Does Your School Have What It Takes?

Implementation of a Bring Your Own Device Technology Program

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[1] A pseudonym has been used for the name of the school and principal of the school.

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Abstract

The purpose of this qualitative single-case study was to examine one high school's journey towards the implementation of its BYOD initiative. The study had three specific aims. The first aim was to expand the context specific knowledge of implementing a BYOD initiative. The second aim was to assess similarities and differences between one-to-one and BYOD implementation strategies. The third aim was to potentially surface new strategies to support and improve the implementation of BYOD initiatives. Using interview and survey data from students, educators, and administrators, the study provided a detailed narrative of one school's BYOD implementation journey. The study also found great overlap between one-to-one and BYOD implementation strategies, with some differentiated emphasis on specific strategies. Lastly, the findings showed that BYOD frameworks should intentionally incorporate the use of a pilot phase and a comprehensive needs assessment to enhance the implementation process. Implications for school-level administrative leaders, academics, and all those interested in theory and research to further the quality of implementation practice can be found in the final chapter of the study.

Table of Contents

Table of Tables

Table of Figures

Chapter One: Introduction

Amidst moments of success in educational achievement around the nation, the underlying trend of the past decade has remained the issue of underperforming students. This issue has been termed the achievement gap and is used to describe unequal achievement between students of color and their white counterparts on multiple measures of academic success. In the face of rising concern and pressure from parents and policymakers, schools have begun experimenting with various strategies and innovations that hold the potential to provide measurable gains for students (WestEd, 2006). With many options to choose from, a quick glance in classrooms across the country will illustrate that many schools have opted to experiment with learning technologies as a tool to increase student academic achievement.

Use of technology in schools is not a new endeavor, but rather an approach that extends back to the use of television, desktop computers, and SMART boards in the classroom. Each decade has been marked with a different technology tool intended to improve student success through the means of teaching and learning (Trilling & Fadel, 2009). Unique about this current decade are the types of technologies that can be found in the hands of students as young as five years old. Today, many schools and districts across the nation have moved beyond computer labs and interactive whiteboards. They have begun adopting programs which utilize mobile devices such as tablet PCs (hereafter known as tablets), laptop computers and netbooks (hereafter known as laptops), smartphones, and E-book readers (e.g., Nook, Kindle) for teaching and learning.

As the number of schools and districts expressing interest in adopting and implementing learning technology programs increases so has the amount of available resources dedicated to supporting that process. But while the innovations to support teaching and learning have changed, Taylor, Nelson, and Adelman (1999) believe education researchers and reformers have not paid enough attention to the process of implementation and diffusion of new initiatives. This lack of focus is problematic because implementation is a "complex endeavor, more complex than the policies, programs, procedures, techniques, or technologies that are the subject of the implementation efforts" (Fixsen, Naoom, Blasé, Friedman, & Wallace, 2005, p. 2). False assumptions about innovative programs, such as learning technologies, being self-executing rather than requiring strategic planning and execution have led to the overemphasized importance of the program at the expense of focusing on the process in which that program is implemented (Fixsen et al., 2005). The continuation of this imbalance between program and implementation is sure to lead to yet another innovative strategy that fails to alleviate the problem that it is intended to address.

The following section will provide a brief historical overview of how student underperformance led to a shift in the culture of teaching and learning towards a new pedagogical approach that supports learning technologies. This will then be followed by a discussion about the rise of learning technologies in schools, examples of the prevalence of poor implementation practices, an in-depth look at the BYOD (Bring Your Own Device) model, and a statement of the research problem.

Background of the Problem

As mentioned above, a continuing issue in the U.S education system is the concern about student underperformance. While distinct subpopulations of students are excelling academically, there remains a pressing challenge to effectively reach all learners (Hudson, 2014). Much of the blame for student underperformance has historically been placed on educators. As the individuals charged to enrich the minds of students and teach the academic curriculum needed for success, educators have been directly and indirectly held responsible for declining test scores and failure to procure adequate yearly progress. Among the many criticisms hurled at educators for student underperformance in the classroom is the possibility that the curriculum being used in schools was not relevant to the lives of students. Additional criticisms include the lack of differentiation and individual instruction and that educators are failing to meet the demands of digital natives (students whose lives were intertwined with technology since their birth), thereby failing to prepare them for success in an information age. The problem of student underperformance has been framed as a lack of focus on the most important stakeholder in the teaching and learning process: students.

