen-Moran et al., 1998).

Computer self-efficacy (CSE) is an individual's perception of his/her ability to use technology successfully in a given context (Compeau and Higgins, 1995). In the case of an examination of teachers integrating BYOT in their classrooms, Compeau and Higgins' (1995) model of computer self-efficacy (CSE) is significant because it incorporates many of the aspects of teacher self-efficacy. According to Compeau and Higgins (1995), CSE is influenced by encouragement by others, others' use of technology, and support. This connection to teacher self-efficacy is important, as teacher self-efficacy helps researchers define teachers' beliefs about the impact they have in the classroom and has also been known to impact student achievement (Tschannen-Moran, et al., 1998).

The theoretical framework of computer self-efficacy (CSE) was used to frame this study. Teachers come to their classrooms with a variety of technology experiences, and these experiences must be considered when implementing technology initiatives (Zhao & Frank, 2003). A teacher's comfort with the latest technology can make him/her more inclined to allow students to use it, just as a teacher's sense of self-efficacy for a particular teaching task can influence the success the teacher has with it. Conversely, if a teacher does not use technology in everyday life and has no need for it, the teacher may not see the need to provide BYOT opportunities for students. The teacher's choice to plan for technology in instruction is where CSE emerges as an important driving factor. Teachers integrating technology in their classrooms, whether through school-provided devices, BYOT, or a combination, develop their own feelings toward their ability to use technology effectively as an instructional tool. This sense of self-efficacy in the context of technology integration may be important in the success or failure of such programs (Wang, Ertmer, & Newby, 2004). The theory used in this program evaluation and illustrated in Figure 1 is that a teacher's CSE – based on the teacher's existing experience, encouragement by others, others' use of BYOT, and the support the teacher receives – influences the teacher to plan for instruction that includes BYOT. Encouragement by others is similar to verbal persuasion in models of teacher self-efficacy (Tschannen-Moran, Woofolk Hoy, & Hoy, 1998). Others' use of technology is synonymous with vicarious experiences in models of teacher self-efficacy (Tschannen-Moran et al., 1998). Support can be either informal or formal and can be in the form of leadership, training and professional development, or access to the technology (Compeau & Higgins, 1995). Once a teacher feels efficacious and plans to use BYOT, the teacher will integrate it into his/her instruction, thus encouraging students to use technology for instructional and productivity purposes. This process is cyclical, in that, as a teacher integrates technology in instruction and sees students using it successfully, the teacher's CSE increases and s/he become more likely to include BYOT in instructional planning. Likewise, the teacher may witness others' use of BYOT, receive encouragement from peers, and receive support from school leaders throughout the process, not just prior to implementing BYOT. These factors impact a teacher's CSE throughout the program, not just in the initial implementation.

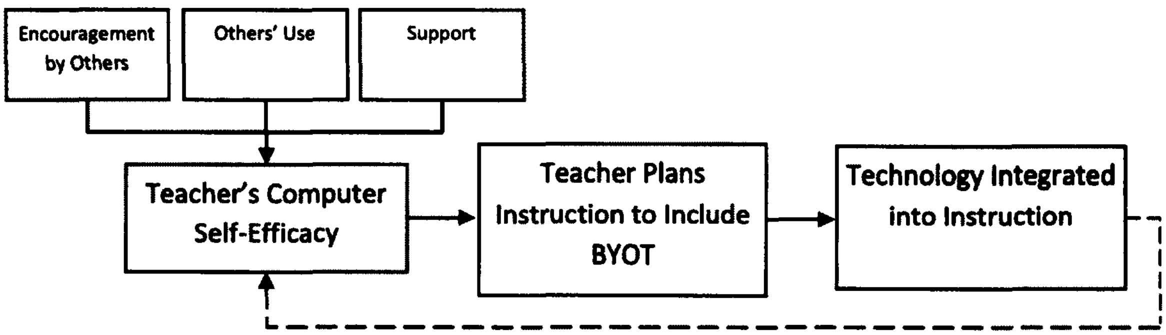

Figure 1. Program Theory for Study of BYOT and Teachers' Computer Self-Efficacy

Research indicates that when teachers believe they have the ability to use computers successfully, they are more likely to believe the technology is easy to use and will ultimately accept the new technology or program (Albion, 1999; Chang, Lieu, Liang, Liu, & Wong, 2012; Oliver & Shapiro, 1993; Wang, Ertmer, & Newby, 2004). In addition, teacher CSE may impact student use; if teachers do not see a tool as having value in the classroom, they are less likely to allow students to try it. Therefore, teacher CSE and perception of technology and its usefulness in the classroom impacts integration (Paraskeva, Bouta, & Papagianni, 2006; Potter & Rockinson-Szapkiw, 2012;). If a teacher experiences encouragement by others, sees others using BYOT successfully, and has the proper support, then the teacher's CSE will increase, and the teacher will plan to use BYOT in instruction.

Program Context

The context of the BYOT program in this study was a medium-sized suburban school district in Virginia. The district is comprised of ten elementary schools, four middle schools, four traditional high schools, and one charter high school. At the secondary level, the school district has an arts magnet program at one middle school and one high school and an International Baccalaureate program at another high school. The school district is historically high achieving by all state standards. All nineteen of the district's schools were fully accredited in 2011-2012 and have received full state accreditation for ten consecutive years. In 2009-2010, the district's on-time graduation rate was 91.6%, a rate 6.1% higher than the average on-time graduation rate for Virginia. In 2011-2012, the district's on-time graduation rate was 94.2%, again 6.2% higher than the state average.

The school district's vision and mission have focused on engaging students in rigorous work, including educational experiences involving technology. Providing students access to technology has been a goal of the district for several years and is included as an objective in the district's strategic plan. The school district implemented BYOT in its four middle schools, four high schools, and one charter high school in the second half of the 2011-2012 school year, and implementation has continued through the 2012-2013 and 2013-2014 school year.

In the years preceding program implementation, the school district spent significant technology funds on supplying the schools with multiple technology resources. The schools in the district are technology rich and have multiple technology assets, including a computer and projector in each classroom and a virtual desktop infrastructure (VDI) that allows teachers and students to access their virtual desktop from any computer with Internet access. Additionally, each school has at least one computer lab with desktop computers and between two and five mobile laptop carts for teachers to sign out of the library and use in their classrooms. This technology took several years' worth of technology funds to implement, and the maintenance – including repairing, replacing and upgrading technology – is difficult to maintain.

The district's technology budget that had funded existing technology and infrastructure was cut significantly since 2010. Consequently, this lack of funding impacted the decision to look at BYOT as an option for continuing to integrate technology in classroom instruction. District leaders saw a need for increased technology access but knew funds would not keep up with the demand to eventually provide ubiquitous access to students and teachers. This need for more access led district leaders to explore BYOT as a cost-effective option. In preparation for the implementation of BYOT, the district created, in addition to the existing secure wireless network for district-owned devices, a second wireless network with "public access" for students, employees, and guests to use with their personal devices. District leaders believed that this up-front cost of preparing for BYOT would pay off in the future when, because of students using their own devices, they would be able to increase access to technology without purchasing large amounts of new technology.

Description of the Program

Program evaluation must begin with a clear understanding of the program that is to be evaluated (Frechtling, 2007). Logic models are commonly used in program evaluation for creating this clear understanding of the program in question (Fitzpatrick, Sanders, & Worthen, 2011). Logic models identify program inputs, activities and processes, and outcomes of the program as well as help evaluators make connections between the program itself and its objectives (Fitzpatrick, Sanders, & Worthen, 2011; Frechtling, 2007). In an effort to fully understand the BYOT program being evaluated, the researcher created a logic model of the existing program to organize the inputs, activities, participation, and intended outcomes involved (see Figure 2). Teachers' CSE was added to the logic model as part of the program theory.

Inputs. Prior to delivering the program to teachers and students, there were several inputs and initial activities that led to implementation. The program implementation began with district leaders' desire to expand learning opportunities and increase access to technology. In addition, the program began with the district leaders' understanding that one-to-one computing would not be a magic bullet for increasing student achievement and access to technology (Oliver, 2010; Tamin, Bernard, Borokhovski, Abrami & Schmid, 2011). Little money remained in the district's technology budget, and the need to keep up with technology changes loomed. The first steps in preparing the district for BYOT were an increase in the school district's Internet bandwidth and changes in its Internet security. The increase in bandwidth was established to account for the significant increase in the number of devices that would be simultaneously accessing the network. The changes in Internet security were made to allow more flexibility in planning technology-rich lessons while still ensuring Internet safety of students. The district created a second wireless network with "public access" for students, employees, and guests to use with their personal devices. Additionally, the district ensured that each secondary school had sufficient computers, laptops, and wireless access to accommodate students without personal devices, thus ensuring equity for students during implementation.

Activities. Because of the nature of the program and the intended student audience, much of the initial time and attention of the program leaders was devoted to creating policies and communication plans to use before and during implementation. Policy that clearly outlined expectations for student and teacher use of personally owned devices was written. In addition to creating a new section in the district's policy manual, the district also revised the existing Acceptable Use Policy (AUP) for students' technology use. Students using BYOT are now required to have the AUP, signed by the student and parent, on file in the school.

After policy was developed, a communication plan was created. The communication plan included a BYOT policy agreement, Administrator-to-Teacher PowerPoint, Teacher-to-Student PowerPoint, Administrator-to-Parent PowerPoint, Administrator-to-Teacher talking points, Teacher-to-Student talking points, Administrator-to-Parent talking points, the BYOT Teacher Handbook, and BYOT Management Suggestions document. The district's educational technology department was responsible for preparing these resources. School and district leaders presented the program to the School Board, the schools' Parent Teacher Student Associations, and community members. Principals were required to deliver the Administrator-to-Teacher

PowerPoint created by district leaders to their staff at a faculty meeting. After this initial presentation delivered to staff and because BYOT was an optional program, schools implemented BYOT in a variety of ways.

Participation. The BYOT program was initiated in January of the 2011-2012 school year in the four middle schools and five high schools in the district. Based on district leaders' philosophy of inspiring rather than mandating change, BYOT was implemented as an optional program with flexibility for teachers to implement how they felt it was appropriate for their students. On one end of the spectrum, some teachers tested BYOT by simply allowing their students to use technology for productivity purposes. For example, some allowed students to use cell phones or tablets to record homework assignments in the device's calendar or to take pictures of the whiteboard where notes had been written. Teachers on the other end of the spectrum used BYOT for its intended instructional purpose. These teachers embedded BYOT into their instruction by designing lessons that required students to access content from the Internet, take pictures or videos to use in student-created products, or use student response applications to participate in class discussions.

Regardless of the extent to which teachers chose to utilize BYOT, when they first used BYOT in their classrooms and allowed students to bring their own devices, several steps were required. First, teachers were required to show the Teacher-to-Student PowerPoint presentation that provided an overview of BYOT and the rules that accompanied it. Teachers were encouraged to show students the BYOT Handbook, the BYOT Frequently Asked Questions document, and the updated Acceptable Use Policy

(AUP) form. Parents and students electing to utilize BYOT when teachers allowed it were required to sign the Student/Parent Technology Usage Form.

Teachers who allowed students to bring their own technology to school for instructional purposes typically supplemented their instruction with school-owned devices such as laptops or iPods. Teachers were encouraged by school and district administrators to allow students to use their devices to be more productive. Technology use for productivity might have involved students recording homework assignments in their phone's calendar or taking a picture of notes a teacher wrote on the board during class (Johnson, 2012). Students might have even recorded parts of a teacher lecture or class discussion for playback at home.

Another step in the participation in BYOT was in the teacher-planning phase. Teachers were encouraged to design instruction that required students to utilize technology. Again, this process was not mandatory across the district; therefore, teachers approached instructional design differently based on their school, students, and own levels of computer self-efficacy. Each school was assigned a full time Educational Technology Facilitator (ETF) whose job was to provide support to teachers integrating technology in the classroom. According to the BYOT documentation the district published, the ETFs should have supported BYOT implementation by helping design and deliver instruction. Although no district-level professional development on BYOT had been provided to teachers and the ETFs were not required by the district to provide professional development in the realm of BYOT, some schools set aside time for the ETFs to provide support and suggestions for using BYOT. Most of these suggestions were related to specific technology applications or tools.

Outcomes. The district leaders believed in the importance of technology in the lives of students and that having mobile devices such as cell phones and laptops help students have instant access to information and resources. The leaders also believed that having these resources available in the classroom could support and engage students during instruction. The BYOT program was implemented to increase student access to technology at school and at home, and to help students be productive learners in a 21st century environment. There were several intended short-term, mid-range, and long-term outcomes of the BYOT program. First, in the first months of program implementation, district leaders intended for teachers to become open to using technology in instruction. Additionally, when teachers developed this sense of openness, district leaders assumed that teachers would integrate technology into their instruction, thus leading to student use of technology for productivity and instructional purposes. District leaders expected BYOT to become commonplace across secondary schools. Mid-range intended outcomes included increased student engagement in instruction, as stated in the district's strategic plan, and students becoming responsible users of technology. Long-term intended outcomes are broader and stem from the district's strategic planning goal of providing students with rigorous educational experiences and preparing them to be productive global citizens of the 21st century. According to district leaders, BYOT should create a school environment where students can be engaged in rigorous educational experiences and be prepared for the 21st century global world of work.

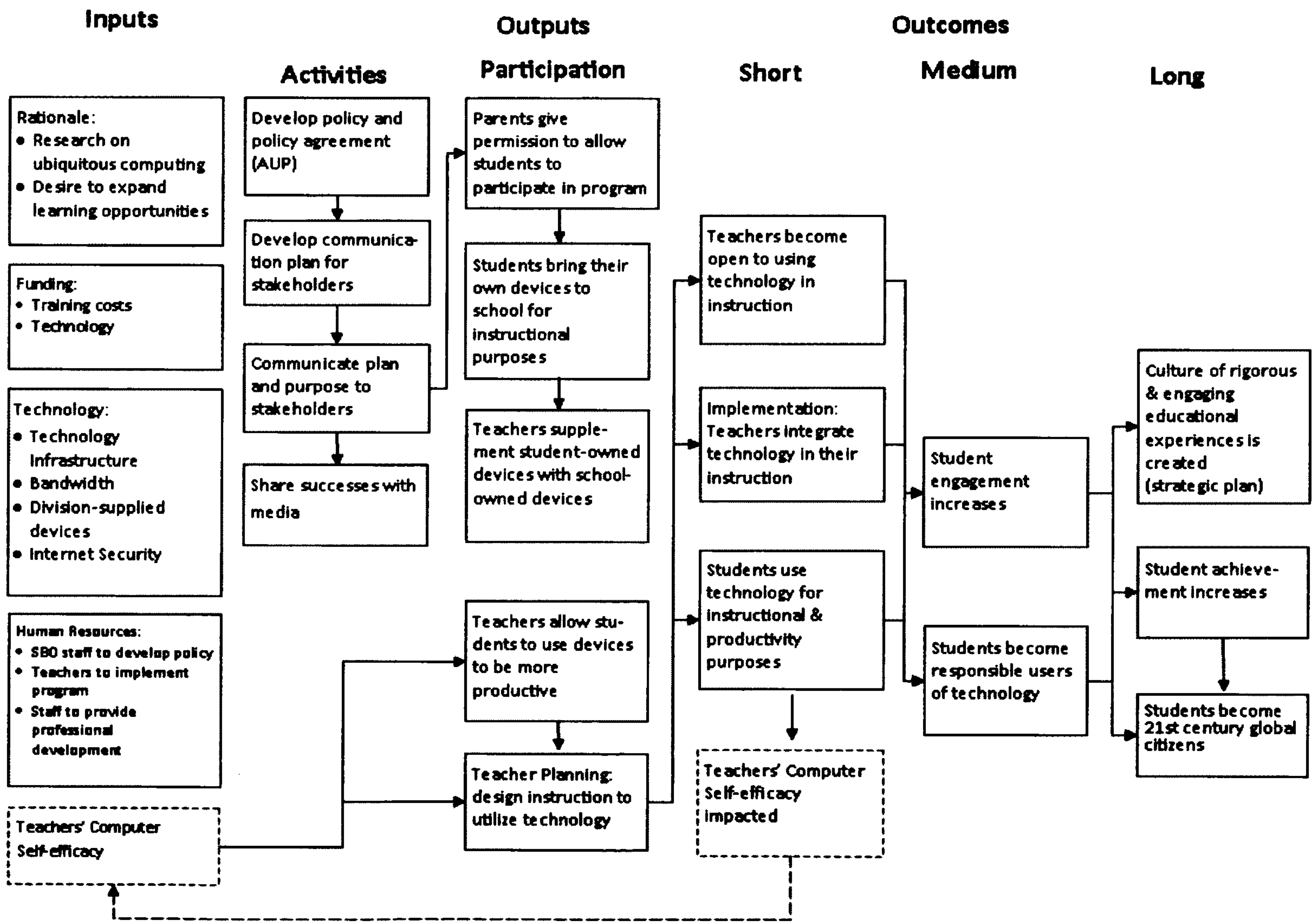

Figure 2. Logic Model of BYOT Program

Program Evaluation Model

The purpose of program evaluation is to gather information about how well a program, whether it is an intervention, product, system, or otherwise, is working (Frechtling, 2007; Mertens & Wilson, 2013). Program evaluation is also more than simply determining the success or failure of a particular program; formative evaluation of a program during its implementation and progression is important for determining how the program is progressing and for making recommendations to stakeholders for changes or improvement of the program (Frechtling, 2007; Mertens & Wilson, 2013). Program evaluation is also important in evaluating the assumptions and intended outcomes of a program (Mertens & Wilson, 2013). To this end, it is often important to evaluate school programs during implementation and regular operation rather than at the end of the program's existence. The BYOT program in this study was an ongoing program that was planned to continue indefinitely. Therefore, a formative evaluation was necessary to determine how the program was working and what changes, if any, needed to be made to the inputs or process. Additionally, the BYOT program was optional for teachers, so a formative program evaluation was necessary to determine to what extent teachers were using BYOT, how the teachers were using the program, and the successes and challenges they faced in implementation.

Evaluation Model. The program evaluation model used in this study is Stufflebeam's CIPP model (Stufflebeam, 2005; Stufflebeam & Shinkfield, 2007). The CIPP model of evaluation is a comprehensive approach that addresses the context, inputs, process, and products of a program, with specific evaluations often focusing on one aspect of the model (Fitzpatrick, Sanders, & Worthen, 2011; Mertens & Wilson, 2012).

According to Stufflebeam & Shinkfield (2007), the CIPP model "is configured especially to enable and guide comprehensive, systematic examination of social and educational programs that occur in the dynamic, septic conditions of the real world" (p. 351). The CIPP model is more flexible than traditional evaluation models and is appropriate as a formative evaluation tool for the BYOT program (Stufflebeam & Shinkfield, 2007). This study utilized the four aspects of the model. Table 1 summarizes how each of the components was used to inform the evaluation.

Table 1

The Components of the CIPP Model and BYOT Program Evaluation

Component of CIPP model	Program Components being Evaluated
Context	Teachers' successes and challenges within the program; teachers' changing computer self-efficacy, based on encouragement by others, others' use of BYOT, and support; the effect of program process and outcomes on teachers' CSE
Input	Teachers' computer self-efficacy, based on existing beliefs, prior experience with technology
Process	Teachers' instructional planning to include BYOT
Product	Teachers integrating technology, utilizing BYOT, into instruction; students using BYOT for instructional and productivity purposes

The context evaluation was ongoing throughout the study, as a way to document changes in teachers' CSE and serve as a structure for the study (Mertens & Wilson, 2012). The study evaluated CSE as an input, based on teachers' prior experiences with technology and the context of the school district. Process was evaluated to determine if and how BYOT was implemented in classrooms. Finally, product evaluation provided information regarding teachers' use of BYOT in instruction. The focus on teachers' computer self-efficacy and involvement in the BYOT program made the CIPP model an appropriate choice for evaluation, as it emphasizes stakeholder involvement (Stufflebeam & Shinkfield, 2007). The evaluation included significant teacher involvement and input to help determine the successes and challenges the teachers faced in the program.

Evaluation Questions

The purpose of this program evaluation mixed methods study was to describe the way in which a Virginia public school district implemented a BYOT program and to discover the successes and challenges the teachers' faced with the implementation of the program, as well as the connection between teachers' computer self-efficacy and their level of use of BYOT in instruction. BYOT programs are becoming increasingly popular in the state and across the nation as school districts are utilizing creative ways to provide students access to technology (Johnson, 2012). This program evaluation study sought to provide school and district leaders with information that will help make BYOT programs successful for teachers, increase student engagement in instruction, and ultimately successful in supporting student achievement. In order to understand the successes and challenges teachers face in implementing BYOT, evaluation questions were necessary in understanding the inputs, process, and outcomes of the BYOT program. These questions are:

1. Inputs: To what degree do teachers have computer self-efficacy?
2. Process: To what degree do teachers design instruction to include BYOT?
3. Context and Product: What is the relationship between teachers' computer self-efficacy and instructional design utilizing BYOT?

The central question of this study addressed the teachers in context and their relationship to the process and outcomes of the program:

4. Context: What successes and challenges do teachers face when implementing BYOT?

Definition of Terms

Bring Your Own Technology (BYOT), or Bring Your Own Device, is a program or policy school districts and businesses employ allowing students or employees to bring their own personal technology to school or work to use on the school or business wireless network (K-12 Blueprint, http://www.k12blueprint.com/byod).

Computer self-efficacy (CSE) is an individual's perception of his/her ability to use technology successfully in a given context. (Compeau and Higgins, 1995; Moos & Azevedo, 2009; Murphy, Coover, & Owen, 1989). CSE beliefs are more than an individual's perception of a specific component of technology, but rather the individual's perception of his/her ability to use the technology to complete a task (Compeau & Higgins, 1995). The sources of CSE are similar to the sources of teacher self-efficacy and include encouragement by others, other's use of technology, and support (Compeau & Higgins, 199).