Mostly framed as an issue that educators were responsible for, one solution that arose and caught the attention of schools and districts was to shift from the traditional model of teacher-led instruction to a student-centered (constructivist) approach to learning. The traditional model of teaching, what most adults of today are familiar with, calls for the educator to determine and set the learning objectives for students and identify lessons to meet those objectives (Pederson & Liu, 2003). This method assumes that learners are incapable of determining a process to meet the specific objectives, so educators are tasked with assigning a process for all students (Pederson & Liu, 2003). In contrast, with the student-centered approach, students are presented with a topic of instruction, then are supported by educators who act as facilitators to their learning by questioning them to identify alternative pathways to reach their goals without solving problems for them (Pederson & Liu, 2003). The student-centered approach is favored in part because of concerns that the traditional method fails to emphasize problem-solving and critical thinking skills in students. Supporters add that the traditional approach "fail[s] to address the knowledge requirements of a rapidly expanding technological society" (Hannafin & Land, 1997). The traditional approach is said to merely transmit information from the educator to the student. What reformers aimed for with this new approach was increased engagement and interactivity with and from each student; a goal said to be supported using technology (Hudson, 2014).

As conversation and support grew around the shift from the traditional approach towards student-centered learning to address the lack of focus on students, a structural issue arose regarding the design and implementation of student-centered learning environments (Hannafin & Land, 1997). As a result of what An and Reigeluth (2011) describe as an association between high-level use of technology and learner-centered or constructivist practices, what emerged as a potential solution to this issue was the integration and utilization of technology in schools. No stranger to schools and classrooms, technology and more specifically advances in digital and learning technologies were now being framed as solutions that could facilitate the development and management of student-centered learning environments (Hannafin & Land, 1997). In support of the use of technology for this new approach was the belief that it was no longer appropriate for students to have access to less technology than educators in the classroom (Blair, 2012). Previous uses of technology in the classroom asked educators to simply teach with technology, but the student-centered approach would require educators to teach through technology (Blair, 2012). As proponents of technology use in the classroom, Jones-Kavalier and Flannigan (2006) added that use of PowerPoint and note taking in the classroom and casually pointing to countries on a map would no longer be sufficient to teach the digital natives occupying today's classrooms.

The pairing of the issue of how to design student-centered teaching, coupled with the use of technology as a solution is akin to John Kingdon's Multiple Streams Framework. The two streams, problem and policy, had come together and what was missing to bring about real change on the ground was political support (politics stream). At the onset of this pairing, federal and state educational policies were still closely tied to traditional teaching approaches (Borsheim, Merritt, & Reed, 2008), but soon after, federal policies began following the shift from a traditional to technology-supported student-centered approach. The motivation for these policies was not entirely academic, but rather stemmed from a need to prepare the next generation of citizens to participate in a changing workforce. In a report entitled "Roadmap to America's Future," the Federal Communication Commission (FCC) expressed concern for the current (traditional approach) education system to adequately develop a workforce for the emerging information–based economy (Brent & Johnson, 2011). These concerns were echoed by An and Reigeluth (2011), who asserted that "the traditional factory model of education is incompatible with the evolving demands of the information age" (p. 54). The report goes on to propose a focus on Science, Technology, Engineering and Mathematics (STEM) related curriculum to develop an adequate workforce. In support of the FCC, Brent and Johnson (2011) added, "Schools must begin teaching to the future. This means investing in the technologies that empower students to take control of their individual learning and that provide the intellectually challenging and engaging learning environments they want and need" (p. 6). In additional to policy briefs, support for the shift towards integration of technology for teaching and learning was evidenced by state and federal spending priorities. Riley (2010) asserts that across federal and state governments and school districts, billions of dollars have been spent to increase internet access and technology equipment – tools necessary to create a learner-centered constructivist classroom.

The emergence of policy briefs and funding served to flow Kingdon's politics stream and helped create what he would describe as the window of opportunity for real change to take place. Conversations and opinions about how schooling was to be done slowly began to change, and student-centered learning went from an unknown approach to an innovative process that schools were eager to adopt. In practice, this is evidenced by independent school districts and individual schools adopting and implementing learning technology programs. The short-term aim of this practice is towards the goal of academic achievement. The mid-term aim is to utilize an approach that puts knowledge into the hands of students and teaches them to be agents of their learning. The long-term aim is the development of technology skills, thereby preparing students for the information age. Understanding of the historical background makes it clear that learning technologies surfaced as a means to support student-centered learning environments towards student achievement. The next section will cover how learning technologies have risen to compete with notebooks and markers as the most popular back-to-school accessory.

The Rise of Learning Technologies in School

The 21st century is not the first time technology was used in schools. The acquisition of technical hardware in schools can be traced back to the late 1970s and increasing in the 1980s (Picciano, 2011). The recent push for wireless learning technologies in schools began in the early 2000s to facilitate student-centered learning and more recently has gained popularity fueled by the release of Apple's iPad in 2010. The iPad (and other notable tablets), with its use of applications (apps), opened the door for seemingly endless possibilities for personal and professional use and emerged as a tool that holds great potential in the classroom (Beskow & Deb, 2013; Melhuish & Falloon, 2010). Since its release, many companies have joined in to develop and produce devices for the booming demand of technology use in the classroom. Learning technologies have increasingly become a solution to meeting the needs of low-achieving students and the needs of diverse learners in both empirical studies and practitioner conversations (McClanahan, Williams, Kennedy, & Tate, 2012; Hew & Brush, 2007). This eagerness has been so profound that in a 2013 national report put forth by Interactive Education System Design and STEM Market Impact, 71% of district leaders reported a high level of interest to purchase tablets. From the same report, 60% said that mobile technology had been adopted in a quarter or more of their schools, and 15% reported being "very likely" to take on a mobile technology program within the next two years (Logan, 2013). Tablets and laptops are by no means the only approach with the potential to address the issue of differentiated academic achievement. They are but one solution that gives schools control over the problem, students' agency over the solution, and they provide educators control over the areas they can directly change: teaching and learning.

As previously stated, a major driver in the adoption of learning technologies in schools is the overwhelming amount of information presented about the potential of digital devices to improve teaching and learning, thereby enhancing student outcomes

(Matthews & Khoie, 2007; Sneller, 2007). Researchers have found that proper use of learning technologies can impact student engagement as well as classroom efficiency (Samsung, 2013; Goodwin, 2012; Fowler, Gasen, Roberts, & Saltzberg, 1996), factors that are known to positively contribute to positive academic outcomes. The most commonly cited driver for adoption of learning technologies in schools is the desire for educators to engage students in learning using the same methods and devices students utilize outside the classroom (Walling, 2012; Sweeney, 2012). The culture of school-age children, where they are digitally connected for access to news, communication, entertainment, and everyday activities (Samsung, 2013; Goodwin, 2012; Lee & Spires, 2009; Levin & Schrum, 2012; Goodwin, 2012), has become so pervasive that schools are pushing to be another reason for students to remain digitally plugged in.

The significant use of and interaction with technology for students has many academic and technology experts exploring how technology can be used to improve K-12 education (Lee & Spires, 2009; Goodwin, 2012). Experts are urging schools to incorporate technology into their academic practice if they intend to prepare students for lives beyond the classroom (Adobe, 2009; Goodwin, 2012; Murray & Olcese, 2011). As a result of their technology-saturated lives, today's students access, process, and produce information in ways that are different than their educators and previous generations (Goodwin, 2012). In a 2004 NetDay study, before the rapid adoption of learning technologies, a student was quoted as saying,

> We do not pick up dictionaries anymore—we go to Dictionary.com. We do not walk to the library—we search online journal databases. We would not know an archive if we stumbled into it on the way to the fax. (p. 3)

If schools are serious about raising student achievement and reaching their intended goals, they must understand the habits and needs of digitally connected students and work to develop environments that can foster and sustain their engagement (Lee & Spires, 2009).