Educational Technology Facilitator (ETF) is a full-time employee of the school district in this study who works with teachers to design and implement technology-integrated lessons. Each high school in the district has one ETF.

One-to-one computing is a practice of providing a laptop or other computing device for every student in a school or district in order to meet goals such as equitable access to technology, increased student engagement and student achievement (Rosso, 2011).

Teacher self-efficacy is a teacher's belief in his or her capability to organize and complete courses of action to successfully accomplish a specific teaching task in a particular context (Tschannen-Moran, Woolfolk Hoy, & Hoy, 1998).

Technology, for the purposes of this study, refers to any computer, laptop, tablet, cell phone, or iPod that can be connected to the Internet.

Technology integration is a teacher's use of technology to introduce, reinforce, extend, enrich, assess, and remediate student mastery of the curriculum (Hamilton, 2007).

Ubiquitous computing is another term for one-to-one computing, where each student and teacher in a school or district has a laptop or other computing device (Zucker, 2004).

CHAPTER 2

Review of the Literature

This chapter provides a review of the literature focusing on important elements of this study. A basic understanding of technology integration in K-12 schools and its impact on teachers and students is necessary for evaluating a specific technology integration program such as Bring Your Own Technology (BYOT). Additionally, an understanding of the history of one-to-one computing programs and the limited research on BYOT as a substitute for one-to-one computing and a move toward mobile learning are needed to support the study. Finally, an understanding of the conceptual framework of computer self-efficacy is essential for framing the study in the context of teachers' implementation of BYOT in their classrooms.

Technology Integration

Although technology has been integrated in K-12 schools to varying degrees and through multiple methods for the past few decades, there is not a standard definition of technology integration in K-12 public schools (Bebel, Russell, & O'Dwyer, 2004). However, various definitions do all include the use of technology for instructional purposes (Bebell, Russel, & O'Dwyer, 2004; Hew & Brush, 2007). Technology integration is more than placing a certain number of computers in each classroom or using a technology tool to deliver a lecture via PowerPoint—technology integration has become a meaningful teaching approach with multiple delivery methods (Mueller, Wood, Willoughby, Ross, & Specht, 2008; Tamin, Bernard, Borokhovski, Abrami, & Schmid, 2011). Technology integration involves teachers using technology to "introduce, reinforce, extend, enrich, assess, and remediate student mastery of curricular targets"

(Hamilton, 2007). For the purposes of this study, technology integration is defined as teacher and student use of technology, including desktop computers, laptops, tablets, cell phones, and other mobile devices with an Internet connection in classrooms for instructional purposes.

Shifting focus of research. Just as technology integration has taken on many forms, so has the research surrounding it. Early studies focused on numbers alone and were "technology vs. no technology" studies; later studies measured student outcomes, while more recent studies assume access to the technology and focus more on *how* teachers and students are using it (Tamin, Bernard, Borokhovski, Abrami, & Schmid, 2011). Teacher and student access to technology has increased significantly over the past several years, to the point where it is assumed to be available in all classrooms. According to Gray, Thomas, and Lewis (2010), in 2010, ninety-seven percent of teachers in K-12 public schools had computers located in their classrooms and over half of teachers had access to extra computers to bring into their classrooms if needed. Teachers, on average, had a ratio of 1.7 students to one computer in their classroom (Gray, Thomas, & Lewis, 2010). Although the tools have changed, this high access to technology has not changed (Madden, Lenhart, Duggan, Cortesi, & Gasser, 2013).

Teacher and student access to the technology does not, however, equate to productive usage of the technology (Cuban, 2001; Mueller, Wood, Willoughby, Ross, & Specht, 2008). How teachers choose to integrate technology tools into instruction and the student and teacher outcomes of the integration are the focus of more recent studies. Technology integration is not a standardized intervention like a specialized reading program or math tutorial; rather, it is a variety of tools and strategies for learning that takes on various forms in the classroom (Ross, Morrison, & Lowther, 2010; Tamin, Bernard, Borokhovski, Abrami, & Schmid, 2011). As a result, its effectiveness depends on how teachers integrate it into their classrooms and thus necessitates teachers' understanding of how to integrate technology (Tamin, Bernard, Borokhovski, Abrami, & Schmid, 2011).

Successful technology integration. Technology integration is not a magic bullet for student achievement, but some positive outcomes have been found. In a meta-analysis of 1,055 primary studies comparing student achievement in technology-integrated classrooms and traditional classrooms, Tamin, Bernard, Borokhovski, Abrami, & Schmid (2011) found that students in technology-rich classrooms scored, on average, 12 percentile points higher on achievement tests than those in traditional classrooms without technology integrated into them. Additionally, the meta-analysis showed that technologies supporting instruction, such as students using technology during instruction, had a slightly higher significant effect size than technology used only for direct instruction, such as the teacher using a PowerPoint for lecture notes (Tamin, Bernard, Borokhovski, Abrami, & Schmid, 2011). Only a few experimental studies on the impact of technology use and student achievement outcomes have been done. A synthesis of 30 studies of one-to-one laptop initiatives revealed positive impacts, specifically in the area of computer literacy and writing (Penuel, 2006). However, other studies conducted on student outcomes in one-to-one computer initiatives showed mixed results with respect to student achievement and significant positive outcomes for student engagement and motivation to learn (Argueta, Huff, Tingen, & Corn, 2011; Zucker & McGhee, 2005). Despite the lack of overwhelmingly positive results of the impact of technology integration on student achievement, technology has become a fixture in K-12 schools and a necessity in the world; the best educators and researchers can do is to identify and foster conditions for success and to support teachers in being successful with technology integration (Becker, 2000; Cuban, 2001; Penuel, 2006). In doing so, educational leaders and teachers will meet the broader aim of preparing students to be productive citizens in a technology-rich world.

Conditions for successful technology integration. According to the literature, there are several conditions in schools and classrooms that help make technology integration successful for teachers and students. Becker (2000) found that having access to at least five computers in the classroom rather than in a computer lab somewhere else in the school impacted successful integration. Likewise, teachers who were required to plan for technology use weeks in advance, schedule time in a lab, and take class time to move students from the classroom to a computer lab were less likely to use the technology available to them (Becker, 2000). Additionally, he found that teachers with at least average levels of technical experience with computers and who possessed a student-centered teaching philosophy, as opposed to a teacher-centered philosophy, had more successful integration of technology (Becker, 2000).

Barriers to technology integration. Despite the access to technology that is now the norm, as well as the research that supports the positive impact of technology integration on student outcomes, studies indicate that teachers do not always have the right skills, support, or beliefs to successfully integrate technology in their classroom (Becker, 2000; Littrell, Zagummy, & Zagummy, 2005; Mueller, Wood, Willoughby, Ross & Specht, 2008; Zhao & Frank, 2003). Research indicates that technology in education can help student achievement, motivation, and problem-solving skills, but that there are often roadblocks that prevent schools from using technology successfully for these purposes (Hew & Brush, 2007). Early studies identified access and hardware and software issues as barriers, but with the pervasiveness of technology in all aspects of our lives, concerns have turned to more personal, pedagogical, and context-specific concerns of the teachers (Chang, Lieu, Liang, Liu, & Wong, 2012; Mueller, Wood, Willoughby, Ross & Specht, 2008; Wood, Mueller, Willoughby, Specht, & DeYoung, 2005). Hew and Brush (2007) identified six categories of barriers to technology integration in K-12 schools. These categories are summarized in Table 2 and include resources, knowledge and skills, institution, attitudes and beliefs, assessment, and subject culture.

Table 2

Hew and Brush's (2007) Barriers to Successful Technology Integration

Barrier	Characteristics
Resources	Resources include technology, access to technology, time, and technical support.
Knowledge and skills	Knowledge and skills includes technology knowledge and pedagogy of teaching with technology.
Institution	Institution may include leadership, school scheduling, and school planning.
Attitudes and beliefs	Feelings that include a teacher's likes or dislikes regarding technology as well as their educational beliefs about teaching, learning, and technology.
Assessment	The pressure of assessment of student learning, specifically high-stakes testing, can be a barrier.
Subject culture	Subject culture is the expectations and practices that have developed around a particular school subject such as art, math, or English (Goodson & Mangan, 1995).

Note. Adapted from Hew, K. F. & Brush, T. (2007). Integrating technology into K-12 teaching and learning: Current knowledge gaps and recommendations for future research. *Educational Technology and Research Development, 55*(3), 223-252.

The six categories also appear across the literature on technology integration. Lack of resources may include the technology itself, access to the technology, time, and technical support (Hew & Brush, 2007). For example, Zhau, Pugh, Sheldon, and Byers (2002) found that schools with computer labs had teachers who did not feel they had easy access to computers and were competing with other teachers for access. A lack of applicable knowledge and skills could also be a barrier to technology integration. According to Mueller, Wood, Willoughby, Ross, and Specht (2008), a teacher's pedagogical beliefs about technology determine the success of computer integration. Additionally, Becker (2000) found that teachers with at least an average level of technology expertise were more likely to integrate technology into their classroom instruction.

Characteristics of the school or district institution can also impact integration. Block scheduling, in which teachers have at least 90 minutes with each group of students, is more conducive to successful technology integration than traditional 45-minute classes (Becker, 2000). Support from district and school leaders also facilitates successful integration (Zucker & McGhee, 2005). Additionally, leadership that promotes a shared vision of technology use in a school or district helps successful integration (Argueta, Huff, Tingen, and Corn, 2011; Silvernail & Lane, 2007). School principals, technology coordinators, and formal or informal teacher leaders can provide this necessary leadership. (Silvernail & Lane, 2007).

Teachers' attitudes and beliefs impact all of what they do in the classroom, including integrating technology into their teaching. Teachers' beliefs about technology are directly related to their use of technology in the classroom and will impact how they integrate technology (Bebell & O'Dwyer, 2010; Zhao & Frank, 2003; Penuel, 2006).

Ertmer (2005) found that teachers likely use their beliefs about their current teaching practices to develop their beliefs about technology integration. Teachers who have concerns about technology integration have been found to be comfortable with more traditional instructional approaches, thus sharing a teacher-centered teaching belief (Lei & Zhao, 2008). Additionally, the pressure of standardized tests and the "coverage mentality" of having to cover all of the content prior to the standardized test can hinder technology integration (Hew & Brush, 2007). Teachers who feel the pressure of covering the content tend to be less engaged in technology integration (Becker, 2000). Teachers in different subject areas may not approach technology integration in the same way, and the specific context of teaching matters for technology integration (Lawless & Pellegrino; 2007).

Role of the teacher in technology integration. Teachers are the gatekeepers to their classrooms and have a great deal of autonomy over them; likewise, they have a direct impact on the success of technology integration in their classrooms (Chang, Lieu, Liang, Liu, & Wong, 2012; Cuban, 2001; Mueller, Wood, Willoughby, Ross, & Specht, 2008; Wood, Mueller, Willoughby, Specht, & DeYoung, 2005). Despite the fact that teachers are key factors in successful implementation of technology, they are rarely asked about their experiences, beliefs, or needs with respect to technology integration (Wood, Mueller, Willoughby, Specht, & DeYoung, 2005). Barriers that school leaders and technology coordinators identify are often not the barriers teachers identify as truly preventing their technology integration (Wood, Mueller, Willoughby, Specht, & DeYoung, 2005). Barriers such as hardware and technical concerns that used to be seen as primary roadblocks have been replaced with individual experiences, beliefs, and concerns about one's ability to integrate technology successfully (Hew & Brush, 2007; Wood, Mueller, Willoughby, Specht, & DeYoung, 2005). Teachers' beliefs and self-efficacy in the context of technology integration will impact their success with technology integration (Wood, Mueller, Willoughby, Specht, & DeYoung, 2005).

The future of technology integration. In the 2010 *National Educational Technology Plan*, the United States Department of Education (USDOE) states that,

> Technology is at the core of virtually every aspect of our daily lives and work, and we must leverage it to provide engaging and powerful learning experiences and content, as well as resources and assessments that measure student achievement in more complete, authentic, and meaningful ways. (USDOE, 2010)

USDOE challenges school and district leaders to "engage and empower" students through access to multimedia content, online social networks, and mobile access to information and resources. As access to technology continues to increase and policy makers emphasize the importance of this access (USDOE), technology integration plans in K-12 schools have evolved to keep up with the demands. One-to-one computing initiatives and more recently Bring Your Own Technology (BYOT) initiatives are specific ways in which schools have attempted to provide this access and change in teaching and learning that USDOE has set forth.

One-to-One Computing

As school budgets shrink but demands for technology integration continue, one strategy that school districts have implemented to overcome a lack of technology and access to it is the use of laptops or other mobile devices to save costs and maintain sufficient access (Lowther, Ross, & Morrison, 2003). One-to-one computing is a practice that began in K-12 schools over a decade ago and involves providing a laptop or other computing device, more recently an iPad or other tablet, for every student and teacher in a school or district. Goals of one-to-one initiatives include providing equitable access to technology, increasing student engagement, and raising student achievement (Penuel, 2006; Rosso, 2011). Actual classroom practices are not included in the definition of one-to-one computing and, although it may seem that providing equal access to all students and teachers would be an optimal condition for learning, teachers' classroom practices do not always change as a result of one-to-one implementation (Bebell & O'Dwyer, 2010).

One-to-one computing implementation. One-to-one learning environments are unique settings in which to study teachers' technology integration (Windschitl & Sahl, 2002). One-to-one initiatives are implemented differently across the United States, and the earliest implementations occurred in the mid-1990s (Penuel, 2006). In a 2005 study of a large Virginia school district implementing one-to-one computing, over 25,000 laptops were distributed to teachers and students in grades 6 through 12 (Zucker & McGhee, 2005). Maine became the first and only state to implement a statewide one-to-one initiative in 2002 (Silvernail & Lane, 2004). The Maine Learning Technology Initiative involved purchasing over 34,000 laptops for middle school teachers and students. These students and teachers used their laptops for administrative purposes as well as teaching and learning (Silvernail & Lane, 2004). Penuel (2006) completed a research synthesis of 30 original articles studying one-to-one initiatives. In the studies synthesized, access to computers was the same across contexts, but school policies and implementation strategies were different (Penuel, 2006). The three core features of the one-to-one programs studied included student access to laptop computers, Internet access through the school or district's wireless network, and a focus on laptop use to help complete educational tasks (Penuel, 2006).

In the past decade, one-to-one computing has emerged as a popular way to provide students access to technology, but only in the past few years has there been evidence to support these initiatives (Bebell & O'Dwyer, 2010). One challenge schools and districts face is identifying a clear purpose for integrating the technology; school leaders should identify key beliefs and purposes for integrating technology prior to doing so (Windschitl & Sahl, 2002). Much like earlier technology integration studies, once one-to-one computing initiatives are implemented, the effects on student achievement are unclear (Penuel, 2006).

Teacher beliefs about one-to-one computing. Much like earlier technology integration studies, one-to-one computing programs depend on teachers using the technology in the classroom (Bebell & O'Dwyer, 2010). Studies indicate that teachers have varying beliefs about technology integration and more specifically one-to-one computing (Bebell & O'Dwyer, 2010; Lei & Zhao, 2008; Oliver, 2010). According to Penuel (2006), "teachers' attitudes and beliefs about technology's role in the curriculum can influence how and when teachers integrate computers into their instruction" (p. 333). Bebell and O'Dwyer (2010) emphasize the importance of examining one-to-one computer outcomes in the context of the teachers implementing it. They found that the beliefs of the teachers in the one-to-one computer settings they studied were related to their use of the available technology (Bebell & O'Dwyer, 2010). Table 3 summarizes teacher beliefs about one-to-one computing initiatives found in the research.

Table 3

Summary of Teacher Beliefs about One-to-one Computing

Positive Beliefs	Negative Beliefs
Technology is important for teaching and learning (Lei & Zhao, 2008; Silvernail & Lane, 2004)	Discomfort in a move away from traditional teaching practices (Lei & Zhao, 2008)
Technology helps teachers communicate with students and parents (Lei & Zhao, 2008)	Teachers who are unfamiliar with the technology cannot predict problems that might occur (Oliver, 2010)
Teachers notice increased use of technology in themselves and their students (Bebel & O'Dwyer, 2010)	Concerns about classroom management and student discipline in a one-to-one setting (Oliver, 2010; Penuel, 2006; Zucker & McGhee, 2005)
Teachers noticed increased student engagement (Bebel & O'Dwyer, 2010)	Increased planning time, especially during early stages of implementation (Oliver 2010, Zucker & McGhee, 2005)
Teachers feel they have more flexibility during instruction (Zucker & McGhee, 2005)	Lack of quality professional development, including a network of support among colleagues (Oliver, 2010; Windschitl & Sahl, 2005)
Students seem to be more organized (Zucker & McGhee, 2005)	Concerns about the use of technology with specific subject matter (Penuel, 2006)

Although the research outcomes on student achievement and one-to-one computing are unclear, teachers believed students' achievement and engagement in learning increased as a result of one-to-one access to technology (Bebell & O'Dwyer, 2010; Penuel, 2006,). Based on a study of seven one-to-one initiatives across the United States, Arguenta, Huff, Tingen, and Corn (2011), found that one of the crucial factors for successful implementation of one-to-one program was well-planned, high-quality professional development that was sensitive to the needs of the teachers.

Professional development needs for teachers. Professional development for one-to-one initiatives should focus on more than the computers themselves and should be developed within the context of the curriculum (Windschitl & Sahl, 2002). Three types of professional development emerge in one-to-one research (Penuel, 2006). The first type of professional development is focused on the technology itself and is often not useful in and of itself for teachers to integrate technology successfully (Littrell, Zagummy, & Zagummy, 2005; Penuel, 2006). Teachers' technology skills are important for technology integration, but more professional development is needed (Arguenta, Huff, Tingen, & Corn, 2011). The second type of professional development in one-to-one computer programs focuses on helping teachers integrate technology into their curriculum and instruction (Arguenta, Huff, Tingen, & Corn, 2011; Penuel, 2006). This type of professional development is provided by district leaders or technology facilitators. The third type of professional development that emerges from studies on one-to-one programs is informal support from colleagues; teachers found this type of informal and ongoing support to be the most helpful in successful technology integration (Arguenta, Huff, Tingen, & Corn, 2011; Davies, 2004; Silvernail & Harris, 2004; Windschitl & Sahl, 2002). Teachers need to see others be successful with the technology and want time to collaborate with each other on ways to integrate the technology into their instruction (Arguenta, Huff, Tingen, & Corn, 2011; Windschitl & Sahl, 2002).

Bring Your Own Technology Initiatives

In 2010, seventy-five percent of teenagers, ages 12-17, in the United States owned a cellphone. In 2013, seventy-eight percent of teenagers owned a cellphone, and almost half of those were smartphones with Internet access (Madden, Lenhart, Duggan, Cortesi,

& Gasser, 2013). Overall, three out of four teenagers in the United States are mobile Internet users who access the Internet on a cellphone, laptop, tablet, or other mobile device (Madden, Lenhart, Duggan, Cortesi, & Gasser, 2013). Districts and policymakers argue that one effective way of successfully integrating technology in the classroom is to utilize the devices that students already own and use on a daily basis in their lives outside of school (Johnson, 2012; Ullman, 2011). The increase in student-owned devices coupled with the realization that adequate funding for one-to-one computing may never exist makes Bring Your Own Technology (BYOT) a popular alternative to expensive one-to-one initiatives (Johnson, 2012). For the purposes of this study, BYOT is defined as a program or policy school districts employ allowing students to bring their own personal technology to school to use on the school wireless network (K-12 Blueprint, 2013).

Lack of research. Tamin, Bernard, Borokhovski, Abrami, and Schmid (2011) discuss the presence of nuances in the field of educational technology. Nuances are the specific conditions and methods of technology integration that vary greatly across districts and schools (Tamin et al., 2011). BYOT is one such nuance in need of further research. As BYOT programs become less of a nuance and more prevalent in K-12 schools, there is a need for research on how teachers implement these programs and how student outcomes are affected. Current literature on BYOT is in the form of anecdotes, pilot programs, and opinion pieces. From this anecdotal evidence, researchers and school leaders can glean useful information in the form of lessons learned, advantages, and disadvantages of this type of program.

Advantages of BYOT initiatives. Several aspects of BYOT have been successful for schools and districts implementing this type of program. One of the most cited advantages and reasons for implementing is cost effectiveness (Fritschi & Wolf, 2012; Johnson, 2012; Ullman, 2011). Schools no longer have to purchase a device for every student, nor do they have to provide technical support for large numbers of devices (Fritschi & Wolf, 2012). There is also evidence that parents already support BYOT and would purchase devices for their students regardless of program implementation (Fritschi & Wolf, 2012; Ullman, 2011). Benefits for students include increased student-centered learning and enhanced interaction among teachers and students (Lahiri & Moseley, 2012). Additionally, some studies show an increase in student motivation, critical thinking, problem solving, and time management, all of which are in the goals of the National Technology Plan (Lahiri & Moseley, 2012; Norris & Soloway, 2011; USDOE, 2010). Despite identified advantages for districts and students, some disadvantages have also emerged.

Disadvantages of BYOT initiatives. Some educational leaders and policymakers are skeptical of BYOT programs and cite potential pitfalls to implementing such programs. The biggest drawbacks are equity among students and the challenge of providing devices for students who do not bring their own (Quillen, 2011; Stager, 2001). Another concern is the Internet safety of the students (Quillen, 2011). Even proponents of BYOT caution schools and teachers to plan for appropriate Internet security for students prior to implementation (Johnson, 2012; Lahiri & Moseley, 2012). Some fear that teacher anxiety increases when BYOT is allowed in the classroom because BYOT could be a source of distraction for students rather than an educational tool (Lahiri &

Moseley, 2012; Stager, 2001). One final potential challenge for BYOT initiatives is the need for increased professional development for teachers on how to incorporate a variety of technology tools into instruction (Lahiri & Moseley, 2012). Despite these potential disadvantages, the push for technology and interest in BYOT continues to rise; school leaders and policymakers are now looking for ways to plan successful BYOT programs (Johnson, 2012).

Leadership for BYOT. Johnson (2012) states that, "good planning is essential" for successful implementation of BYOT. There are seven steps school and district leaders should take when planning a BYOT initiative, including (a) establishing clear policies, (b) determining a rationale for the plan, (c) meeting infrastructure requirements, (d) providing professional development, (e) informing parents, (f) selecting resources wisely, and (g) striving for equity among students (Johnson, 2012). Additionally, there are conditions that should exist in a school or district planning a BYOT initiative; if these conditions do not exist, school and district leaders are encouraged to create them prior to BYOT implementation (Fritschi & Wolf, 2012). For example, districts should ensure that appropriate technology infrastructure is in place to provide Internet access to an increased number of student-owned devices (Fritschi & Wolf, 2012; Ullman, 2011). Additionally, school leaders should plan appropriate professional development to ensure successful implementation (Fritschi & Wolf, 2012; Johnson, 2012; NASSP, 2011). Fritschi and Wolf (2012) state that, "rather than trying to fit the new devices into the same instructional strategies, educators should be thinking critically about how they will deliver instruction differently using the opportunities afforded by mobile technologies. Professional development is key to helping teachers make the paradigm shift necessary to effectively integrate mobile devices into instruction" (p 30). The essential conditions for BYOT implementation are summarized in Table 4.

Table 4

Essential Conditions for BYOT

Condition	Description
Visionary leadership and commitment	Successful programs have visionary leaders who promote and oversee the program. To ensure success, the initiative should be framed as an educational initiative clearly tied to instructional goals rather than a technology initiative.
Robust technology capacity	Schools and districts should first consider existing technology infrastructure and what broadband, hardware and software, and technical support will be needed for a successful mobile learning program. Security and privacy, in the form of appropriate Internet filters, must be considered.
Professional development	Schools and districts must have a plan for providing appropriate professional development for teachers. More important than an understanding of specific technology tools are the skills and knowledge to incorporate technology into instruction.
Scalability	Successful programs have taken the "start small, think big" approach. Although initial implementation may be a pilot at one or two schools, capacity for a large-scale implementation should be considered at the outset.
Policies that promote and support the initiative	Schools who are moving to mobile learning programs have shifted from "acceptable use" policies to "responsible use" policies in an attempt to shift the institutional mindset that technology should be banned or limited.

Note. Adapted from Fritschi, J. & Wolf, M. A. (2012). *Turning on mobile learning in North America: Illustrative initiatives and policy implications.* United Nations Educational, Scientific and Cultural Organization.

Change in teacher beliefs and pedagogy. As long as teachers use technology to teach existing content in ways they always have, little will change in teaching and learning (Norris & Soloway, 2011). Teachers who struggle with one-to-one and BYOT initiatives often have a more teacher-centered approach and focus on classroom management and discipline issues (Penuel, 2006). They may see BYOT as a distraction for students (Johnson, 2012). Successful BYOT programs should have support and professional development for teachers as they learn BYOT strategies and gain confidence in their ability to use BYOT in their classrooms (Fritschi & Wolf, 2012; Johnson, 2012). As Fritschi & Wolf (2012) indicate, teachers will experience a paradigm shift, including changes in their beliefs and practices. Providing successful experiences for teachers will increase teachers' self-efficacy and change their beliefs regarding BYOT (Fritschi & Wolf, 2012; Johnson, 2012; Windschitl & Sahl, 2002). Teachers' self-efficacy beliefs about technology are important to their integration of technology in their instruction (Cuban, Kirkpatrick, & Peck, 2001; Ertmer, 2005; Pareskeva, et al., 2006; Potter & Rockinson-Szapkiw, 2012).

Computer Self-Efficacy

Computer self-efficacy (CSE), or an individual's beliefs about his/her ability to successfully use computers, is an important construct that has implications for teachers integrating technology in the classroom. CSE has been explored extensively in the business sector but has not been as closely and specifically linked to teacher use of technology (Chang, Lieu, Liang, Liu, & Wong, 2012). Exploring CSE as an important construct for teacher technology integration can help school leaders more effectively implement technology integration in their schools. CSE is a construct worthy of exploration in the educational realm as it can help researchers and educational leaders address the changing needs of students and teachers in technology-rich classrooms.

Social cognitive theory and self-efficacy. Bandura's (1986) Social Cognitive Theory is a widely used and accepted model of behavior. The model is a triadic relationship between an individual's behaviors, cognitive and personal factors, and the environment. These three elements interact and operate together: thus, one's actions are not determined explicitly by intrinsic forces or external factors, but rather by an interaction among them (Bandura, 1986). Behavior is affected by cognitive and personal characteristics; likewise, personal characteristics and cognition affect an individual's behavior (Bandura, 1986). Out of Social Cognitive Theory stems the construct of self-efficacy, a more specific construct of individuals' beliefs regarding their actions and outcomes.

Bandura (1986) defines self-efficacy as an individual's judgments of his or her capabilities to plan and implement courses of action required for certain tasks (p. 391). Self-efficacy is not about the skills one has, but rather a judgment about one's capability. There are four principal sources of information from which individuals develop their sense of self-efficacy. These four sources are mastery experiences, vicarious experiences, verbal persuasion, and physiological states (Bandura, 1986).

Mastery experiences. Mastery experiences are the most powerful source of self-efficacy and refer to the success that an individual has with a specific task (Ashton & Webb, 1986; Bandura, 1986; Bandura, 1997; Tschannen-Moran, Woolfolk Hoy, & Hoy, 1998). Success in a particular activity raises an individual's feelings of self-efficacy (Bandura, 1986). For example, if a teacher were to implement a technology strategy in her classroom and students were engaged in the lesson and learned from the experience, her sense of efficacy for that particular lesson or technology may increase. Likewise, multiple successes will help an individual develop a stronger sense of self-efficacy and intermittent failures will not hinder one's feelings of success or self-efficacy (Bandura, 1986). If the teacher were to experience one unsuccessful lesson after many mastery experiences, she may be less inclined to deem it as a failure. Bandura (1986) explains that individuals with higher self-efficacy and mastery experiences are more likely to consider other external or contextual factors as causes of failure; individuals with lower self-efficacy may blame themselves or the difficulty of the task itself.

Vicarious experiences. Individuals do not develop self-efficacy through experience alone. Vicarious experience refers to seeing or visualizing others being successful with a particular task (Bandura, 1986). When individuals see others being successful, they are more likely to believe that they too will be successful. Likewise, if an individual without relatively high self-efficacy sees others struggle, this too can influence their own self-efficacy in negative ways. Vicarious experiences can be face-to-face observations, such as a peer observation of another teacher completing a task successfully, or a vicarious experience can be through video or some other observable format (Guskey & Passaro, 1994; Tschannen-Moran et al., 1998).

Verbal persuasion. Verbal or social persuasion may be in the form of specific instruction or feedback from a supervisor, or it may be more informal such as a pep talk from a colleague (Tschannen-Moran et al., 1998). Verbal persuasion may be helpful in maintaining self-efficacy beliefs or persistence in situations in which a teacher has a minor setback (Tschannen-Moran et al., 1998). Verbal persuasion can also be positive or negative; an unkind or unprofessional comment can impact self-efficacy as much as a positive pep talk from a supervisor. When considering the power of verbal persuasion, one must consider the existing relationship with the individual providing the feedback. If the individual is respected, the feedback will have more of an impact on self-efficacy (Bandura, 1997).

Physiological states. Physiological and emotional states refer to the stress or anxiety level an individual may feel when preparing for or completing a task (Bandura, 1986; Compeau & Higgins, 1995; Tschannen-Moran et al., 1998). Often, too much fear or anxiety about a given task may cause a person to be unable to perform the exact task they were afraid to do (Bandura, 1986). However, some level of stress or anxiety can cause an individual to perform at a higher level.

In addition to the four sources of self-efficacy, there are also three significant dimensions of self-efficacy: magnitude, strength, and generalizability (Bandura, 1986; Compeau & Higgins, 1995). These dimensions are important when exploring the way self-efficacy in one isolated situation may affect self-efficacy in other situations.

Magnitude. Magnitude refers to the level of difficulty of a task that an individual believes is attainable. An individual with a high magnitude of self-efficacy believes that s/he can accomplish more challenging tasks than someone with a lower magnitude of self-efficacy (Compeau & Higgins, 1995). Two individuals may each have high levels of self-efficacy, but the magnitude is measured in the challenging tasks the individuals believe they can accomplish. Magnitude is also context-specific, as an individual may have self-efficacy belief for accomplishing a task with one group of students but not for another.

Strength. The strength of an individual's self-efficacy refers to the conviction about the judgment; someone with strong self-efficacy is not set back by challenges, whereas, someone with weaker self-efficacy is more easily frustrated or likely to give up (Compeau & Higgins, 1995). The individual who has high self-efficacy and has had multiple mastery experiences with a particular task develops a strong sense of self-efficacy and is able to overcome challenges more easily than someone with weaker self-efficacy.

***Generalizability*.** Generalizability of self-efficacy refers to the degree to which an individual's self-efficacy is limited to a particular situation or carried over to other similar situations. Someone who is able to complete a task or behavior under specific conditions has self-efficacy that is less generalizable than someone who believes they can perform the task under a variety of conditions (Compeau & Higgins, 1995). The complex nature of teaching and classroom settings make generalizability an important dimension to consider. Teachers work in a variety of contexts and are influenced by both internal and external factors (Guskey & Passaro, 1994). Because most models of self-efficacy are task-specific, one must be careful not to assume that self-efficacy for one task can be generalized to other tasks or other groups of students. If a teacher has a high sense of self-efficacy for a particular task, such as utilizing a current technology device, his or her self-efficacy specific to the use of this device may not be generalizable to other classroom activities or other groups of students.

Teacher self-efficacy. Over the past twenty years, Bandura's research on self-efficacy has been expanded to the realm of teachers (Ashton & Webb, 1986; Gibson & Dembo, 1984; Guskey & Passaro, 1994; Tschannen-Moran et al., 1998). There are multiple models of teacher self-efficacy and several instruments for measuring self-efficacy of classroom teachers (Guskey & Passaro, 1994). In general, teacher efficacy is defined as a teacher's belief that s/he has an impact on student learning (Guskey & Passaro, 1994). Teacher self-efficacy deals with a teacher's perception of his/her competence or ability rather than the teacher's actual competence or ability to perform a certain task (Tschannen-Moran et. al, 1998). A teacher may be very skilled with computers in his or her personal life but may have low self-efficacy beliefs about his/her ability to use them in instruction.

Teacher self-efficacy is worthy of study because research shows that teachers' self-efficacy can impact student achievement (Ashton & Webb, 1986; Guskey & Passaro, 1993; Tschannen-Moran et al., 1998). Teachers' self-efficacy beliefs are impacted by the teachers' behaviors, such as their thoughts, choices of actions, effort, and persistence in specific teaching tasks (Ashton & Webb, 1986). For example, teachers with low self-efficacy may doubt their abilities to carry out certain actions in the classroom and thus be less inclined to try new or innovative strategies (Ashton & Webb, 1986). Teachers with low self-efficacy are more likely to employ basic management strategies rather than innovative instructional strategies that may relinquish some teacher control; teachers with higher self-efficacy may be more willing to try new instructional strategies without a stifling fear of failure (Ashton & Webb, 1986). Low teacher self-efficacy, however, does not necessarily equate to bad teaching; it may just mean the teacher is less likely to step out of a comfort zone or embrace new strategies or ideas. Developing a teacher's sense of self-efficacy may help teachers branch out and be more willing to embrace new instructional strategies as well as be more likely to persist and overcome challenges when faced with them in the classroom (Guskey & Passaro, 1994; Tschannen-Moran et al., 1998). Teachers with high self-efficacy beliefs exhibit behaviors that have been shown to increase student achievement (Ashton & Web, 1986; Tschannen -Moran & Woolfolk Hoy, 2001). The possibility of developing and nurturing teacher self-efficacy is worth exploring because of its potential impact on student achievement.

Teaching efficacy and personal teaching self- efficacy. Ashton and Webb (1986) identify an important distinction between sense of teaching efficacy and sense of *personal* teaching efficacy. A teacher's sense of teaching efficacy is his/her belief that teaching has an impact on student learning. A teacher with a high sense of teacher efficacy may believe that teachers are important and that teachers impact student learning without necessarily seeing his/her own impact on student learning in his/her own classroom. A teacher's sense of personal teaching efficacy is his/her perception of his/her own teaching capability (Ashton & Webb, 1986). The level of a teacher's sense of personal teaching self-efficacy will affect his or her willingness to try new strategies or be comfortable in new teaching situations. As in Bandura's construct of self-efficacy, the four sources from which teachers develop their sense of personal teaching self-efficacy are mastery experiences, vicarious experiences, verbal persuasion, and physiological states (Bandura, 1986; Guskey & Passaro, 1994, Tschannen-Moran et al., 1998). It is the realm of personal teaching efficacy that will be important as we explore computer self-efficacy and how a teacher integrates technology in his/her own classroom.

Models of teacher self-efficacy. Two additional significant models of teacher self-efficacy that have emerged from the work of Ashton and Webb are Gibson and Dembo's (1984) model and Tschannen-Moran, Woolfolk Hoy, and Hoy's (1998) model. Gibson and Dembo (1984) found that teacher self-efficacy is multi-dimensional and that it may influence classroom behavior patterns of teachers. This model, as Bandura first described, distinguishes between personal teaching efficacy and general teaching efficacy (Gibson & Dembo 1984). Teacher self-efficacy positively impacts teacher behaviors as well as student outcomes (Ashton & Webb, 1986; Gibson & Dembo, 1984; Tschannen-

Moran & Woolfolk Hoy, 2001; Tschannen-Moran et al., 1998). Tschannen-Moran, Woolfolk Hoy, and Hoy (1998) proposed an integrated model of teacher self-efficacy. Their integrated model considers that teacher self-efficacy is context specific; a teacher can have high self-efficacy for one particular teaching task or in one context and not in another (Tschannen-Moran et al., 1998). For example, a teacher may have very high self-efficacy in cooperative learning strategies but have low self-efficacy for integrating technology in instruction.

This model of teacher self-efficacy is an integrated one because it connects a teacher's beliefs about the particular teaching task and his/her beliefs about his/her personal teaching ability. A teacher goes through a cognitive processing of the four sources of efficacy and separates the processing into the *analysis of teaching tasks* and *assessment of personal teaching competence* (Tschannen-Moran et al., 1998). In *analysis of the teaching task,* the teacher makes a judgment on the resources and constraints in a particular teaching task; this analysis also involves an assessment of what will be required of the teacher for a particular teaching task (Tschannen-Moran et al., 1998). For example, a teacher integrating technology in his/her classroom may express concern for the lack of technology available in the school; this is an analysis of the teaching task itself and has little to do with the teacher's competence. The analysis of the teaching task has a great deal to do with the context or setting. In *assessment of personal teaching competence*, the teacher makes a judgment about his or her own perceived strengths and weaknesses; this may be, for example, a teacher's own perceived comfort level with technology and how that could affect his or her ability to use it effectively with students (Tschannen-Moran et al., 1998). This teacher may worry that he or she does not know how to use a particular technology tool or program. Analysis of the task at hand and assessment of personal competence happen subconsciously for teachers and contribute to their beliefs about teaching (Tschannen-Moran et al., 1998). The study of teacher self-efficacy must address the subjective perceptions of teachers, the specific contexts in which teachers work, direct influences such as students and administration, and indirect influences such as parents and the community (Ashton & Webb, 1986). To that end, this review will refer to Tschannen-Moran, Woolfolk-Hoy, and Hoy's integrated model of teacher self-efficacy. These added dimensions of analyzing teaching tasks and assessing personal teaching competence may have important implications for computer self-efficacy of teachers and the use of technology in the classroom. In order to understand computer self-efficacy of teachers, it is important to understand and articulate the components and underlying assumptions of teacher self-efficacy.

Computer Self-efficacy. Self-efficacy is context specific, thus researchers have explored self-efficacy in different settings and with respect to specific tasks such as teaching or technology use (Cassidy & Eachus, 2002). This study examines self-efficacy of teachers in a BYOT program through the lens of CSE. Teachers integrating technology in their classrooms, whether through school-provided devices, BYOT, or a combination, develop their own feelings toward their ability to use technology effectively as an instructional tool. This sense of self-efficacy in the context of technology integration may be important in the success or failure of such programs (Wang, Ertmer, & Newby, 2004). Research indicates that self-efficacy beliefs are a major factor in individuals' use of and success with technology (Cassidy & Eachus, 2002). CSE is an important construct to consider when exploring teachers' integration of technology and implementation of BYOT.

Dimensions of computer self-efficacy. CSE is an individual's perception of his/her ability to use technology successfully in a given context. (Cassidy & Eachus, 2002; Compeau and Higgins, 1995; Moos & Azevedo, 2009; Murphy, Coover, & Owen, 1989). The construct addresses an individual's beliefs about what could be done in the future with computers, rather than past experiences alone (Compeau & Higgins, 1995). Computer self-efficacy also incorporates one's beliefs that a particular skill can be applied to a broader task; computer self-efficacy beliefs are more than an individual's perception of a specific component of technology, but rather the individual's ability to use the technology to complete a task (Compeau & Higgins, 1995). In other words, it is not an individual's ability to use Microsoft Excel, but rather his/her beliefs that he/she can use it successfully to balance a budget.

Computer self-efficacy, analogous to Bandura's construct of self-efficacy, has three dimensions of magnitude, strength, and generalizability (Compeau & Higgins, 1995; Moos & Azevedo, 2009). The magnitude of computer self-efficacy can be seen in the level of an individual's capability expected in a particular situation where technology is involved. Magnitude can also be measured by the perceived amount of support required to complete a task. For example, an individual with a higher magnitude of self-efficacy would believe he or she could complete a task with less assistance than those who feel they have lower self-efficacy. The strength of computer self-efficacy can be seen in the amount of confidence an individual has in performing a task. According to Compeau & Higgins (1995), the generalizability of computer self-efficacy refers to the degree to which an individual's judgment of his/her ability is limited to a particular domain of the activity. For example, someone with high computer self-efficacy generalizability may be confident in using both Windows and Macintosh platforms; someone with lower computer self-efficacy generalizability would perceive himself as being limited to one platform or software. These dimensions have important implications for exploring the technology integration of classroom teachers.

Compeau and Higgins' model. Through a research model constructed of eight elements and fourteen hypotheses, Compeau & Higgins (1995) developed and validated a 10-item measure focused on tasks rather than specific tools or technologies. This model includes similar sources of self-efficacy to Bandura's four sources of self-efficacy and models of teacher self-efficacy (Bandura, 1986, Tschannen-Moran et al., 1998). The distinction between tasks and technologies in Compeau and Higgins' model is an important one in the context of schools and in a world in which technologies emerge and change at a rapid rate. Possessing the knowledge of a particular technology tool is not as beneficial as having the skill and self-efficacy to adapt to new devices as they emerge. This distinction is important if the model is to be used in conjunction with teacher self-efficacy and classroom technology integration. It is not enough to know if a teacher has the skills, but rather his/her beliefs about how s/he can use technology to complete tasks in the classroom and with students is also important. To that end, this study will utilize Compeau and Higgins' (1995) model of computer self-efficacy because of its focus on tasks and task difficulty as well as its use in other educational research settings (Chang, Lieu, Liang, Liu, & Wong, 2012; Teo, 2009).

Elements of computer self-efficacy. Bandura's Social Cognitive Theory dimensions of cognitive, behavioral, and environmental forces are also incorporated into the eight elements of this model that influence computer usage (Compeau & Higgins, 1995). The elements also parallel the four sources of teacher self-efficacy (Bandura, 1986, Tschannen-Moran et al., 1998). The first element is encouragement by others, or verbal persuasion as other models of self-efficacy would define it, and usually comes from the people with whom an individual works (Compeau & Higgins, 1995). The second element is other's use of computers; the third is the support of the organization for computer users within the organization (Compeau & Higgins, 1995). Support includes availability of technology and assistance for those who need it. The fourth element is the computer self-efficacy of the individual; self-efficacy was found to be an important antecedent to computer use (Burkhardt & Brass, 1990; Compeau & Higgins, 1995). The fifth element in the model is outcome expectations, or the expected consequences of a behavior exhibited by the individual (Compeau & Higgins, 1995). The sixth element is an individual's affect or liking for a particular behavior, and the seventh element is anxiety toward computers (Compeau & Higgins, 1995). These seven elements all influence each other and the final element in the model, computer usage. The model indicates that encouragement by others, others' use of technology, and additional support all influence an individual's computer self-efficacy and outcome expectations. Computer self-efficacy then directly impacts an individual's outcome expectations, positive affect, anxiety level, and use of technology. Outcome expectations influence usage and affect. Finally, affect, anxiety, outcome expectations, and computer self-efficacy all impact an individual's usage of technology (Compeau & Higgins, 1995). The research model is shown in Figure 3.