The need for rapid adoption of learning technology programs has been met with copious amounts of one-size-fits-all implementation resources. The hastiness of some schools to be on the front end of innovation coupled with improper implementation strategies has given way to countless examples of flawed implementation outcomes. Below are three examples of schools that struggled through implementation as a result of minor mistakes that could have been avoided with increased attention to the complexities of the process, rather than to the novelty of the innovation.

Examples of Improper Implementation

Increasing use of learning technologies, coupled with the diverse quality of implementation, has led to a variety of challenges in schools. One example comes from the Los Angeles Unified School District's (LAUSD) initiative to equip every one of its 700,000 students and educators with an Apple iPad. The plan faced many setbacks, was halted, and then replaced with a laptop program (Lasevoli, 2013). In another example, officials at Hoboken, a school district in northern New Jersey, abandoned their laptop program after an intervention to assign every 7th, 8th, and 9th-grade student a laptop computer failed (Barshay, 2014). A final example comes from Fort Bend Independent School District in Texas. The district is said to have abandoned its iAchieve program that integrated thousands of iPads into 14 different schools (Rhor, 2012).

Despite being in various regions of the nation, what these schools have in common is that the cause of their failures can be directly attributed to flawed implementation practices. The LAUSD's shift from tablets to laptops illustrates a failure to acknowledge and determine the specific needs of their students and staff before the adoption of a device. If all relevant stakeholders were invited to contribute to the discussion before adoption, their needs and intended uses for the device could have been taken into consideration when determining which device would be most appropriate for students and staff. Similarly, in Hoboken, amidst a host of security and financial issues, the superintendent admitted that the lack of quality training about how to use the computers for instruction was a reason the initiative failed (Barshay, 2014). The failure to train and equip educators with the skills required to change their practice of teaching will likely lead to disastrous implementation outcomes. For Fort Bend, among concerns with wireless coverage and the school's firewall, were issues related to inconsistency between the new curriculum taught with the devices and the district level standards (Michels, 2013). The expectations the district held were beyond the means of the new devices, they rushed the process without acquiring the right team of people, and they lacked control of the finances of the program. This example serves to underscore the value of establishing an instructional vision that is directly aligned with the district, as well as connecting the vision, instruction, and districts' academic goals.

In each of the three examples, the school or district had the right intention in place, but good intention alone will not lead to successful outcomes. Although there were many things the schools and districts did well, the things they did not do or did poorly still managed to disrupt their overall success. This highlights the complexity of the implementation process and the care that must be taken when engaging in it. As the examples above show, the consequences of poorly planned implementation include wasted time, high financial costs, and academic setbacks (Levin & Schrum, 2012). These are significant outcomes that are best not to be overlooked, and that serve as a reminder that the success of any program is dependent on equal parts of a well-developed plan and the proper implementation of that plan (Franks & Schroeder, 2013). The way to avoid any of the mistakes shared above is to begin by preparing and planning with the best approach in mind. The next section will review two popular approaches to learning technology programs.

Approaches for Learning Technology Programs

Up until this point, the term *learning technology* has been used broadly to describe programs in which educators and students use devices (e.g., laptops, tablets) in the classroom to accomplish specific learning objectives and tasks (Spector, Merrill, Elen, & Bishop, 2014). Currently, there are two common approaches for learning technology programs: One-to-one, and Bring Your Own Device (BYOD). The one-to-one approach had become the most sought-after and well-known of the two. This approach is marked by schools that provide a digital device for every student and educator in the building to be used to support teaching and learning. Schools that take this approach look to district levies, one-time grants, or other means to help finance the program. As one may expect, implementation of this approach is financially costly and out of reach for many of the schools and districts with high levels of underperformance (Gaines & Martin, 2014). For schools unable to acquire the necessary funding to provide a device for every student and educator, another approach gaining popularity is Bring Your Own Device (Dixon & Tierny, 2012; Ruedel, Brann, Gray, & Zorfass, 2013). BYOD is commonly defined as "allowing pupils/students to bring their own devices, especially tablets and other suitable personal devices, into classrooms to support improving student learning outcomes" (PDST, 2014, p. 1; see also Stavert, 2013 and Alberta Education, 2012). Because BYOD is the primary focus of this study, the next section will provide a closer look at BYOD to give readers a detailed understanding of the model.