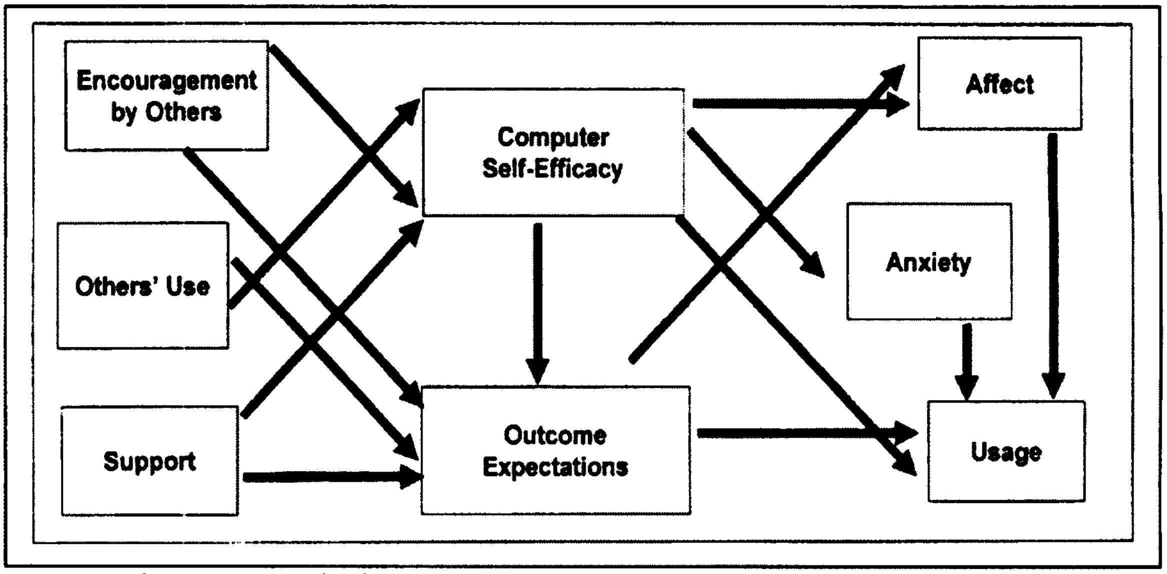

Figure 3. Compeau & Higgins Research Model (1995). From Compeau, D. R. & Higgins, C. A. (1995). Computer Self-efficacy: Development of a measure and initial test. *MIS Quarterly, 19*(2), 189-211.

Computer self-efficacy is a significant construct because it has been shown to impact computer usage (Berkhardt & Brass, 1990; Compeau & Higgins, 1995). The target population for the development and validation of the measurement was whom Compeau & Higgins (1995) called knowledge workers, or individuals who are required to process large amounts of information. Knowledge workers may include researchers, consultants, financial analysts, and others. Although teachers were not used in their sample, educational researchers have used this model to measure the computer self-efficacy of teachers (Chang et al., 2012; Paraskeva, Bouta, & Papagianni, 2008). In the case of an examination of teachers integrating BYOT in their classrooms, this computer self-efficacy model is significant because it incorporates many of the aspects of teacher self-efficacy and addresses tasks rather than technology tools alone.

Development of measures and tests. There have been multiple approaches to the development and measurement of computer self-efficacy (CSE), but measurements seem to be self-reporting scales (Cassidy & Eachus, 2002). Some approaches to CSE focus on early adoption of computer technologies, others on computer training and skills (Compeau & Higgins, 1995). One early model developed by Burkhardt and Brass (1990) was a three-item scale measuring general perceptions about ability to use computers successfully. A second measure explored CSE as it related to performance in a computer training situation (Webster & Martocchio, 1992). Another measurement was developed by Murphy, Coover, and Owen (1989). to measure the computer self-efficacy of individuals based on their computer-related skills and knowledge. A fourth important measure explored the relationship between computer self-efficacy, training methods and training performance, focusing on computer skills only (Gist, Schwoerer, & Rosen, 1989). This model was significant in the development of future models but lacked emphasis on task completion (Compeau & Higgins, 1995). Aspects of these models and measurements are apparent in Compeau and Higgins' model and measurement (1995).

Cassidy and Eachus (2002) identified limitations in Compeau and Higgins' model, including the high task specificity and reference to specific software packages, thus making items on Compeau and Higgins' scale obsolete years later as technology changes. Cassidy and Eachus (2002) developed and validated a 30-item CSE scale called the Computer User Self-Efficacy Scale (CUSE) to measure CSE in adults in educational settings. Their rationale for developing the CUSE focused on the general impact computers have on individuals in education and life; individuals, particularly students and teachers, are expected to be proficient in computer use (Cassidy & Eachus, 2002). They constructed the CUSE in an effort to create a scale appropriate for use in general populations of computer users (Cassidy & Eachus, 2002).

Computer self-efficacy of teachers. Teacher beliefs are not easily understood, but they are very powerful in changing classroom practice and impacting student achievement (Ertmer, 2007; Tschannen-Moran, et al., 1998). Individual factors such as computer self-efficacy are important in changing those classroom practices that impact student achievement (Pareskeva, Bouta & Papagianni, 2006; Tschannen-Moran, et al., 1998). As Bandura (1986) indicates, it is important to focus self-efficacy measures to a specific context of interest in order for it to be relevant or meaningful. Computer self-efficacy has been used to investigate teachers' and pre-service teachers' use of technology in the classroom (Chang et al., 2012; Pareskeva, et al., 2006; Teo & Koh, 2010; Wang, et al., 2004), and research indicates that when teachers believe they have the ability to use computers successfully, they are likely to also believe the technology is easy to use and will ultimately accept the new technology (Albion, 1999; Chang et al., 2012; Oliver & Shapiro, 1993; Wang, et al., 2004). A teacher's computer self-efficacy may also impact student use; if a teacher does not see a tool as having value in the classroom, the teacher is less likely to allow students to try it. Therefore, teacher computer self-efficacy and perception of technology and its usefulness in the classroom impacts integration (Pareskeva, et al., 2006; Potter & Rockinson-Szapkiw, 2012;). More specifically, a teacher's use of one-to-one technology in instruction is facilitated by the teacher's belief system (Windschitl & Sahl, 2002). Beliefs are formed in a variety of ways, and teachers are more inclined to be influenced and change their beliefs based on what they view as right and attainable in the classroom rather than a particular educational theory or instructional strategy (Ertmer, 2005; Windschitl & Sahl, 2002). Teacher self-efficacy, and more specifically teacher computer self-efficacy, is an important construct in understanding teachers' beliefs and how their beliefs play out in classroom practice and technology integration.

Conclusion

Technology integration in K-12 public schools continues to expand and evolve with pressure from policymakers to provide increasing access to students and teachers. Teachers have a pivotal role in the success of programs like BYOT that provide such access. The value of a variety of sources of self-efficacy becomes important in developing a teacher's sense of computer self-efficacy, and the structures schools have in place often do not support teachers' computer self-efficacy. Teachers report that they have access to technology but do not always know what to do with the devices, how to use them for instructional purposes, or have the time to learn (Cuban, 2001; Gray et al., 2010; Mundy et al., 2012; Simsek, 2011). This lack of knowledge and efficacy may hinder integration (Newhouse & Rennie, 2001). Another factor that makes technology integration challenging is that the technology is constantly evolving, as evidenced by new technologies such as the iPad, iPhone, and other mobile computing devices that did not exist even five years ago. Training for specific tools can be challenging, as the tools change so frequently (Zhao & Frank, 2003). Instructional programs or initiatives are often implemented with little forethought or provision for adequate training of teachers or preparation for students (Lawless & Pellegrino, 2007); if teachers are unaware of the technology tools available to them or lack specific strategies for implementation, integration is likely to be unsuccessful. These challenges pose an important question for research: how can leaders provide proper professional development, experiences, and support to help build teacher computer self-efficacy and encourage successful implementation of classroom technology integration?

CHAPTER 3

Methodology

The purpose of this mixed methods program evaluation study was to investigate the way in which a Virginia public school district and its teachers implemented a BYOT program and to discover the successes and challenges the teachers faced with the implementation of the program. Additionally, this study investigated the relationship between teachers' computer self-efficacy and teachers' use of BYOT. As technology integration in K-12 schools has increased and changed over the past few decades, school districts are looking for new ways to provide technology access to students and teachers. Technology integration has been done for multiple reasons, including increased student engagement and improved student achievement. Additionally, school districts continue to integrate technology to prepare students to be successful global citizens in the 21st century (Zucker & McGhee, 2005). As funds for technology dwindle, BYOT programs are becoming increasingly popular in Virginia and across the nation as school districts are utilizing creative ways to continue to provide students' access to technology (Johnson, 2012).

Chapter 2 provided a review of the literature pertinent to a program evaluation of a BYOT program. Technology integration, or teacher and student use of technology including desktop computers, laptops, tablets, cell phones and other mobile devices with an internet connection in classrooms for instructional purposes, has been occurring in K-12 schools for the past few decades (Bebel, Russell, & O'Dwyer, 2004; Hew & Brush, 2007). In order to understand the nuances of the broad topic of technology integration, it is important to have a clear understanding of the different ways in which technology has been integrated in schools (Tamin, Bernard, Borokhovski, Abrami, & Schmid, 2011). One-to-one computing, or the practice of providing a laptop or other computing device for every student and teacher in a school or district, is one such nuance that became popular over a decade ago (Lowther, Ross, & Morrison, 2003; Tamin et al., 2011).

Although there is often not a clear purpose for districts implementing one-to-one computing, student engagement and motivation seem to increase slightly with these initiatives (Bebel & O'Dwyer, 2010; Windschitl & Sahl, 2002). More recently, as a solution to the high cost of one-to-one initiatives, school districts have begun to implement BYOT programs that allow students and teachers to bring their own technology devices to school. Districts and policymakers argue that BYOT programs are an effective way to successfully integrate technology in the classroom by utilizing the devices that students already own and use on a daily basis in their lives outside of school (Johnson, 2012; Ullman, 2011).

The teachers are one of the most important factors in the success or failure of any technology integration program (Bebell & O'Dwyer, 2010). Likewise, teachers' beliefs and self-efficacy toward technology – or computer self-efficacy (CSE) – will impact their use of the technology (Bebell & O'Dwyer, 2010; Windschitl & Sahl, 2002). Because of their essential role in the success of important programs such as BYOT, this study focused on the computer self-efficacy of teachers implementing a BYOT program and the extent to which they integrated BYOT into their instruction.

Evaluation Questions

This program evaluation study sought to provide school and district leaders with information that will help make BYOT programs successful for teachers, thus increasing student engagement in instruction, and ultimately successful in supporting student achievement. In order to identify the successes and challenges teachers faced in implementing BYOT, the following evaluation questions were developed to understand the inputs, process, and outcomes of the BYOT program. The questions are:

1. To what degree do teachers have computer self-efficacy?
2. To what degree do teachers design instruction to include BYOT?
3. What is the relationship between teachers' computer self-efficacy and instructional design utilizing BYOT?

The central question of this study addressed the teachers in context and their relationship to the process and outcomes of the program:

4. What successes and challenges do teachers face when implementing BYOT?

Method

This study was a mixed-methods program evaluation of a BYOT program. According to Fitzpatrick, Sanders, & Worthen (2011), evaluation is the "identification, clarification, and application of defensible criteria to determine an evaluation object's value, its merit, or worth in regard to those criteria" (p. 7). Evaluation of social programs like those found in K-12 educational settings is not always as clear as this definition suggests. Rossi, Lipsey, and Freeman (2004) define program evaluation or "evaluation research" as, "a social science activity directed at collecting, analyzing, interpreting, and communicating information about the workings and effectiveness of social programs" (p. 2). This definition takes the political and social ramifications of program implementation and evaluation into account and is thus a more appropriate definition for this particular study of a BYOT program in K-12 schools.

The CIPP model of program evaluation is the specific type of program evaluation that was used to frame this study. The CIPP model has four components – Context, Input, Process, and Product – that were addressed in Chapter 1. Context evaluation is used to provide a wide-lens view of a program and was used to identify the teachers' successes and challenges as well as their computer self-efficacy. Input evaluation is used to assess the strategies, plans, budgets, and schedules used in the program and was used to explore the teachers' plans for integrating BYOT into their instruction as well as district strategies for implementation (Stufflebeam & Shinkfield, 2007). Process evaluation is used to predict problems in the design or implementation of the program and addressed the teachers' instructional planning to include BYOT (Stufflebeam & Shinkfield, 2007). Product evaluation was used to "collect descriptions and judgments of outcomes and relate them to the context, input, and process information," as well as to determine their worth (Stufflebeam & Shinkfield, 2007). This program evaluation integrated the four components of the CIPP model to answer the evaluation questions.

Standards of Program Evaluation

Specific standards of program evaluation were considered in developing this program evaluation. The Joint Committee on Standards for Educational Evaluation (2011) developed *The Program Evaluation Standards* (*Standards*) to guide the evaluation of educational programs in a variety of settings and provide a complete framework for determining the quality of an evaluation (Yarbrough, Shulha, Hopson, & Caruthers, 2011). The *Standards* are organized into five categories: utility, feasibility, propriety, accuracy, and meta-evaluation (Yarbrough, Shulha, Hopson, & Caruthers, 2011). The utility standards address the usefulness and appropriateness of the evaluation. The feasibility standards address the extent to which the evaluation can be done successfully in a particular setting. The propriety standards address the moral, ethical, and legal aspects and ramifications of the study to ensure participants are treated safely and fairly. The accuracy standards refer to how dependable and trustworthy the evaluation is. The meta-evaluation standards refer to a critical examination of the program evaluation itself to ensure the merit of the study (Mertens & Wilson, 2012).

Guiding Principles for Evaluators

In addition to the *Standards,* program evaluators have the American Evaluation Association's (AEA) *Guiding Principles for Evaluators* to guide their work. The AEA *Guiding Principles for Evaluators* are summarized in Table 5.

Table 5

Guiding Principles for Evaluators

Principle	Description
Systematic Inquiry	Evaluators should conduct systematic, data-based inquiries.
Competence	Evaluators provide competent performance to stakeholders.
Integrity/Honesty	Evaluators display honesty and integrity in their own behavior, and attempt to ensure the honesty and integrity of the entire evaluation process.
Respect for People	Evaluators respect the security, dignity, and self-worth of respondents, program participants, clients, and other evaluation stakeholders.
Responsibilities for General and Public Welfare	Evaluators articulate and take into account the diversity of general and public interests and values.

Note. Adapted from American Evaluation Association. (2004). *Guiding Principles for Evaluators*. Retrieved from http://www.eval.org/p/cm/ld/fid=51

The definition of program evaluation, the evaluation standards, and the AEA's guiding principles of program evaluation were all taken into consideration when designing this program evaluation study.

Participants

Participants in this study represented teachers and students in the four high schools in the district implementing the BYOT program. Participating teachers and the data collected remained confidential; student survey data was collected by the school district and remained anonymous.

Teachers. The teacher participants in this program evaluation were volunteers from the four high schools in the district. The total student population of the district was just over 12,000. Approximately 1,000 highly qualified teachers and administrators served these students. At the time of the study, over half of the licensed staff had a Master's degree or higher. Approximately 250 worked in the four high schools in the study, and the CUSE and survey was distributed to them electronically. The combined Computer User Self-Efficacy scale and teacher survey was provided electronically via Qualtrics, a web-based survey tool, to all teachers assigned to the four high schools. Of the 168 teachers who responded to the confidential survey, 47 teachers supplied their name and email address, indicating their willingness to be contacted to participate in a classroom observation and interview. The 41 teachers were ranked by CUSE score and divided into three groups: low, middle, and high CSE. Those selected were contacted via email to request participation in a classroom observation and interview. Twelve teachers volunteered and participated in a 10-20 minute interview and a 30-45 minute classroom observation.

Students. Students did not participate directly in this study. However, in order to triangulate the quantitative data from the teacher survey indicating the frequency of BYOT in classrooms and the qualitative data collected in the classroom observations and teacher interviews, extant data from a survey distributed by district leaders to students participating in BYOT was used. A district-created survey was given to all middle and high school students during the fall of 2013. The survey asked questions regarding students' perceptions of teacher use of BYOT in instruction. This information was triangulated with the teachers' self-reported use of BYOT and observed classroom behaviors.

Data Sources

The CIPP model falls under the umbrella of the use branch and pragmatic paradigm of program evaluation and focuses mainly on data that are useful to the stakeholders in the program (Mertens & Wilson, 2012). Program evaluation models in this branch and paradigm of program evaluation also focus primarily on mixed methods for data collection (Mertens & Wilson, 2012). Both quantitative and qualitative data was collected for this program evaluation. Quantitative data was in the form of the Computer User Self-Efficacy Scale (Cassidy & Eachus, 2002), teacher survey questions, and existing student survey. Qualitative data included classroom observations and teacher interviews.

Computer user self-efficacy scale. The Computer User Self-Efficacy Scale (CUSE) was used to determine the CSE of teachers participating in the BYOT program (Cassidy & Eachus, 2002). The CUSE is a 30-item scale designed and validated to measure general computer self-efficacy in adult populations (Cassidy & Eachus, 2002).

The CUSE has a minimum score of 30 and maximum score of 180. There is sufficient evidence for the reliability and validity of the CUSE. Cassidy & Eachus (2002) found that internal consistency of the scale, measured using Cronbach's Alpha, was high (*alpha* = 0.97, N = 184). Additionally, test-retest reliability over the course of one month was also high and statistically significant ($r = 0.86$, N = 74, $p < 0.0005$). Construct validity of the CUSE was determined by correlating the self-efficacy scores of respondents to self-reported computer experience and familiarity with computer packages. Both correlations were significant, with $r = 0.79$, $p<0.0005$, $N = 212$ for computer experience and $r = 0.75$, $p < 0.0005$, $N = 210$ for familiarity (Cassidy & Eachus, 2002). Cassidy and Eachus (2002) suggest that the CUSE has a high level of external validity superior to other existing computer self-efficacy measures. The authors also suggest that the use of the CUSE is not limited to specific computer technologies and is appropriate for use in general adult populations of computer users, such as the teachers who were participating in the BYOT program (Cassidy & Eachus, 2002).

Part I of the CUSE asked respondents to provide basic background information about themselves and their experience with computers. Sample questions in Part 1 include:

1. Experience with computers:
    a. None
    b. Very limited
    c. Some experience
    d. Quite a lot
    e. Extensive

2. Do you own a computer?

    a. Yes

    b. No

Part 2 of the CUSE contained 30 statements concerning how the respondent might feel about computers. Each statement was followed by a 6-point scale from 1 (Strongly Disagree) to 6 (Strongly Agree). Sample statements are:

1. Most difficulties I encounter when using computers, I can usually deal with.
2. I find that computers get in the way of learning.
3. Some computer packages definitely make learning easier.

Some of the questions were modified to incorporate modern technology terms to provide clarity for participants. For example, the phrase "applications and computer software" was used instead of "computer packages." Additionally, a definition of "computer" was included in the introduction to the survey to incorporate laptops, tablets, and other mobile devices. The CUSE questions are in Part 1 and Part 2 of the survey in Appendix A. Instructions for scoring the CUSE are in Appendix B.

Teacher survey. In addition to the confidential CUSE, the researcher added survey questions that were used to gather quantitative data on the number of teachers who participate in BYOT and the extent to which participating teachers do so. The CUSE and teacher survey were confidential between researcher and participants. Sample survey questions include:

1. Do you use in BYOT during instruction?

    a. Yes

    b. No

2. If so, how often do you incorporate BYOT in your instruction?
    a. Daily
    b. Weekly
    c. Monthly
    d. Once or twice a year
    e. Never

These additional survey questions were included as Part III of the survey distributed to teachers and were analyzed separately to determine teachers' use of BYOT and self-reported successes and challenges. These survey questions are included in the complete teacher survey in Appendix A. Survey questions were exported from Qualtrics to SPSS for analysis. Likewise, qualitative responses such as optional comments following several questions, were uploaded to Dedoose (www.dedoose.com), a web-based application used for analyzing text, video, and audio data. Comments were read multiple times and coded into categories. Themes emerged from the codes and are addressed in Chapter 4 (Creswell, 2013).

Classroom observation protocol. Twelve teachers who had completed the teacher survey participated in the classroom observation and teacher interview portions of the study. Of the 168 teachers who responded to the confidential survey, 41 teachers supplied their name and email address, indicating their willingness to be contacted to participate in a classroom observation and interview. The 41 teachers were ranked by CUSE score and divided into three groups: low, middle, and high CSE. Volunteers from each group, including the volunteer with the lowest and highest CSE, were selected via stratified purposeful sampling to ensure that teachers with different levels of computer self-efficacy were represented and compared (Creswell, 2013). Those selected were contacted via email to request a classroom observation and interview. Twelve teachers volunteered and participated in a 10-20 minute interview and a 30-45 minute classroom observation.

The Looking for Technology Integration (LoFTI) observation protocol was used to observe these teachers' use of BYOT in instruction. The LoFTI protocol was designed by SERVE in collaboration with the North Carolina Department of Public Instruction Educational Technology Division (SERVE, 2013). The LoFTI protocol can be used to collect observation data on the classroom environment, teaching and learning activities, student engagement, use of technology, and hardware/software use (SERVE, 2013). The aspects of the protocol that were used include information on student engagement, hardware and software tools in use, how teachers used the technology (e.g., activating prior knowledge, facilitating, lecturing), and how students used the technology (e.g., brainstorming, cooperative learning, presentations). The LoFTI protocol has been used successfully in research on one-to-one technology initiatives (Oliver, 2010). The complete LoFTI observation protocol is in Appendix C. Classroom observation data was gathered and used as in triangulation with the teacher interviews and survey data.

Teacher interview protocol. The same twelve teachers who participated in the classroom observation also participated in a 10-20 minute interview. Teachers who volunteered to participate in a classroom observation and interview answered interview questions designed to determine their level of use of BYOT and the successes and challenges they faced when implementing BYOT. The levels of use questions came from the Levels of Use (LoU) interview protocol used to determine the levels of use of an innovation (Hall, Dirksen, & George, 2006). Program evaluators have found the LoU to be a useful tool to support formative program evaluation because it assists the evaluator in defining program elements and interpreting related teacher use and concerns (Hall, Dirksen, & George, 2006). The LoU interview protocol focuses on behaviors and shows how teachers are acting with respect to a specific change, in this case BYOT implementation. The LoU focused interview uses a branching technique, asking a series of questions in a particular order based on interviewee response (Hall, Dirksen, & George, 2006). Sample questions from the LoU interview protocol include:

1. Are you using the innovation (BYOT)?
2. What do you see as the strengths and weaknesses of the innovation (BYOT) in your situation?
3. Are you working with others in your use of the innovation (BYOT)?

The interview protocol reliability was checked by having sample interviews rated by a second rater, and the percent agreement is the strongest indicator of reliability (Hall, Dirksen, & George, 2006). A second method of determining the reliability of the protocol involves converting each LoU rating to a numeric value and then determining Cronbach's alpha through traditional statistical analysis. The reliability of the LoU rating system tends to be high when interviews are properly conducted using the branching format (Hall, Dirksen, & George, 2006).

To supplement the LoU interview questions, questions specifically addressing teachers' successes and challenges were included in the interview protocol. These questions were used in a pilot study of three teachers implementing BYOT in the same district during the 2012-2013 school year. The complete interview protocol used in this program evaluation is in Appendix D. The accompanying letter of consent for participation in the classroom observation and interview portion of the study is included in Appendix E. All classroom observation and interview data remained confidential.

Student survey. In addition to a qualitative teacher survey, extant student data was used to determine student participation in BYOT and student perception of their teachers' participation in BYOT. The school district collected data via an anonymous student survey distributed to all students in the participating high schools during the fall of 2013. This student survey included questions designed to determine the levels of use of BYOT, the ways in which teachers integrate BYOT, and the frequency of use of BYOT in instruction. Sample questions in this existing district-created survey include:

1. How often do you use BYOT in class?
    a. Daily
    b. Weekly
    c. Monthly
    d. Once or twice a year
2. How many of your teachers allow you to use your own technology in their classrooms?
    a. All of my teachers
    b. More than half of my teachers
    c. About half of my teachers
    d. Less than half of my teachers
    e. None of my teachers

The district-created survey was distributed via a memo to all secondary school principals on November 14, 2013. The survey was available to students to complete from November 22 through December 6, 2013. The complete survey is included in Appendix F.

Data Collection

Data collection took place during the 2013-2014 school year. The first step in data collection was the electronic distribution of the teacher CUSE survey. The survey was distributed in October 2013, via Qualtrics, an online survey program, to all teachers in the four high schools. As directed by the College of William and Mary's Institutional Review Board, the researcher provided appropriate opportunity for teachers to consent to participation prior to completing the survey. Teachers who had not completed the survey within one week received a reminder to complete the survey; a final reminder was sent two days prior to the close of the survey. All survey results remained confidential.

Teachers willing to participate in the classroom observation and interview portion of the study provided their email address for the researcher to contact and schedule one classroom observation and follow-up interview. Forty-seven teachers provided their contact information to participate in the observation and interview. Of those who indicated their willingness to participate in the classroom observation and interview, four participants from each school – for a total of 16 participants of varying levels of CUSE – were selected to participate. Classroom observations and interviews were scheduled at the convenience of the participants between December 1, 2013, and February 1, 2014.

Data Analysis

Data collected for this study was analyzed using both quantitative and qualitative research methods. The Computer User Self-Efficacy Scale (CUSE), teacher survey questions, and existing district-created student survey were used to provide descriptive statistics on teachers' levels of computer self-efficacy and frequency of BYOT use in instruction. Additionally, a correlation between teachers' CSE as indicated by the CUSE and the frequency of their use of BYOT as indicated on the teacher survey was run to determine if a relationship between a teacher's CSE and integration of BYOT exists. The teacher survey data was exported from Qualtrics, through which the survey was distributed, into Excel. The researcher calculated the CUSE score of each respondent and then transferred the data to Statistical Package for the Social Sciences (SPSS), a data analysis software program, for analysis.

The researcher also engaged in qualitative analysis by interpreting the classroom observation and interview data. Interpretation in qualitative research is the "abstracting out beyond the basic codes and themes to the larger meaning of the data" (Creswell, 2013). Qualitative interpretation involves transcribing interview and observation data, developing codes, identifying themes that emerge from the codes, and organizing the themes into larger units to make sense of the data (Creswell, 2013). In preparation for interpreting the data, each interview was recorded and transcribed into a Word document. The interviews were recorded to increase the reliability of the data (Creswell, 2013). Teacher names were changed to maintain confidentiality. The researcher then read the interview transcriptions multiple times to gain an understanding and begin segmenting the interviews (Creswell, 2013). The researcher wrote notes in the margins of the interviews and began coding into categories using Creswell's (2013) method of "lean coding" (p. 184). After a list of codes was created, the researcher continued to read the interview transcripts and developed emerging themes.

Triangulation of data, or the use of multiple data sources for comparison to enhance the credibility of qualitative data, was also conducted (Mertens & Wilson, 2012). The combination of the quantitative and qualitative data collected and interpreted illuminated the current status of the BYOT program and provides insight for school and district leaders. Table 6 provides a summary of the data sources and method of data analysis for the evaluation questions.

Table 6

Evaluation Questions and Data Analysis

Evaluation Question	Data Sources	Data Analysis
1. To what degree do teachers have computer self-efficacy?	• CUSE Scale (Part 1 and 2 of Teacher Survey)	• Descriptive statistics
2. To what degree do teachers design instruction to include BYOT?	• Teacher Survey Questions (Part 3 of Teacher Survey) • Classroom Observations • Teacher Interviews • Student Survey	• Descriptive statistics • Qualitative analysis and interpretation of classroom observations and teacher interviews • Triangulate data with student survey responses
3. What is the relationship between teachers' computer self-efficacy and instructional design utilizing BYOT?	• CUSE Scale (Part 1 and 2 of Teacher Survey) • Teacher Survey Questions (Part 3 of Teacher Survey) • Teacher Interviews	• Correlation • Qualitative analysis and interpretation of classroom observations and teacher interviews • Triangulate data from CUSE, classroom observations, and teacher interviews/surveys
4. What successes and challenges do teachers face when implementing BYOT?	• Teacher Survey Questions (Part 3 of Teacher Survey) • Teacher Interviews	• Qualitative analysis and interpretation of responses from teacher interviews

Ethical Considerations

There were multiple ethical considerations addressed in the development of this study. These considerations include adherence to guidelines established by the College of William and Mary's Institutional Review Board and adherence to program evaluation standards.

Institutional Review Board. After a successful dissertation proposal defense, the researcher submitted a complete application to the College of William and Mary Educational Institutional Review Board (IRB). Upon securing appropriate permissions to conduct the study and taking required precautions to protect teacher participants from any potential harm, the teacher survey was sent to high school teachers via an electronic link through Qualtrics. Informed consent was required of teachers participating in the survey, classroom observation, and teacher interview. Student data was not collected except in the form of extant data from the district-conducted survey.

Adherence to program evaluation standards. In addition to adhering to the IRB guidelines, the study also adhered to the *Standards for Program Evaluation* (Yarbrough, Shulha, Hopson, & Caruthers, 2011). To adhere to the utility standards, the researcher communicated regularly with district program leaders about the usefulness of the study for district leaders. The researcher shared the program logic model with the district leaders to ensure the program being evaluated was adequately and appropriately described. In order to adhere to the feasibility standards, the researcher attempted to maintain clear and appropriate data collection measures as well as a data collection schedule of surveys and interviews that was least disruptive to the work of the teachers in the program. To maintain the propriety of the evaluation, the researcher made every effort to design an evaluation that will maintain the dignity of the teachers and others participating in the study. Additionally, complete descriptions of the findings, limitations, and conclusions was communicated to district leaders and other interested stakeholders. Every effort has been made to adhere to the program evaluation standards for accuracy, including the selection of valid and reliable survey and interview questions, complete and accurate descriptions of the program and participants, and accuracy and consistency in reporting results.

Delimitations and Limitations

Delimitations are boundaries set by the researcher to control the scope of the study (Creswell, 2013). Delimitations of this study include the focus on four high schools rather than all nine secondary schools. Additionally, in an attempt to evaluate the program in action and those involved in the day-to-day use of BYOT, the study focused on the teacher stakeholder group rather than including school administrators or district leaders. Another delimitation was the program theory used to frame the study. The study focuses on teachers' computer self-efficacy as a lens through which they approach BYOT in instruction.

This study was limited by several factors. The program evaluation format of the study created a unique set of limitations; evaluations are limited by the realities of the programs they evaluate (Fitzpatrick, Sanders & Worthen, 2011). Due to limitations of time and resources, the program evaluation only focused on the four traditional high schools in the school district, leaving the same questions to be asked of the program in the middle school setting and at the charter school in the district. Factors that determine the success of educational programs such as BYOT are often not generalizable from one school setting to another (Fitzpatrick, Sanders & Worthen, 2011). While the findings that emerged from this study might be generalizable to teachers with similar backgrounds and in similar contexts as the district in this study, the findings lack generalizability to other school contexts.

Another potential limitation of the study was the researcher's relationship to the school district and potential bias toward the program. Although the district employed the researcher at the time of the study, she was not in an evaluative role of any of the teachers in the district. Some teachers may have felt uneasy about providing honest responses to questions; however, there may have been some benefits to the researcher's relationship with teachers, based on the overwhelming response for volunteers to participate in the classroom observations and interviews. For example, Fitzpatrick, Sanders & Worthen (2011) indicate that an internal evaluator's "closeness to the organization and relationships in it may enable her to behave more ethically when it comes to creating an ongoing evaluative culture in the organization" (p. 103). While the researcher's role in the district allowed for access to information regarding the program, personal bias toward the program must be considered and accounted for. One effective way of reducing evaluator bias is to keep an audit trail of all of the data collected, including copies of surveys, completed classroom observations, and transcriptions and audio recordings of all interviews (Fitzpatrick, Sanders & Worthen, 2011). The researcher also prepared by getting the support of district leaders for the program evaluation prior to conducting the study. The researcher was also prepared to give positive and/or negative feedback about the BYOT program to the district leaders, and district leaders were prepared to receive both positive feedback and recommendations for program improvement (Fitzpatrick, Sanders & Worthen, 2011).

Summary

This program evaluation allowed for an in-depth study of the computer self-efficacy of high school teachers in a district implementing BYOT. Mixed methods, including extant student survey data, the CUSE, teacher survey questions, classroom observations, and teacher interviews were used to determine the computer self-efficacy of teachers, the extent to which teachers integrated BYOT in their instruction, and the successes and challenges teachers faced with implementation. Findings from this study will be used to inform school and district leaders in this context as they continue the operation of the BYOT program and in other contexts considering BYOT implementation.

CHAPTER 4

Results

The purpose of this mixed methods program evaluation study was to investigate the way in which a Virginia public school district and its teachers implemented a BYOT program and to discover the successes and challenges the teachers faced with the implementation of the program in their schools and classrooms. Additionally, this study investigated the relationship between teachers' computer self-efficacy and their use of BYOT. Chapter 3 provided an overview of the methodology of the study, including the participants, data sources, and data analysis. Chapter 4 provides an overview of the results of the study and is organized by evaluation question. Data for the study were collected from October 1, 2013, through February 1, 2014. Results of both quantitative and qualitative data collection for the study are described in this chapter.

Teacher Survey

The teacher survey was used to collect quantitative and qualitative data regarding the four evaluation questions. The evaluation questions are:

1. To what degree do teachers have computer self-efficacy?
2. To what degree do teachers design instruction to include BYOT?
3. What is the relationship between teachers' computer self-efficacy and instructional design utilizing BYOT?
4. What successes and challenges do teachers face when implementing BYOT?

The survey that included Cassidy and Eachus' (2002) Computer User Self-efficacy Scale (CUSE) and researcher-created survey questions regarding BYOT was distributed to 254 high school teachers in the district via Qualtrics©, an online survey program. The survey data, once collected, were imported into Statistical Package for the Social Sciences (SPSS), a data analysis program, and analyzed to inform the study. There was a 66.14% response rate, as 168 respondents completed the survey. Of the 168 teachers who completed the survey, all of them were high school teachers. The survey asked participants to provide the number of years they have been teaching. Descriptive statistics were run on this question and yielded a mean of 13.5 years of experience, with a minimum of 1 year, a maximum of 40 years, and mode of 10 years of experience. In SPSS, the data were binned into 5-year increments. Descriptive statistics on the years of experience are provided in Table 7.

Table 7

Participants' Years of Experience

Years of Experience	Frequency	Percent	Cumulative Percent
< 5	21	12.5	12.5
5 - 9	37	22.0	34.5
10 - 14	50	29.8	64.3
15 - 19	25	14.9	79.2
20 - 24	13	7.7	86.9
25 - 29	10	6.0	92.9
30 - 34	8	4.8	97.6
35+	4	2.4	100.0
Total	168	100.0	

As indicated in Table 7, 12.5% of the participants have less than 5 years of experience, and almost 80% have between zero and 20 years of experience.

Extant Student Survey Results

The extant student survey data were used to triangulate the data and inform two of the four evaluation questions:

- Evaluation Question 2: To what degree do teachers design instruction to include BYOT?
- Evaluation Question 4: What successes and challenges do teachers face when implementing BYOT?

The school district in which the program exists distributed a survey on the use of BYOT to all secondary students during the fall of 2013. At the close of the survey, data were separated into middle and high school responses, and the high school responses were used as part of the data collection process.

The student survey yielded a 56.6% response rate, as 2,266 students of approximately 4,000 high school students responded to the survey. Of the 2,266 students who completed the survey, 539 were in Grade 9, 546 were in Grade 10, 621 were in Grade 11, and 560 were in Grade 12. The survey data were compared to the feedback provided by the teachers and provided valuable feedback from students on their experiences with BYOT in their schools.

Teacher Interviews

The qualitative data collected in the teacher interviews were used to inform two of the evaluation questions:

- Evaluation Question 2: To what degree do teachers design instruction to include BYOT?

- Evaluation Question 4: What successes and challenges do teachers face when implementing BYOT?

Twelve teacher interviews were conducted between January and February 2014. The interviews were conducted with teachers who had completed the teacher survey and volunteered to participate in a classroom observation and interview. Volunteers were place in order by their CUSE scores. The researcher attempted to contact and schedule observations and interviews with teachers of varying CUSE scores, including volunteers with the lowest (88) and highest (178) reported score. In all but one case, the classroom observation took place on the same day as the interview. The teachers, whose names were changed to maintain confidentiality, and demographic information are listed in order of their CUSE score in Table 8. The participants' CUSE score, years of experience, and self-reported comfort with technology are included in the table. Teachers reported their comfort with technology by responding to the question, "On a scale of one to ten, with one being extremely uncomfortable and ten being extremely comfortable, how would you rate your own comfort with technology?"

Table 8

Interview and Classroom Observation Information

Teacher	Date of Interview	CUSE	Years of Experience	Comfort with Technology
Brandy	12/05/13	88	20	4
Scott	01/17/14	120	20	6
Kelly	01/08/14	136	6	8
Rebecca	01/15/14	136	15	8
Ryan	01/06/14	142	13	8
Beth	01/16//14	147	9	8
Alex	12/05/13	151	13	8
Margaret	12/13/13	154	9	8
Toni	01/03/14	162	6	8
Ann	01/08/14	173	6	10
Chris	12/17/13	174	18	9
Haley	12/06/13	178	11	10

During the interview, the researcher used levels of use questions from the Levels of Use (LoU) interview protocol used to determine the levels of use in an innovation (Hall, Dirksen, & George, 2006), as well as other interview questions specifically addressing teachers' use of BYOT in the classroom.

Classroom Observations

The qualitative data collected in the classroom observations were used to triangulate with other data and address three of the four research questions:

- Evaluation Question 2: To what degree do teachers design instruction to include BYOT?
- Evaluation Question 3: What is the relationship between teachers' computer self-efficacy and instructional design utilizing BYOT?
- Evaluation Question 4: What successes and challenges do teachers face when implementing BYOT?

The researcher conducted twelve classroom observations of teachers who completed the teacher survey and volunteered to participate in one classroom observation and interview. The twelve classroom observations took place between January and February 2014. The dates of specific classroom observations are listed in Table 8. The researcher used portions of the Looking for Technology Integration Protocol (LoFTI) during the observation to determine how technology – specifically BYOT – was being used in the classroom. When technology was not evident in the classroom instruction being observed, the researcher took field notes regarding the observation, including a count of students using their own technology for non-instructional purposes.

The teacher survey, extant student survey results, teacher interviews, and classroom observations were used to inform evaluation questions based on the data collection plan described in Chapter 3. Quantitative and qualitative data analysis measures were used in interpreting the above information. Data were then organized and interpreted through the lens of each research question and is reported by research question below.

Evaluation Question 1. To What Degree do Teachers Have Computer Self-Efficacy?

The indicators for the first evaluation question were teachers' scores on the Computer User Self-Efficacy Scale (CUSE) and an additional survey question regarding experience with computers. The degree to which high school teachers in the school district had computer self-efficacy (CSE) was determined by Cassidy and Eachus' (2002) Computer User Self-efficacy Scale (CUSE), given to participants in the first half of the electronic survey distributed to teachers in the fall of 2013. Results of the survey were first exported to Excel to calculate the CUSE score of each respondent (Cassidy & Eachus, 2002). Descriptive statistics were then run in SPSS. The CUSE scale ranges from a possible low score of 30 to the highest possible score of 180 (Cassidy & Eachus, 2002). Descriptive statistics for the 168 respondents appear in Table 9. The data presented indicate that, on average, teachers surveyed in the school district had a high degree of CSE (Cassidy & Eachus, 2002).

Table 9

Descriptive Statistics for Computer User Self-Efficacy Scale

	N	Minimum Score	Maximum Score	Mean CUSE Score	Standard Deviation
Total CUSE	168	88	180	141.80	22.89

In addition to the CUSE score, representing an individual's perception of his or her ability to use technology successfully in a given context or computer self-efficacy (Compeau & Higgins, 1995; Cassidy & Eachus, 2002), participants were asked to report their experience with computers. Possible answers to this question range from "No Experience" to "Extensive" experience with computers. Of the 168 teachers who completed the survey, 162 participants responded to this question. A summary of total responses is in Table 10.

Table 10

Teachers' Reported Experience with Computers

Experience with Computers	Frequency	Percent
No Experience	0	0
Very Limited	0	0
Some Experience	35	20.8
Quite a lot	85	50.6
Extensive	42	25.0
Total	*162*	

Of the 162 teachers who provided their experience with computers, none responded that s/he had limited or no experience with computers. The mean response was 4.04 (SD = .690). Of all of the respondents, 50.6% reported having quite a lot of experience with computers.

Based on the data gathered to inform the first evaluation question, the teachers surveyed tended to have high CSE. They had average to high CUSE scores and reported having at least some experience with computers. Most teachers reported having quite a lot or extensive experience with computers, which would contribute to their sense of CSE (Cassidy & Eachus, 2002).

Evaluation Question 2. To What Degree do Teachers Design Instruction to Include BYOT?

The indicators for the second evaluation question were the frequency with which teachers incorporated BYOT in instruction as well as descriptions from students and teachers of how BYOT was used during instruction. Data were gathered from multiple data sources including quantitative questions on the teacher survey, qualitative data from comments on the teacher and student surveys, and the twelve teacher interviews. Classroom observation data were also collected but yielded little information.

Teacher survey responses. The teacher survey responses were helpful in providing quantitative data and qualitative survey comments to inform this evaluation question. The following four questions in the teacher survey were analyzed in determining the degree to which teachers design instruction to incorporate BYOT.

Do you use BYOT during instruction? There were 153 of 168 respondents who responded to this survey question. Of the 153 teachers who responded to this question, 114 (74.5%) responded that they use BYOT during instruction. Thirty-nine teachers (24.5%) responded that they do not use BYOT during instruction.

If so, how often do you incorporate BYOT in your instruction? Respondents were also asked how often they incorporate BYOT into their instruction. Table 11 summarizes the frequency with which respondents report incorporating BYOT into instruction.

Table 11

Frequency of BYOT in Instruction

How often do you incorporate BYOT in your instruction?	Frequency	Percent	Cumulative Percent
Daily	19	16.7	16.7
Weekly	48	42.1	58.8
Monthly	33	28.9	87.7
Once or twice a year	14	12.3	100.0
Total	114	100.0	100.0

Of the 114 teachers who reported using BYOT, all of them used BYOT at least once or twice a year; no teacher in this group selected "Never" as a response. Likewise, almost 60% of teachers who used BYOT in their classroom reported using it at least weekly.

Have your lesson plans changed as a result of BYOT? This survey question was designed to address instructional practice and planning for BYOT. Of the 153 teachers who reported using BYOT in their classrooms and responded to this question, 78 (51%) reported change in their lesson plans as a result of BYOT. Likewise, 75 (49%) responded that their lesson plans had not changed as a result of incorporating BYOT.

Respondents were also asked to elaborate on their response in a comments section of the survey. Comments were uploaded to Dedoose, a web-based application used for analyzing text, video, and audio data (www.dedoose.com). The comments were coded in Dedoose and analyzed for emerging themes. Themes were categorized as either "BYOT Successes" or "BYOT Challenges." Of the BYOT successes that emerged, codes that were used included: 1) productivity, 2) student engagement and interest, and 3) ease of use. Of the BYOT challenges that emerged, codes that were used included: 1) connectivity and bandwidth, 2) student access to BYOT, and 3) inappropriate (student) use of BYOT.

Several teachers commented on using BYOT for productivity purposes such as recording homework assignments in a calendar, taking a picture of notes, and setting reminders for homework. One teacher provided the following examples: "students using them as agendas, using the calculator, students looking up images to identify a definition, research, etc." Multiple teachers responded with phrases such as, "access information" and "research more easily." Another theme that emerged was that of increased student engagement and interest in the lesson. For example, one teacher shared that, "I have been able to turn a lot of the inquiry over to my students. I have also been able to tap into their interests to create meaningful displays of their knowledge and creativity instead of just paper and pencil results." Others simply stated, "student engagement" or "more engaging for students."

On the other hand, others discussed the inconsistency in availability of BYOT as well as the unreliability of the school district's technology. For example, one teacher stated, "I encourage them to use the BYOT if they have it. BUT I do not count on it because it puts those without technology at a disadvantage for learning and the school's technology is not useable (very often) and does not suffice." Over half of the comments reflected positive changes in instruction; however, there were multiple comments reflecting reactive changes that had to occur in order to make BYOT successful in the classroom. An interpretation of these comments is provided in Chapter 5.

Do you believe there are instructional benefits of BYOT? There were 147 teachers who responded to this survey question. Of those who responded, 71.4 % believe there are instructional benefits to BYOT. The results are summarized in Table 12.

Table 12

Belief in Instructional Benefits of BYOT

Do you believe there are instructional benefits to BYOT?	Frequency	Percent
Yes	105	71.4
No	16	10.9
Not sure	26	17.7
Total	147	100.0

Respondents were also asked to elaborate on their response in a comments section of the survey. Comments were uploaded to Dedoose (www.dedoose.com) for analysis. The comments were coded in Dedoose and analyzed for emerging themes. The codes that emerged from a qualitative analysis of responses were: 1) BYOT strength, 2) BYOT weakness, 3) potential strength, and 4) real world. "BYOT strength" was used to code comments that provided a positive example or comment regarding instructional benefits of BYOT. Forty-one comments were coded as "BYOT strength." For example, teacher responses were, "I think that some students are more engaged if they can use their own technology to take notes or look up facts during a lesson;" and, "when incorporated appropriately it allows students to personalize their experiences with the content."

"BYOT weakness" was used to code comments that clearly represented disagreement with or saw a lack of instructional benefits of BYOT. Twenty-seven comments were coded as "BYOT weakness." For example, one teacher responded that, "The level of distraction and wasted time is much greater than the level of productivity provided by the BYOT." Another teacher stated, "I also believe there aren't enough teachers using BYOT in a way that is beneficial enough to outweigh all of the distraction and bandwidth use it costs to allow students to have and use their devices, having students text responses so they show up on a screen instead of simply asking for a show of hands is ridiculous." Even though the question was asking about instructional benefits of BYOT, 27 of the 100 comments that were coded reflected frustration on behalf of the teacher or a lack of instructional benefits of the BYOT initiative.

Seventeen teachers commented specifically on the *potential* strength of BYOT. For example, one teacher stated that, "I think if a teacher is organized and has firm expectations with BYOT you can really enhance learning." Another responded, "when students are self-disciplined and have the technology, learning can be accelerated. Lessons really can have rigor and relevance. The problem is most kids want to play and not work - it takes a great deal of energy to keep them focused and on task." Finally, another teacher stated that, "Potentially, as long as there is equal access, not all students have their own technology; so we have to be careful about our implementation. We also need to make sure that we are not implementing technology for technology's sake and that it is tied to the curriculum and leads to a better learning outcome."

Another code that emerged in the responses was "real world." Fifteen out of 100 coded comments were coded as "real world." The researcher labeled this code because of multiple comments about the importance of BYOT for students in the 21st century. Comments in this code had a focus on 21st century skills, the fact that students already use technology in their daily lives, and that they will have to have the technology skills in college and careers. For example, one teacher stated that, "We need to teach our 21st century students how to be digital citizens. We need to incorporate technology into our lessons." Another stated that, "it is our obligation to make of our students global, informed citizens, and what better way than to include their devices as a tool in the classroom." A third stated, "We need to meet the students where they are." This teacher survey data, along with student survey data and the teacher interviews, help to determine the degree to which teachers design instruction to include BYOT.

Student survey responses. Of the 2,242 students who responded to the district's student survey on BYOT, 93.8% report that they do participate in BYOT. Table 13 shows students' reported frequency of BYOT use in the classroom.

Table 13

How often Students Report Using BYOT in Class

Reported Use of BYOT	Response	Percent	Cumulative Percent
Daily	1,277	56.88	56.88
Weekly	533	23.74	80.62
Monthly	207	9.22	89.84
Once or Twice a Year	112	4.99	94.83
Never	116	5.17	100

Additionally, data on the number of students' teachers who allow them to use BYOT during instruction were collected to triangulate with the teachers' reported use of BYOT. Students were asked, "How many of your teachers allow you to use your own technology in their classrooms?" Table 14 provides a summary of responses.

Table 14

Students' Reported Number of Teachers Allowing BYOT in Class

Number of Teachers	Responses	Percent	Cumulative Percent
All of my teachers	291	12.95	12.95
More than half of my teachers	859	38.23	51.18
About half of my teachers	644	28.66	79.84
Less than half of my teachers	403	17.94	97.78
None of my teachers	50	2.22	100
Total	2,247		

Students were also asked, "For what purposes are you allowed to use your own device in class?" This question was used to triangulate the data from the teacher interviews and teacher survey responses regarding instructional design including BYOT. Students were asked to check all of the uses that apply to them, thus the responses indicate multiple purposes for BYOT that are used by teachers. A summary of responses is provided in Table 15.

Table 15

Purposes of BYOT in Class

Purpose	Responses	Percent
Never	82	3.68
Silent reading	617	27.67
Take notes	927	41.57
Record homework assignments	1,567	70.27
Camera	1,206	54.8
Research	1,792	80.36
Dictionary/Thesaurus	1,597	71.61
Specific BYOT enhanced lessons	1,193	53.50
When classwork is complete	1,663	74.57

Over 70% of students responded that they were allowed to use BYOT for recording homework assignments, conducting research, as a dictionary/thesaurus, and when classwork is complete. Less than 4% indicated that they were never allowed to use BYOT. Following data collection on teachers' computer self-efficacy and instructional design to include BYOT, the next step in the evaluation process was to collect data on the relationship between the two.

Teacher interviews. The twelve teachers who participated in the classroom observations and interviews were asked if they were currently using BYOT during instruction. Their responses are summarized in Table 16.

Table 16

Use of BYOT during Instruction

Teacher	CUSE	Years of Experience	Comfort with Technology	Do you currently use BYOT?
Brandy	88	20	4	Sometimes
Scott	120	20	6	No
Kelly	136	6	8	Yes
Rebecca	136	15	8	Yes
Ryan	142	13	8	Yes
Beth	147	9	8	Yes
Alex	151	13	8	Yes
Margaret	154	9	8	Yes
Toni	162	6	8	Sometimes
Ann	173	6	10	Yes
Chris	174	18	9	Yes
Haley	178	11	10	Yes

Scott was the only teacher who shared he did not currently use BYOT during instruction. Brandy stated that she sometimes used it and elaborated later in the interview that she did not see the benefits outweighing the time it took her to plan for it. Toni answered "sometimes" and then stated that she used it about once a week. The others shared that they use BYOT; their use fluctuates from daily to a few times a month "when appropriate."

The teachers interviewed, with the exception of Brandy and Scott, reported that the effects of BYOT could be positive for student engagement and interest in the lessons. For example, Beth stated, "I think it is engaging for kids...The kids are very positive when we use it, if we use it in a meaningful way." However, all twelve teachers sited similar frustrations to those who commented in the teacher survey. For example, Rebecca stated that, "I worry that in some ways they are less engaged in class because of BYOT. They would much rather be playing with their phones than paying attention."

This evaluation question sought to determine the degree to which teachers design instruction to include BYOT. The results from multiple data sources were mixed. Almost 75% of teachers reported using BYOT during instruction, and 71.4% also believed there were instructional benefits to BYOT. However, only 58.8% of the surveyed teachers used it daily or weekly. According to the students surveyed, 80.62% report using BYOT daily or weekly, and 74.57% of students surveyed reported using BYOT when their classwork was complete. The question on the district's student survey regarding using BYOT in class did not ask students explicitly about BYOT for instructional purposes, which may be a reason for the discrepancy. The teacher interviews were used to triangulate the data from the surveys. The teachers with lower CSE, such as Brandy and Scott, used BYOT less frequently than those with higher CSE, such as Toni, Ann, Chris, and Haley. The teachers interviewed indicated that they design instruction to include BYOT but did not cite specific examples of *how* they incorporate BYOT into their instruction. Further discussion of these discrepancies and gaps are reported in Chapter 5.

Evaluation Question 3. What is the Relationship between Teachers' Computer Self-Efficacy and Instructional Design Utilizing BYOT?

The third evaluation question was informed by the following sources of data: teachers' CUSE scores as reported in the teacher survey questions, teacher survey questions regarding instructional design using BYOT, a correlation between teachers' CUSE and use of BYOT for instruction, teacher interviews, and classroom observation data.

CUSE. The CUSE score for each survey respondent was calculated in Excel and exported to SPSS for analysis. The mean CUSE score among the 168 participants was 141.80 (median = 146.0, SD = 22.89). There was a minimum score of 88 and maximum score of 180. This data was used with the teacher survey responses to determine the relationship between CUSE and instructional design utilizing BYOT.

Teacher survey responses. Teachers were asked to indicate how often they used BYOT in their instruction. The survey responses are summarized in Table 17.

Table 17

How often Teachers Report Incorporating BYOT into Instruction

How often do you incorporate BYOT into your instruction?	Frequency	Percent	Cumulative Percent
Daily	18	12.4	12.4
Weekly	22	15.2	27.6
Monthly	37	25.5	53.1
Once or twice a year	48	33.1	86.2
Never	20	13.8	100.0
Total	145	100.0	100.0

Of the 145 people who responded to this survey question, 27.6% incorporated BYOT daily or weekly; 33.1% reported incorporating BYOT only once or twice a year. A correlation between teachers' CUSE scores and how often they incorporated BYOT into instruction was run. The results of this correlation are reported in Table 18.

Table 18

Correlation between Teachers' CUSE and Use of BYOT during Instruction

		CUSE Score	If so, how often do you incorporate BYOT in your instruction?
CUSE Score	Pearson Correlation	1	-.241**
	Sig. (1-tailed)		.002
	N	168	145
If so, how often do you incorporate BYOT in your instruction?	Pearson Correlation	-.241**	1
	Sig. (1-tailed)	.002	
	N	145	145

** Correlation is significant at the 0.01 level (1-tailed).

There was a negative correlation between teachers' CUSE score and how often teachers incorporate BYOT in instruction, at $r=-.241$, $p<.01$, $N=145$, $r^2=.058$. Implications for this negative correlation are discussed in Chapter 5.

Almost half (51.0%) of survey respondents indicated that, although they used BYOT, their lessons had not changed as a result. Those who indicated that their lesson plans had changed as a result of BYOT added comments regarding those changes. These survey comments regarding changes to instruction were analyzed in Dedoose (www.dedoose.com). Changes in instruction were coded and indicate increased use of technology, new applications and programs, and more resources available to students.

For example, one teacher stated, "I have used more interactive activities and have students give simultaneous feedback." Another teacher stated, "I use Edmodo and other learning based technology to engage students in learning." Other comments indicated a focus on weaknesses of BYOT in planning for instruction. For example, one teacher stated that, "I'm constantly telling the kids to stop texting and get off Facebook, etc." Another stated, "With the unreliable internet I have had to switch to using a lesson without technology." The teacher interviews yielded similar mixed responses with respect to instructional design utilizing BYOT.

Teacher interviews. The teachers who participated in the interview were asked to describe any effects of BYOT that they have seen. Additionally, they were asked if they had made any changes in their use of BYOT since the initiation of the program. They were also asked if they were currently participating in any activities that supported their use of BYOT. In addition to coding the interviews and identifying emerging themes, the researcher also organized the interviews by research question and identified trends across the twelve interviews (Creswell, 2013). These pertinent interview questions and trends are provided in Table 19.

Table 19

Interview Questions and Implications for Instructional Design Utilizing BYOT

Interview Question	Significant Trends
What do you see as being the effects of BYOT in your classroom?	• Students are more engaged when they are using technology • Not all students have technology to bring • Requires a shift in instructional design • Students can access information more easily • Often becomes a classroom management issue
Have you made any changes in how you use BYOT? If so, what? Why?	• Classroom management has changed and become more challenging • Create lessons that require deeper thinking • Some paper and pencil activities have changed to technology activities
Are you currently working with others in your use of BYOT?	• Teachers tend to work with others in their department but not beyond that • The Educational Technology Facilitator (ETF) in each high school helps teachers find resources and plan BYOT lessons
Are you currently engaged in any activities to support you integrating BYOT in your instruction?	• Teachers are not currently engaged in formal activities to support BYOT • Teachers often find resources on their own or with the help of their ETF

The qualitative data from the interviews indicated that teachers often designed BYOT lessons much like they designed lessons that do not require technology. The teachers tended to work with others in their department and seek information and support from their technology resource teacher (ETF). There did not appear to be a difference between teachers with high CUSE scores and low CUSE scores with respect to designing instruction that utilizes BYOT.

Classroom observations. The final data source used to inform the relationship between teachers' computer self-efficacy and instructional design utilizing BYOT was the classroom observations conducted for the twelve volunteer teachers. The researcher was prepared to use the Looking for Technology Integration Protocol (LoFTI) to determine the level and type of technology use in the classroom. However, because only two of the twelve classrooms observed had technology in use for instructional purposes, the researcher took detailed field notes during observations instead.

Haley's Grade 10 English class used BYOT and school-provided devices to look up vocabulary terms online and record definitions in their notebooks; this activity took fifteen minutes. Of the 23 students in the class, 20 had their own device and 3 used a school-owned device provided by the teacher. After this activity, students were required to keep their devices face down on their desks while they engaged in a whole group reading activity. Margaret's Grade 9 English class used BYOT to research modern superstitions and connect them to a story they had read and video they watched at the start of class. Of the 21 students in the class, 18 had their own device. Those who did not have their own device shared with a partner who did. This lesson lasted 30 minutes, and students were then asked to put their devices away. The other ten observations yielded no evidence of instruction utilizing BYOT. Multiple students in each setting were observed having their devices and using them for non-instructional purposes.

The data collected for the third evaluation question were intended to determine the relationship between teachers' CSE and instructional design utilizing BYOT. Data from the teacher survey indicated that teachers tended to have high CUSE. Data also indicated that teachers have not dramatically changed their instructional practices to incorporate BYOT. Even those indicating they use BYOT do not seem to plan for it or change their instructional practice. The lack of BYOT seen in the classroom observations substantiates the data collected from the other sources.

Evaluation Question 4. What successes and challenges do teachers face when implementing BYOT?

One of the purposes of this evaluation study was to identify the successes and challenges teachers face when implementing BYOT. The previous evaluation questions along with specific data sources helped to inform this fourth evaluation question.

Teacher survey responses. The teacher survey asked participants to indicate whether they had experienced any successes or challenges involving BYOT and to elaborate on those successes and challenges with additional comments. Both quantitative data on the responses and qualitative data on the survey comments are provided.

Since the initiation of the BYOT program at your school, have you experienced any successes involving BYOT? Of the 146 teachers who responded to this question, 95 (65.1%) indicated that they have had successes involving BYOT, and 51 (34.9%) indicated that they have not had any success involving BYOT. Comments following this question were coded in Dedoose and several themes emerged. Among the comments regarding BYOT successes, there were 34 comments coded as successes and eight comments specifically addressing BYOT weaknesses. The strengths emerged into four distinct categories: 1) student engagement, 2) fast/efficient, 3) more resources are now available, and 4) research is much easier. Of these four categories, 17 of the 34 comments addressed student engagement as a success of BYOT. For example, one teacher stated, "Students enjoy using technology and it helps them to stay focused and engaged." Others simply stated, "student engagement" or "students enjoy learning with technology."

Several comments in response to this question addressed weaknesses of BYOT rather than successes. These comments focused on students' misuse of the technology or the classroom management required. For example, one teacher stated, "But kids can be very distracted and use technology to check Facebook. Teachers have to be very vigilant." Another stated, "distracting from the objective." Overall, just over half of the respondents providing comments for this question reported to have experienced success in integrating BYOT.

Since the initiation of the BYOT program at your school, have you experienced any challenges involving BYOT? Of the 149 teachers who responded to this survey question, 135 (90.6%) indicated that they have had challenges involving BYOT. Only 14 people indicated they had not had challenges involving BYOT. Comments following this question were coded in Dedoose and several themes regarding BYOT challenges emerged. The themes, occurrences, and significant excerpts are summarized in Table 20.

Table 20

BYOT Challenges and Significant Survey Excerpts

BYOT Challenge Code	Responses	Significant Excerpts
Connectivity and bandwidth issues	29	"We have ongoing connectivity issues and not enough bandwidth to support full-scale use of technology. We have also been overwhelmed with applications and other software." "The students stream video all day long using the school Wi-Fi; consequently, our bandwidth is compromised and the teacher stations do not always work."
Student distraction and misuse of BYOT	87	"Students use BYOT for everything *but* classwork. It's a constant distraction." "Students who have used to their own technology for note taking end up being off task online instead. In several cases, students who used technology to take notes actually dropped a letter grade for the term due to these distractions." "Students texting during instruction, students discretely listening to music, students becoming confrontational when asked to put tech. away, not mature enough to make choice of when appropriate or inappropriate, visiting inappropriate sites, even parents who are texting their child during class."
Inequity among students	15	"Not all students have equal technology." "Some students don't have it; some do--- inequality and perceived unfairness."
Teacher monitoring of BYOT	13	"It is hard to police use of personal electronic devices for instructional applications." "The BYOT makes it very, very difficult to police inappropriate cell phone usage. I find I spend more time telling them to put away their cell phones than ever before."
Multiple device platforms (iOS, Android, etc.)	2	"Not all students have the same technology, requires planning to accommodate differences."

The challenges that emerged in the teacher survey data also emerged in the teacher interviews.

Teacher interviews. During the teacher interviews, teachers were asked to describe the successes and challenges they have faced in implementing BYOT. These responses were coded in Dedoose. The codes that were used in analyzing the BYOT successes and challenges are listed in Table 21.

Table 21

Emerging Themes of BYOT Successes and Challenges

	Emerging Themes	Count of Occurrences in Interviews
BYOT Successes	Efficient	19
	Engaging	11
	Real World	6
	Research	12
BYOT Challenges	Access to school devices	18
	Connectivity	12
	Distraction and Inappropriate Use	32
	Implementation Issues	4
	Inequity	10
	Student lack of knowledge/skills	5
	Teacher lack of knowledge/skills	6
	Time	12

The successes and challenges that emerged in the teacher interviews are similar to those that appeared in the teacher survey data.

Classroom observations. The classroom observations were used to triangulate the data from the teacher survey and teacher interviews. The classroom observation data indicated that, overall, the teachers observed did not use BYOT during instruction. Several students in all twelve classes were observed using technology for non-instructional purposes. Two of the twelve teachers observed incorporated BYOT into one activity during the class period. In both cases, students were asked to put their technology away at the conclusion of the activity.

The fourth evaluation question sought to identify the successes and challenges teachers face when implementing BYOT. The teacher survey responses indicated a few successes, including student engagement and time-saving benefits. Almost all of the teachers surveyed (90.6%) identified challenges in using BYOT for instruction. The teacher interview data paralleled the successes and challenges teachers identified in the survey. Additionally, the classroom observations yielded little demonstration of success in using BYOT for instruction. Most of the technology use observed in the classrooms visited was non-instructional use of BYOT on the part of the students. These observed behaviors parallel the challenges of distraction, student misuse of technology, and teacher monitoring of BYOT discussed in the teacher survey and interviews.

Summary

Chapter 4 provided a detailed breakdown of multiple data sources, including teacher survey data, student survey data, classroom observations, and teacher interviews. These data sources were used to inform the four evaluation questions. Chapter 5 will discuss these findings, including the implications of the successes and challenges the teachers have faced in implementing BYOT and implications for the BYOT program in the school district. Additionally implications for other school leaders implementing or considering BYOT programs will be discussed.

CHAPTER 5

Conclusions

School districts across the country and in Virginia are recognizing a need for allowing students access to technology throughout the school day and are addressing this need by allowing students to bring their own technology devices to school (Johnson, 2012). Recent studies focused on the effects of technology integration in the classroom cite student-centered learning, increased student engagement, and preparation for a technology-rich world as the most significant purposes of technology integration (Argueta, Huff, Tingen, & Corn, 2011; Zucker & McGhee, 2005). Technology is now a permanent fixture in K-12 public schools and, no matter the reasons for or methods of integration, teachers and school leaders should determine how to implement effectively (Cuban, 2001).

Little research has been done specifically on Bring Your Own Technology (BYOT) programs such as the one in this study, and little consideration has been given to the beliefs and classroom practices of the teachers involved in these programs. The purpose of this study was to conduct a mixed-methods evaluation of a BYOT program being implemented in the four high schools in a Virginia school district. The study sought to identify the successes and challenges the teachers face during implementation and use of BYOT, as well as to investigate the relationship between the teachers' computer self-efficacy and their use of BYOT during instruction. Findings from the study and recommendations for the program as well as future BYOT programs are provided in this chapter.

Discussion of Findings

The program theory underlying this evaluation study was that a teacher's CSE – based on his/her existing experiences, encouragement by others' use of BYOT, and the support s/he receives – influences him/her to plan for instruction that includes BYOT. Once a teacher plans to use BYOT s/he will integrate it into his/her instruction, thus encouraging students to use technology for instructional and productivity purposes (Figure 1). The construct of CSE was used as a theoretical framework for this study and was an underlying factor in the program theory. The findings presented in Chapter 4 yielded important information regarding the CSE of the teachers involved, as well as several strengths and weaknesses about the implementation of the BYOT program. The findings related to each evaluation question and to the program in its entirety are discussed here.

Teachers' computer self-efficacy. The researcher used Cassidy and Eachus' (2002) CUSE scale and other survey questions to determine the degree to which teachers in the school district have CSE. The data revealed that teachers in the study had, on average, a high level of CSE. Additionally, the teachers had, on average, quite a lot of experience with computers. Since all of the survey respondents reported having at least some experience with computers and the average CUSE score was 141.80, a correlation was run between the two for a more in depth analysis.

Cassidy and Eachus (2002) found there to be a significant positive correlation between CSE and computer experience. A correlational test was run between the CSE scores of participants and response to the survey question regarding experience with technology to determine if there is a correlation between teachers' CUSE score and self-reported experience with technology. Respondents who did not report their experience with computers were not included in the correlation. There is a positive correlation between teachers' CUSE score and experience with computers, at $r=.608$, $p<.01$, $N=162$, $r^2 = .3697$ (shared variance). The correlation is provided in Table 22.

Table 22

Correlation between CUSE and Experience with Computers

		Experience with computers	CUSE score
Experience with computers	Pearson Correlation	1	.608**
	Sig. (2-tailed)		.000
	N	162	162
CUSE score	Pearson Correlation	.608**	1
	Sig. (2-tailed)	.000	
	N	162	168

** Correlation is significant at the .01 level (2-tailed).

Based on the data, teachers who have a higher sense of CSE typically reported having more experience with computers. This correlation aligns with the results of Cassidy and Eachus' study (2002). The teachers' experience with computers and high CSE could be due in part to an emphasis on technology integration in the school district as well as the implementation of the BYOT program. Additionally, the four high schools in the study were all equipped with technology in every classroom as well as mobile laptop carts, computer labs, and a wireless network available to all staff and students. Teachers were regularly encouraged, even beyond the use of BYOT, to use technology, thus may have been comfortable with it prior to implementation of BYOT.

Teachers' use of BYOT during instruction. Although the teachers in the study had high CSE, results indicated that they did not necessarily plan instruction to incorporate BYOT as was suggested in the program theory. Most of the teachers surveyed (74.5%) reported using BYOT during instruction, and 58.8% of those teachers use BYOT as frequently as daily or weekly. However, of those who reported incorporating BYOT in instruction, just over half (51%) reported actually changing their instructional practices. The teacher comments regarding change in instructional practice indicated that even those who stated their instructional practices had changed focused on the management of the devices in the classroom or of technology simply being an added level of student engagement. For example, teachers reported having students use their phones for "keeping track of homework" or "looking up a definition." Likewise, the teachers who participated in the interview reported that they designed instruction to incorporate BYOT, but did not cite specific examples of *how* they incorporated BYOT into their instruction. Therefor, teachers' instructional practices, or their integration of technology into instruction had not changed with the use of BYOT.

Data from the student survey distributed by the district were similar; 66.89% of students reported that half or more than half of their teachers allow them to use their technology in the classroom. However, the students' reported purposes of BYOT use were when classwork was complete (74.57%), for managerial purposes such as recording homework assignments (70.27%), and for use during research (80.36%). Just over half

(53.50%) of the students surveyed reported that their teachers allow BYOT specifically during “BYOT-enhanced” instructional activities.

Of the six categories of barriers to technology that Hew and Brush (2007) identified, knowledge and skills – including technology knowledge and pedagogy of teaching with technology – are barriers that seemed to impact the teachers in this study. The teachers had high CSE and experience with computers but did not, as the program theory suggests, plan instruction to incorporate BYOT. This gap in planning instruction to incorporate BYOT aligns with the research on barriers to technology integration but not with the program theory in this study. Early studies indicated lack of access to technology as a barrier, but more recent studies indicate personal, pedagogical, and context-specific concerns of the teachers as more significant barriers (Chang, Lieu, Liang, Liu, & Wong, 2012; Mueller, Wood, Willoughby, Ross, & Specht, 2008; Wood, Mueller, Willoughby, Specht, & DeYoung, 2005). It was the personal, pedagogical, and context-specific concerns of the teachers in the study that surfaced more in the comments and interviews. It may have been as a result of their high CSE that the teachers did not consider pedagogy of teaching with technology. However, it is important to note that a teacher’s pedagogical beliefs about technology determine the success of computer integration (Mueller, et al., 2008).

Relationship between teachers’ computer self-efficacy and instructional design to incorporate BYOT. The program theory described in Chapter 1 (Figure 1) indicated that the relationship between teachers’ CSE and their instructional design to incorporate BYOT would be a positive one. However, the results described in Chapter 4 indicated that there was not a clear relationship between CSE and instructional design utilizing BYOT. The teachers had high CSE and experience with computers and also believed there were benefits of BYOT; however, only half reported having changed their instructional practice as a result of using BYOT. Even among those who reported having changed their instruction to incorporate BYOT, few reported changing more than classroom management of devices or transferring some traditional "paper and pencil" activities to technology-based activities. One teacher stated that, "I've changed some more traditional paper and pencil activities to electronic activities." Teachers interviewed also reported that they are not engaged in activities such as professional development to support their use of BYOT in the classroom.

Teachers' CUSE score, and thus their high CSE, measured their perception of their ability to use technology (Compeau & Higgins, 1995). However, the measurement did not specifically address integrating technology into classroom instruction. The teachers had high CSE, likely due to their access to technology and the expectation of the school district to use the available tools—but this high CSE was not related to any pedagogy of using technology in instruction. Research indicates that teachers' self-efficacy beliefs about technology are important to their integration of technology into instruction (Cuban, Kirkpatrick, & Peck, 2001; Ertmer, 2005; Rockinson-Szapkiw, 2012; Pareskeva, et al., 2006). However, studies also show that, as long as teachers use technology to teach their content in ways they always have, little will actually change in instruction and learning (Norris & Soloway, 2011). Likewise, Fritschi and Wolf (2012) indicate that teachers implementing ubiquitous computing programs such as BYOT will experience a paradigm shift including changes in their practices. The teachers in this study, based on the findings in Chapter 4, have experienced little change in their instruction or student learning; additionally, they have not yet experienced a shift in practices regarding BYOT. The absence of change or shift in practices may be due to a lack of professional development as an activity in the program (Figure 2). District leaders may consider further investigation of teachers' instructional practices to determine appropriate support and professional development that will lead to improved instructional practice with respect to BYOT.

Successes and challenges of using BYOT. A review of the literature identified the importance of the role of the teacher in successful integration of technology. Research also shows that teachers are rarely asked about their experiences, beliefs, or challenges with respect to technology integration (Wood, Mueller, Willoughby, Specht, & DeYoung, 2005). This study focused on the important role of the teacher and sought to obtain feedback from teachers on their experiences, successes, and challenges in the BYOT program. The results indicated that teachers had more challenges than successes when using BYOT. Teachers referring to successes they had with BYOT focused on the enjoyment students have using their own technology as well as the ease with which they can research. None of the comments regarding successes referred to teachers' instructional practices or student achievement.

It is also important to note that, even when asked about their successes with BYOT, teachers commented on the challenges they had experienced. Challenges mentioned in the survey and in the teacher interviews included connectivity and bandwidth issues, student distraction and misuse of technology, inequity among students, difficulty teachers had in monitoring BYOT, and multiple device platforms to consider when planning. The student survey data aligned with the teacher input regarding successes and challenges. The students also identified the bandwidth/connectivity issue as a significant challenge. They also identified the challenge of students using their devices inappropriately. The summary of challenges outlined in Table 20 included connectivity and bandwidth issues, student distraction and misuse of BYOT, inequity among students, teacher monitoring of BYOT, and the challenge of planning activities for multiple devices and electronic platforms. These challenges are similar to teachers' negative perceptions of technology and one-to-one initiatives in the research (Oliver, 2010; Penuel, 2006; Zucker & McGhee, 2005). These findings also align with the research on the disadvantages of BYOT initiatives; research indicates that disadvantages include equity among students, student Internet safety, and BYOT as a source of distraction rather than an educational tool (Lahiri & Moseley, 2012; Stager, 2001).

In the limited extant research on BYOT initiatives, studies show that successful programs may increase student-centered learning and enhance interaction among teachers and students (Lahiri & Mosely, 2012). However, if the students are not using their technology appropriately, and the teachers have not yet determined how to best monitor the appropriate use of the technology, BYOT will continue to be a source of distraction rather than a useful instructional strategy, and the challenges will continue to outweigh the successes (Lahiri & Moseley, 2012; Stager, 2001). BYOT in the schools in this study had not yet become a way to increase student-centered learning, and seemed to be more of a distraction than a successful instructional tool.

Research on BYOT initiatives also cites increased need for professional development regarding how to incorporate technology into instruction as a potential challenge of BYOT programs (Lahiri & Moseley, 2012). Likewise, one of the negative beliefs held by teachers who use BYOT and one-to-one initiatives is a lack of quality professional development with respect to the programs (Oliver, 2010; Windschitl & Sahl, 2005). This research aligns with the findings in this study, as indicated by the absence of professional development in the program logic model (Figure 2) and teachers' reports of professional development on specific tools but not on BYOT instructional practices. Overall, there was limited evidence of professional development, either in the program model or referenced by teachers in survey or interview data.

Student engagement and misuse of technology. The term "student engagement" came up multiple times in teacher interviews and survey comments. Teachers were not explicitly asked to define student engagement, nor were they given a definition to use. As a result, teachers had various perceptions of what student engagement was or looked like in their individual classrooms. Teachers did, however, agree that student engagement was a relative success of the program. Teachers also, however, overwhelmingly agreed that students' misuse of the technology during instruction was a challenge of the program. Misuse involved using their technology to send text messages and check social media websites. The student "engagement" seen by many teachers could have easily been seen as student using the technology inappropriately in other classrooms. The researcher recommends having a clear definition of student engagement that is understood by the teachers. This definition should be accompanied by clear indicators or student behaviors that teachers could look for to determine if students are engaged in school work or in off-task activities.

Limiting factor. It is important to note a limitation of the study that may have impacted the lack of comments regarding professional development. This absence of comments regarding professional development may have been due in part to the role of the researcher in the school district. The researcher, at the time of the study, was the coordinator of staff development for the district. Although this was a non-supervisory role, and she had no evaluative role in the teachers' work, they may have been hesitant to report on the lack of staff development with respect to the program.

Recommendations for BYOT Program

The CIPP model of program evaluation framed this study and guided the four evaluation questions (Mertens & Wilson, 2012; Stufflebeam, 2005; Stufflebeam & Shinkfield, 2007;). Using the CIPP model of program evaluation, a relative strength of the program laid in the inputs. The inputs that contributed to the success included the teachers' high CSE, teachers' experience with technology, and the availability of technology in the schools. The district had used time and resources to lay the foundation for successful implementation of BYOT. Based on the results in Chapter 4, it is clear that teachers were comfortable with technology and knew the expectations were to use it in the classroom.

Program planning and implementation. Based on the findings in the study, the researcher found that there was a significant gap between the program logic model and the implementation of the program in the four high schools in the district. First, there was no indication of professional development that would occur in the original implementation of the program. The study revealed that some professional development occurred at individual school sites, but the professional development was focused on technology tools rather than technology integration. A needs assessment of teachers' technology experience, integration of existing technology into instruction, and teachers' perceived needs would have informed program leaders of professional development needs and a lack of technological pedagogical content knowledge of the teachers. A needs assessment may have also provided district and program leaders information regarding teachers' hesitation toward managing multiple student devices in one classroom. After learning of such hesitation, program leaders might plan policy and training that would support teachers in this endeavor.

Focus on process and management. The process, or the teachers' instructional planning to utilize BYOT, seemed to be the relative weakness in the district's BYOT program. Results indicate that, even when teachers did plan for BYOT, their planning included more management of BYOT rather than specific pedagogy that utilizes technology. Despite the teachers' efforts to plan for management of BYOT, this was still identified as a challenge the teachers and students faced. A recommendation for future implementation would be for school and district leaders to devote time and effort to providing teachers with professional development and resources regarding the implementation and management of BYOT. In addition to the messaging documents that were created and provided to school leaders and their teachers at the beginning of implementation, teachers may benefit from specific strategies or a clear policy for monitoring daily use of devices. District and school leaders may consider a universal policy for BYOT use during school hours. A succinct and consistent policy may contribute to successful implementation and fewer challenges in the classroom.

Focus on integrating technology into instruction. A third recommendation is for district and school leaders to provide professional development opportunities to teachers regarding the knowledge and skills teachers need to successfully teach with technology. For example, the Technological Pedagogical Content Knowledge (TPACK) framework may be useful for leaders as they plan professional development and for teachers as they plan instruction to incorporate BYOT (Koehler, 2012; Koehler & Mishra). The TPACK framework, illustrated in Figure 4, provides a much needed connection between technology, pedagogy, and content knowledge. Professional development activities structured around this framework may help bridge the gap between teachers' high CSE and their pedagogy and content knowledge.

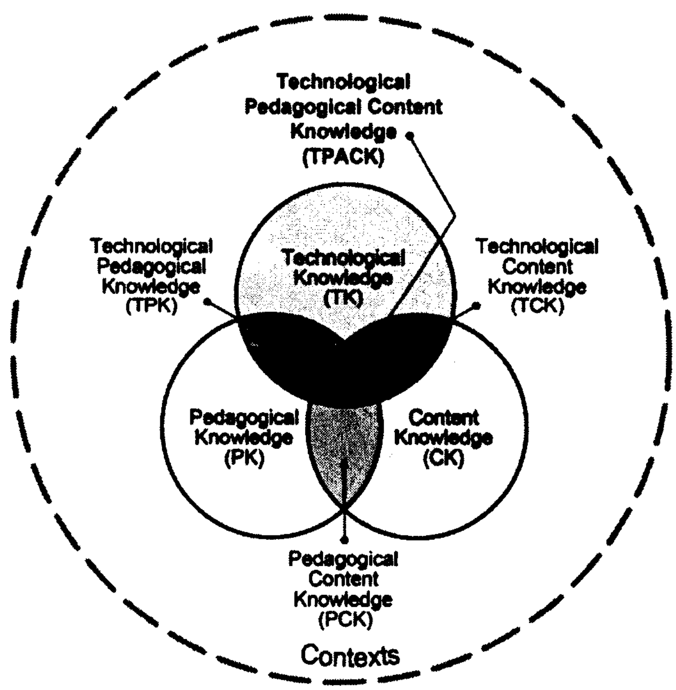

Figure 4. *Technological Pedagogical Content Knowledge.*

Content, pedagogy, and technology are the three essential components of successfully teaching with technology (Koehler & Mishra, 2009). The teachers in this study may have knowledge of all three of these separate components, but it is the interaction between and among them that leads to successful teaching with technology (Koehler & Mishra, 2009). According to Koehler and Mishra (2009):

> TPACK is the basis of effective teaching with technology, requiring an understanding of the representation of concepts using technologies; pedagogical techniques that us technologies in constructive ways to teach content; knowledge of what makes concepts difficult or easy to learn and how technology can help redress some of the problems that students face; knowledge of students' prior knowledge and theories of epistemology; and knowledge of how technologies can be used to build on existing knowledge to develop new epistemologies or strengthen old ones. (p.66)

The teachers in this study had high CSE with respect to their own use of technology, but professional development focused on the connection between technology, pedagogy, and the teachers' individual content could better support their integration of BYOT into their instruction.

Evaluate and address connectivity issues. The teacher survey data and teacher interviews indicated a significant teacher concern regarding connectivity to the district's wireless network. One teacher commented in the survey that, "We have ongoing connectivity issues and not enough bandwidth to support full-scale use of technology." Additionally, the issue was evident in the student survey responses. Of the 490 students who provided a comment regarding their challenges with BYOT, 222 of them referred to issues with wireless access to the Internet and connectivity to the district's wireless network. One recommendation for the district is to explore possible solutions to the issue of connectivity and bandwidth. Other districts considering BYOT should take caution when considering it as a cost-saving measure. District and program leaders should carefully consider technology infrastructure and bandwidth and seek the lessons learned from those who have attempted similar programs before to determine how much bandwidth is necessary for successful implementation.

Professional development. Professional development was a significant missing component of the BYOT program in this study, and the lack of professional development may have led to some of the teachers' reported challenges. Professional development is necessary for teachers to successfully implement a ubiquitous computing program such as BYOT (Windschitl & Sahl, 2002; Penuel, 2006). Three specific types of professional development emerge in the research on one-to-one and ubiquitous computing. The first type of professional development focuses on the technology itself and is often not useful in and of itself for teachers to integrate technology successfully (Littrell, Zagummy, & Zagummy, 2005; Penuel, 2006;). Teachers in the study who did mention professional development cited this as the type of professional development they had experienced. Teachers' technology skills are important for technology integration, but more professional development is needed, especially in a district such as this one in which the teachers already have the computer skills (Arguenta, Huff, Tingen, & Corn, 2011).

The second type of professional development focuses on helping teachers integrate technology into their curriculum and instruction (Arguenta, Huff, Tingen, & Corn, 2011; Penuel, 2006;). Very few teachers in this study indicated receiving this type of professional development. The third type of professional development that emerges from studies on one-to-one and ubiquitous programs is informal support from colleagues; research indicates that teachers find this type of informal and ongoing support to be the most helpful in successful technology integration (Arguenta, Huff, Tingen, & Corn, 2011; Davies, 2004; Silvernail & Harris, 2004; Windschitl & Sahl, 2002). Teachers need to see others be successful with the technology and want time to collaborate with each other on ways to integrate the technology into their instruction (Arguenta, Huff, Tingen, & Corn, 2011; Windschitl & Sahl, 2002). A few teachers in this study indicated that they collaborated with others in their department, but no teacher indicated that s/he had observed others being successful with it.

Although teachers in the study did not identify professional development as a strength or a weakness, there was little evidence of professional development regarding the implementation of BYOT. Likewise, the support teachers received, as evidenced by the teacher interviews, was from the technology resource teachers in the building and was not from school or district leaders. The evaluation questions did not explicitly address professional development, but further exploratory analysis of survey questions related to professional development support the findings. For example, the teacher survey asked teachers if they had participated in professional development regarding BYOT. One hundred forty-four teachers responded to this question; 94 (65.3%) responded that they had participated in professional development on BYOT, and 50 (34.7%) responded that they had not.

Teachers were then asked to elaborate on the professional development they had received in the comments section of the survey. Sixty-seven teachers provided a comment. These comments were coded in Dedoose. Of the 67 comments, 56 people commented that they had received training on specific tools such as Twitter, Edmodo, or iPad applications. Only eight responses indicated professional development on integration of BYOT into instruction. One teacher stated that, "I haven't gotten too much professional development on specifically incorporating it into lessons. Most of the professional development has been to show us what apps are out there to use. I'd love to see more PD to show us USING these apps in the classroom!" Another teacher stated that, "this was a brief overview of what we might use BYOT for, but we weren't presented with many practical applications for it." One teacher suggested that, "Other teachers presented how they had used BYOT in their classrooms. This was helpful because it gave me new ideas about lessons I could do in the future."

The teacher survey also asked teachers to select a focus of professional development regarding BYOT that would be most beneficial to them. The results of this survey question are in Table 23.

Table 23

What BYOT professional development would be most beneficial to you?

Professional Development	Frequency	Valid Percent
None needed	30	20.8
Classroom management of BYOT	44	30.6
BYOT for productivity (calendar, homework, note-taking tools)	14	9.7
BYOT for instruction (specific instructional strategies incorporating BYOT)	56	38.9
Total	144	100.0

The two areas of professional development that stood out were "classroom management of BYOT" and "BYOT for instruction (specific instructional strategies incorporating BYOT)".

The logic model outlining the BYOT program (Figure 2) does not contain professional development as an aspect of the program. However, based on the literature review and the results of the study, the district may consider providing professional development, specifically focused on helping teachers integrate technology into their curriculum and instruction (Arguenta, Huff, Tingen, & Corn, 2011; Penuel, 2006). Likewise, the researcher recommends that districts considering BYOT programs in the future add professional development as an activity in their programs. Professional development should be focused on integrating technology, rather than on specific technology tools (Fritschi & Wolf, 2012; Oliver, 2010;). Providing successful experiences for teachers will increase teachers' self-efficacy and change their beliefs regarding BYOT (Fritschi & Wolf, 2012; Johnson, 2012; Windschitl & Sahl, 2002).

Ongoing evaluation. Finally, as is best practice in evaluating school programs, the school district should continue to evaluate the program, how it is progressing, and the continued successes and challenges of those implementing the program (Mertens & Wilson, 2013). If professional development is implemented, an evaluation of its effectiveness should also be conducted. Likewise, the effect – if any – that BYOT has on students' appropriate use of technology and on student achievement should also be evaluated to ensure that the program is meeting its long-term anticipated outcomes.

Recommendations for Future Evaluation and Research

The context for this program evaluation study was the four high schools in a school district implementing BYOT at all of its secondary schools. One future evaluation could be of the four middle schools in the district also implementing BYOT. Middle school teachers may have different successes and challenges or integrate BYOT into their instruction differently than the high school teachers in the district. An evaluation of the middle school BYOT implementation would provide a more complete picture of the district's program for program leaders as well as potential successes and challenges at one school or level that could inform implementation at another.

A significant challenge to the teachers in this study was the issue of bandwidth and connectivity. Another potential future study is the replication of this study in a similar context that has sufficient bandwidth and connectivity. Further exploration is necessary to determine if the challenge with the bandwidth and connectivity prevented teachers in this study from integrating BYOT successfully, and a similar study in a different context may provide insight.

A third recommendation for future research and evaluation is to consider the importance of teachers' level and use of TPACK rather than CSE. The findings in this study indicate that teachers had high CSE and experience with computers but still did not, on average, change their instructional practices to incorporate BYOT into their instruction. CSE may not be the most appropriate theoretical framework for a program such as BYOT. If a district were to provide teachers with professional development regarding integrating BYOT into instruction using the TPACK model, an action research study investigating teachers' use of the TPACK model to integrate BYOT into their instruction could be conducted. Although teachers' beliefs about and experiences with technology are important in successful technology integration (Wood, Willoughby, Specht, & DeYoung, 2005), a measurement of teachers' TPACK and their incorporation of technology into instruction may provide additional and more practical findings to inform program implementation.

There are two instruments that have been developed and found valid and reliable that could aid future researchers in measuring teachers' TPACK. The first is one that was developed to measure the TPACK of K-12 online educators (Archambault, & Crippen, 2009). A second potential instrument to measure teachers TPACK is the Survey of Preservice Teachers' Knowledge of Teaching and Technology that was developed to measure preservice teachers' TPACK (Schmidt, Baran, Thompson, Koehler, Mishra, & Shin, 2009). These two instruments and the research behind their development and measurement may provide insight into future BYOT programs.

Conclusion

One of the long term intended outcomes of the BYOT program evaluated in this study was that BYOT should create a school environment where students can be engaged in rigorous educational experiences and become prepared for the 21st century global world of work. This is an important goal, and evaluating a program such as the one in this study can provide valuable insight into the strengths and weaknesses of the program as well as recommended changes to improve the quality of the program.

The focus of this study was on the CSE of the teachers implementing BYOT, as well as the successes and challenges they faced with implementation. The program theory of CSE may not have been the most appropriate for investigating technology integration; however, it was useful in that the study revealed that CSE alone does not ensure successful technology integration. There are other important factors that contribute to the successes and challenges of a technology program that researchers and school leaders must consider. Teachers' understanding of how to integrate technology into instruction is more than their own experience or comfort with technology. Therefore, teachers require support and professional development to be successful at integrating technology into instruction. The study illuminated the successes and challenges of the teachers as well as areas of recommended improvement of the program. The results revealed that there were some teachers and students experiencing successes in the program but that almost all teachers had experienced challenges with the program. The researcher's hope is that, with ongoing program monitoring and evaluation, the program leaders will recognize the challenges and consider recommended changes that will result in increased successes of the teachers and students using BYOT in classrooms every day.

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Appendix A

Computer User Self-Efficacy Scale and Teacher Survey

Teacher Survey – Teachers' Computer Self-efficacy and Technology Integration Participation Letter, Informed Consent

Dear Teacher,

Background Information
You are being asked to participate in a survey regarding your experiences with computers and Bring Your Own Technology (BYOT). This survey is part of a doctoral dissertation with the College of William and Mary School of Education by Ashley Ellis. You may contact Ashley Ellis (757-876-2778), her dissertation chair, Dr. Leslie Grant (757-221-2411), and/or the College of William and Mary Education Internal Review Committee (EDIRC) (757-21-2358) with any questions about this survey or the study.

Voluntary Participation
Your responses will be kept confidential to the extent possible by the researchers and as permitted by law. This online survey will restrict the researcher's access to your identity. Though the dissertation chair, and the College of William and Mary EDIRC may review records as part of this study, your identity will not be revealed in any publication of the survey results.

Benefits
There are no known risks and/or discomforts associated with this study. Your perspective on the implementation of BYOT in your school district will be valuable toward learning about the successes and challenges teachers face when integrating technology. The expected benefits associated with your participation are the information gathered about the experiences in using BYOT and how it may inform this and future BYOT initiatives. Your timely and thorough participation in this survey is appreciated.

Consent
You have been informed regarding the purpose of this study and your voluntary participation in this survey. You have been provided an opportunity to ask questions about the survey and freely volunteer to participate. By clicking the button below, you confirm that you have read the information above and consent to participate in this survey.

The purpose of this questionnaire is to examine attitudes toward the use of computers. The questionnaire is divided into two parts. In Part 1 you are asked to provide some basic background information about yourself and your experience of computers, if any. Part 2 aims to elicit more detailed information by asking you to indicate the extent to which you, personally, agree or disagree with the statements provided. ***For the purposes of this study, computers are defined as a piece of technology, including a desktop computer, laptop, or mobile device that is connected to the Internet.***

Part 1:

Years of Teaching Experience:

Experience with computers:

- none
- very limited
- some experience
- quite a lot
- extensive

Please indicate the computer packages you have used:

- Word processing
- Spreadsheets
- Databases
- Presentations (PowerPoint, Keynote, etc.)
- Statistics packages
- Desktop Publishing
- Multimedia
- Other (specify) ____

Do you own a computer, laptop, or tablet? YES NO

Part 2:

Below you will find a number of statements concerning how you might feel about technology. Please indicate the strength of your agreement/disagreement with the statements using the 6-point scale shown below. Select the number (i.e., between 1 – *strongly disagree* –and 6 *strongly agree*) that most closely represents how much you agree or disagree with the statement. There are no correct responses, it is your own views that are important. ***For the purposes of this study, computers are defined as a piece of technology, including a desktop computer, laptop, or mobile device that is connected to the Internet.***

1. Most difficulties I encounter when using computers, I can usually deal with.

2. I find working with computers very easy.

3. I am very unsure of my abilities to use computers.

4. I seem to have difficulties with most of the programs or applications I have tried to use.

5. Computers frightens me.

6. I enjoy working with computers.

7. I find that computers gets in the way of learning.

8. New applications or software packages don't cause many problems for me.

9. Computers make me much more productive.

10. I often have difficulties when trying to learn how to use a new application/software package.

11. Most of the application or software packages I have had experience with, have been easy to use.

12. I am very confident in my abilities to make use of computers.

13. I find it difficult to get computers to do what I want them to.

14. At times I find working with computers very confusing.

15. I would rather that we did not have to learn how to use computers.

16. I usually find it easy to learn how to use a new software package.

17. I seem to waste a lot of time struggling with computers.

18. Using computers makes learning more interesting.

19. I always seem to have problems when trying to use computers.

20. Some applications and computer packages definitely make learning easier.

21. Computer jargon baffles me.

22. Computers are far too complicated for me.

23. Using computers is something I rarely enjoy.

24. Computers are good aids to learning.

25. Sometimes, when using a computer, things seem to happen and I don't know why.

26. As far as computers go, I don't consider myself to be very competent.

27. Computers help me to save a lot of time.

28. I find working with computers very frustrating.

29. I consider myself to be a skilled computer user.

30. When using technology, I worry that I might press a wrong button and damage something.

Part 3:

1. Do you use in BYOT during instruction?
   a. Yes

b. No

2. If so, how often do you incorporate BYOT in your instruction?
    a. Daily
    b. Weekly
    c. Monthly
    d. Once or twice a year
    e. Never

3. Have your lesson plans changed as a result of BYOT?
    a. Yes
    b. No

4. If so, how? (Free response)

5. For what purpose do you allow your students to use their personally owned portable electronic devices during class? Check all that apply.
    a. None
    b. Reading
    c. Take notes
    d. Record homework assignments
    e. Camera
    f. Research
    g. Dictionary/thesaurus
    h. Specific BYOT enhanced lessons
    i. When classwork is complete
    j. Other (please specify)

6. Do you believe there are instructional benefits of BYOT?
    a. Yes
    b. Not Sure
    c. No

6a. Please elaborate:

7. Since the initiation of BYOT program at your school, have you experienced any successes involving BYOT? Please elaborate.
    a. Yes
    b. No

7a. Please elaborate:

8. Since the initiation of BYOT program at your school, have you experienced any challenges involving BYOT?
    a. Yes

b. No

8a. Please elaborate:

9. Have you received any professional development on BYOT?
    a. Yes
    b. No

9a. If yes, please describe the type of professional development you have received regarding BYOT:

10. What BYOT professional development would be most beneficial to you?
    a. None needed
    b. Classroom management of BYOT
    c. BYOT for productivity (calendar, homework, notetaking tools)
    d. BYOT for instruction (specific instructional strategies incorporating BYOT)

11. If you would be willing to allow the researcher to conduct one classroom observation and a brief teacher interview to gather further information for this study, please provide your name and email address in the spaces provided. Submitting your name and email address signifies your willingness to be contacted by the researcher and does not guarantee your participation in a classroom observation or interview.

Thank you for your time!

THIS PROJECT WAS FOUND TO COMPLY WITH APPROPRIATE ETHICAL STANDARDS AND WAS EXEMPTED FROM THE NEED FOR FORMAL REVIEW BY THE COLLEGE OF WILLIAM AND MARY PROTECTION OF HUMAN SUBJECTS COMMITTEE (Phone 757-221-3966) ON 2013-10-01 AND EXPIRES ON 2014-10-01.

Appendix B

Scoring the Computer User Self-Efficacy Scale

Part 1

Experience with computers—This question is scored using a standard Likert format where "none" is scored as 1 and "extensive" is scored as 5.

Number of computer packages used—Here the respondent is scored 1 for each package used and these are summed to give a total score.

Part 2

Items 1 to 30 are all scored on a 6-point Likert scale.

Items 1, 2, 6, 8, 9, 11, 12, 16, 18, 20, 24, 27, and 29 are positively worded and the respondent's response is recorded as the actual scale score for these items, e.g., a response of 4 to item 1 will be scored as 4, i.e.

Strongly Disagree 1 2 3 4 5 6 Strongly Agree

Items 3, 4, 5, 7, 10, 13, 14, 15, 17, 19, 21, 22, 23, 25, 26, 28, and 30 are negatively worded and are scored in reverse, i.e.

Strongly Agree 1 2 3 4 5 6 Strongly Disagree

A scale score for these items is obtained by subtracting the respondent's response from 7, e.g., a response of 4 to item 3 will be scored as 3.

Summing the scores for all 30 items gives the total self-efficacy score. Using this scoring method, a high total scale score indicates more positive computer self- efficacy beliefs.

From Cassidy, S., & Eachus, P. (2002). Developing the computer user self-efficacy (CUSE) scale: Investigating the relationship between computer self-efficacy, gender, and experience with computers. *Journal of Educational Computing Research, 26*(2), 133-153.

Appendix C

SEIR•TEC IMPACT MODEL SCHOOL SERVE

Looking for Technology Integration (LoFTI)

Purpose: LoFTI is a tool to aid in the observation of technology integration into teaching and learning. The data gathered through use of this instrument should be helpful to building-level staff members as they plan and/or provide professional development in instructional technology. *For all items, check any and all which apply to the activities being observed.*

Is technology in use? (Circle): Yes No Time In: _______ Time Out: _______

Date: __________________ # of Students in class: ______ # of Students using technology: ______

Student Arrangement

- ❑ Tables, Centers, Pods
- ❑ Circle or U
- ❑ Cubicles
- ❑ Rows
- ❑ Other ______________

Learning Environment

- ❑ Auditorium
- ❑ Cafeteria
- ❑ Classroom
- ❑ Gymnasium
- ❑ Lab
- ❑ Media center
- ❑ Multi-purpose room
- ❑ Outside
- ❑ Virtual environment
- ❑ Other ______________

Student Grouping

- ❑ Independent work
- ❑ Learning centers
- ❑ Small groups
- ❑ Whole group
- ❑ Workshops
- ❑ Other ______________

Instructional Collaborators

- ❑ Administrator
- ❑ Assistant
- ❑ Curriculum specialist
- ❑ Media coordinator
- ❑ Other teacher
- ❑ Outside consultant
- ❑ Special ed teacher
- ❑ Student
- ❑ Technology facilitator
- ❑ Volunteer
- ❑ Other ______________

Content Area Activities

Check only if technology is being used

- ❑ Arts
- ❑ Career technical
- ❑ Computer/technology skills
- ❑ English/Language arts
- ❑ English as a second language
- ❑ Guidance
- ❑ Health
- ❑ Physical education
- ❑ Library/media skills
- ❑ Mathematics
- ❑ Foreign languages
- ❑ Science
- ❑ Social studies
- ❑ Other ______________

Teacher Activities

Check only if a teacher is directly using technology for...

- ❑ Activating prior knowledge
- ❑ Assessment
- ❑ Cues, questions, and advance organizers
- ❑ Demonstration
- ❑ Differentiated instruction
- ❑ Facilitation (guiding)
- ❑ Lecture
- ❑ Providing feedback
- ❑ Questioning
- ❑ Reinforcing/recognition
- ❑ Scaffolding
- ❑ Setting objectives
- ❑ Summarizing
- ❑ Other ______________

Student Activities

Check only if students are directly using technology for...

- ❑ Assessment
- ❑ Brainstorming
- ❑ Computer-assisted instruction
- ❑ Cooperative learning
- ❑ Classroom discussion
- ❑ Drill and practice
- ❑ Generating and testing hypotheses
- ❑ Identifying similarities and differences
- ❑ Problem solving
- ❑ Presentation
- ❑ Project-based activities
- ❑ Recitation
- ❑ Summarizing and note taking
- ❑ Other ______________

Assessment Methods

Check only if technology is being used

- ❑ Oral response
- ❑ Product (e.g., project with rubric)
- ❑ Performance (e.g., presentation, demonstration)
- ❑ Selected response
- ❑ Written response
- ❑ Other ___________

SEIR•TEC InPact Model School SERVE

Looking for Technology Integration (LoFTI)

Student engagement is shown by…

Positive Indicator of **Engagement**	**Percentage of Students Using Technology** *Circle your best estimate of the percentage of students using technology who show each positive indicator*						*The opposite is* ***Disaffection***
Sustained behavioral involvement	100%	80%	60%	40%	20%	0%	*Tendency to give up easily in the face of challenges*
Positive emotional tone – cheerful, calm, communicative	100%	80%	60%	40%	20%	0%	*Boredom, depression, anxiety, anger, withdrawal, or rebellion*
Selection of tasks at the border of their competencies	100%	80%	60%	40%	20%	0%	*Selection of tasks well within their comfort zone*
Initiation of action when given the opportunity	100%	80%	60%	40%	20%	0%	*Passivity, lack of initiative*
Exertion of effort and concentration	100%	80%	60%	40%	20%	0%	*Laziness, distraction*

Technology is being **used as a tool** for…

Teacher	Student	(Check either Teacher or Student, or both)
☐	☐	**Problem-Solving** (e.g., graphing, decision support, design)
☐	☐	**Communication** (e.g., document preparation, email, presentation, web development)
☐	☐	**Information Processing** (e.g., data manipulation, writing, data tables)
☐	☐	**Research** (e.g., collecting information or data)
☐	☐	**Personal Development** (e.g., e-learning, time management, calendar)
☐	☐	**Group Productivity** (e.g., collaboration, planning, document sharing)

Technology **hardware** is in use by…

Teacher	Student	(Check either Teacher or Student, or both)
☐	☐	**Assistive Technology**
☐	☐	**Audio** (e.g., speakers, microphone)
☐	☐	**Art/Music** (e.g., drawing tablet, musical keyboard)
☐	☐	**Imaging** (e.g., camcorder, film or digital camera, document camera, scanner)
☐	☐	**Display** (e.g., digital projector, digital white board, television, TV-link, printer)
☐	☐	**Media Storage / Retrieval** (e.g., print material, DVD, VCR, external storage devices)
☐	☐	**Math / Science / Technical** (e.g., GPS, probeware, calculator, video microscope)
☐	☐	**Computer** (e.g., desktop, laptop, tablet, handheld, digital word processing device)
☐	☐	**Other** ______________________________

SEIR◆TEC InPaCt SERVE

Looking for Technology Integration (LoFTI)

Technology **software** in use by...

Teacher	Student	(Check either Teacher or Student, or both)
☐	☐	**Administrative** (e.g., grading, record-keeping)
☐	☐	**Assessment / Testing**
☐	☐	**Assistive** (e.g., screen reader)
☐	☐	**Computer-assisted Instruction** (e.g., integrated learning system, tutorial, learning game)
☐	☐	**Thinking Tools** (e.g. visual organizer, simulation, modeling, problem-solving)
☐	☐	**Hardware-embedded** (e.g. digital white board, GPS/GIS, digital interactive response system
☐	☐	**Multimedia** (e.g., digital video editing
☐	☐	**Productivity Software** (e.g., database, presentation, spreadsheet, word processing)
☐	☐	**Programming or Web Scripting** (e.g., Javascript, PHP, Visual Basic)
☐	☐	**Graphics / Publishing** (e.g., page layout, drawing/painting, CAD, photo editing, web publishing)
☐	☐	**Subject-specific Software**
☐	☐	**Web Browser** (e.g., MS Internet Explorer, Netscape, Firefox)
		Web Applications
☐	☐	Course management software
☐	☐	Database systems
☐	☐	Discussion boards
☐	☐	Libraries, E-publications
☐	☐	Search engine
☐	☐	Computer-aided instruction, integrated learning system (e.g., tutorial, learning game)
☐	☐	Video, voice, or real-time text conference
☐	☐	Web logs
☐	☐	Web mail
☐	☐	Wiki
		NC-Specific Web Resources
☐	☐	*Learn NC*
☐	☐	*NC Wise Owl*
☐	☐	*SAS in School*
☐	☐	**Other** ______________________

Appendix D

Teacher Interview Protocol

Purpose of the Study: The purpose of this interview is to describe the way in which this school district implemented its BYOT program and to discover the successes and challenges the teachers face with the implementation of the program. It will also explore the connection between teachers' computer self-efficacy and integration of BYOT. I appreciate your voluntary participation in this study and want to remind you that the interview is being recorded for purposes of transcribing the interview, but your answers will remain confidential.

Warm-up Questions:

1. How long have you been teaching?
2. What subject do you currently teach and how long have you been teaching it?
3. How would you describe, on a scale of 1 (extremely uncomfortable) to 10 (extremely comfortable) your comfort with technology?

Interview Questions:

1. Are you using BYOT?

If YES	If NO
YES (a) What do you see as the strengths and weaknesses of BYOT in your school?	NO (a) Have you made a decision to use BYOT in the future? If so, when?
YES (b) Are you currently looking for any information about BYOT? What kind? For what purpose?	NO (b) Can you describe BYOT for me as you see it?
YES (c) What do you see as being the effects of BYOT? In what way have you determined this? Have you received any feedback from students? What have you done with the information you get?	NO (c) What are the strengths and weaknesses of BYOT in your school?
YES (d) Have you made any changes in	NO (d) At this point in time, what kinds of

how you use BYOT? What? Why? Are you considering making changes?

questions are you asking about BYOT? Give examples if possible.

YES (e) Are you working with others in your use of BYOT? How do you work together? How frequently?

NO (e) Do you ever talk with others and share information about BYOT? What do you talk about or share?

2. What training, if any, have you had to assist with integrating BYOT in your instruction?
3. Are you currently engaged in any activities to support you integrating BYOT in your instruction? If so, please describe them.
4. What could school leaders do to better support teachers in integrating technology in their classrooms?
5. Is there anything else you would like to add?

Thank you for participating in this study. As a reminder, your responses will remain anonymous and confidential.

Appendix E

Participant Consent Form
Teachers' Computer Self-Efficacy and Technology Integration

I, ________________________________, agree to participate in a research study involving high school teachers teaching in a Bring Your Own Technology (BYOT) school district. The purpose of this study to describe the way in which this school district implemented its BYOT program and to discover the successes and challenges teachers face with the implementation of the program. It will also explore the connection between teachers' computer self-efficacy and integration of BYOT.

As a participant, I understand that my participation in the study is purposeful in that the teachers volunteered and were selected with the intention of providing a representation of high school teachers in the school district utilizing a Bring Your Own Technology initiative. I understand that approximately 24 teachers will be selected to participate in this study.

I understand that I will be expected to participate in one (1) interview related to my knowledge, skills, and dispositions concerning technology integration. I will also allow one (1) observation of the classroom I teach. I also understand that I have already completed an instrument that measures a teacher's sense of computer self-efficacy.

I understand that my responses will be confidential and that my name will not be associated with any results of this study.

I understand there is no personal risk or discomfort directly involved with this research and that I am free to withdraw my consent and discontinue participation at any time. I agree that should I choose to withdraw my consent and discontinue participation in the study that I will notify the researcher listed below, in writing. A decision not to participate in the study or to withdraw from the study will not affect my relationship with the researcher, the College of William and Mary generally or the School of Education, specifically.

If I have any questions or problems that may arise as a result of my participation in the study, I understand that I should contact Ashley Ellis, the researcher at 757-876-2778 or apfisk@email.wm.edu, or Dr. Leslie Grant, her dissertation chair at 757-221-2411 or lwgran@wm.edu. My signature below signifies that I am at least 18 years of age, that I have received a copy of this consent form, and that I consent to participating in this research study.

______________________________ ______________________________

DATE Signature of Participant

______________________________ ______________________________

DATE Signature of Researcher

THIS PROJECT WAS FOUND TO COMPLY WITH APPROPRIATE ETHICAL STANDARDS AND WAS EXEMPTED FROM THE NEED FOR FORMAL REVIEW BY THE COLLEGE OF WILLIAM AND MARY PROTECTION OF HUMAN SUBJECTS COMMITTEE (Phone 757-221-3966) ON 2013-10-01 AND EXPIRES ON 2014-10-01.

Appendix F

District Student Survey

Distributed November 22, 2013

1. Do you participate in BYOT?

- ◯ Yes
- ◯ No

Optional Comments

2. How often do you use BYOT in class?

- ◯ Daily
- ◯ Weekly
- ◯ Monthly
- ◯ Once or Twice a Year
- ◯ Never

3. How many of your teachers allow you to use your own technology in their classrooms?

- ◯ All of my teachers
- ◯ More than half of my teachers
- ◯ About half of my teachers
- ◯ Less than half of my teachers
- ◯ None of my teachers

4. If you participate in BYOT, how often do you use your personal device during the following classes?

	Never	Sometimes	Often	Daily	N/A
English	◯	◯	◯	◯	◯
Math	◯	◯	◯	◯	◯
Science	◯	◯	◯	◯	◯
Social Studies	◯	◯	◯	◯	◯
Health/PE	◯	◯	◯	◯	◯
Fine Arts	◯	◯	◯	◯	◯
World Language	◯	◯	◯	◯	◯
CTE	◯	◯	◯	◯	◯
Library	◯	◯	◯	◯	◯

5. For what purposes are you allowed to use your own device in class?

- [ ] Never
- [ ] Silent reading
- [ ] Take notes
- [ ] Record homework assignments
- [ ] Camera
- [ ] Research
- [ ] Dictionary/thesaurus
- [ ] Specific BYOT enhanced lessons
- [ ] When classwork is complete

Other (please specify)

6. What kind of electronic device(s) do you bring to school for the purpose of BYOT? Select all that apply.

- [ ] Cell phone with texting
- [ ] Cell phone with 3G or 4G wireless
- [ ] Cell phone with WiFi
- [ ] iPod Touch
- [ ] iPad
- [ ] Other tablet with WiFi only
- [ ] Tablet with 3G or 4G
- [ ] Laptop
- [ ] Netbook

Other (please specify)

7. Do you any additional comments regarding BYOT in your school?