Examining BYOD (Bring Your Own Device) More Closely

This concept, commonly abbreviated as BYOD, and the approach this study explored, originated in the business sector and was first used by Intel in 2009 after a realization that an increasing number of its staff were using personal devices for work-related activities (Johnson et al., 2013). Only recently has BYOD been adopted as an education strategy for schools to utilize learning technologies while not bankrupting their budget. One assumption that governs its use in schools is that when students bring their own device, it is typically a device for which they will invest time, energy and responsibility. In the 2012 BYOD guide published by Alberta Education, the organization adds that students will be familiar with the device and proficient in using it, which will ultimately “afford seamless learning opportunities that bridge the formal learning in schools, with the informal, outside of classroom and schools” (p. 1). While the BYOD approach has yet to gain the prominence of the one-to-one approach, there is no denying its presence as a viable option for schools hoping to improve student achievement and reach other academic goals.

The BYOD approach does not guarantee that each student will arrive equipped with the most up-to-date device on the market, but more often than not, students’ personal devices will be more up-to-date than the technology in standard computer labs and school technology carts. BYOD programs are typically modeled after one-to-one programs and often seek the same outcomes, including, but not limited to, shifting the focus from teaching to learning and empowering students to be “active proponents of their understanding and ability to connect ideas in new ways” (Dixon & Tierny, 2012, p. 3). According to PDST (2014), the key reason to implement a BYOD program is "to support, enhance, and transform the learning experiences to improve learning outcomes" (p. 1).

As with any significant innovation, the adoption of a Bring Your Own Device program in schools is not without drawbacks and opposition. The disadvantages of this approach include first and foremost issues related to equity and access to devices (Stavert, 2013). Other concerns include costs of updating the school's digital infrastructure (Dixon & Tierny, 2012), sustainability (Gaines & Martin, 2014), and pressures placed on educators to teach to multiple devices (Ruedel, Brann, Gray, & Zorfass, 2013). These factors are important to keep in mind and will be described in further detail in the following chapter.

BYOD trends. According to Nagel (2017), the number of students using personal devices in class (58%) has surpassed the number using a school-issued Chromebook (56%). Despite one-to-one programs dominating the education technology discourse, students themselves are sending clear signals of their preference for their own devices. With the market cost for personal technology devices decreasing (NETP16), many students from all income brackets now own a tablet, PC, smartphone, or web-enabled device. As described by Impulse (2011), an education nonprofit called Project Tomorrow reports that "60-70% of parents of K-12 students would be willing to buy a mobile device to support learning. Fifty-six percent of high school students say that it would make it easier to learn if they were allowed to use their own mobile device at school" (p. 1).

A pattern that researchers have become aware of is that regardless of the approach schools choose to employ, the devices themselves remain the most important aspect of any program. More attention is spent on identifying the most appropriate device(s), which devices will be allowed and which will not be allowed, than any other aspect of the implementation process. Spector, Merrill, Elen, and Bishop (2014) suspect that this may be a symptom of the novelty of the devices obscuring the educational potential of the devices. The problem with this misdirected focus is that it robs critical implementation activities of the attention they deserve. What schools forget in their rapid adoption of learning technology programs and focus on devices is that the likelihood of reaching their long-term goals may be diminished if learning technologies are poorly implemented and if schools fail to execute the strategies known to lead to effective implementation.

Statement of the Research Problem

The Bring Your Own Device approach is the latest technology innovation gaining popularity around the nation (Gaines & Martin, 2014); however, there is a lack of contextual knowledge about its implementation. To simplify a complicated process, current implementation frameworks, often depicted through simple boxes and arrows, have become short-hand for the enormous task that is implementation. Myers, Durlak, and Wandersman (2012) add that "conceptual frameworks organize a set of coherent ideas or concepts in a manner that makes them easy to communicate to others. Often, the structure and overall coherence of frameworks are 'built'' and borrow elements from elsewhere" (p. 465). This attempt at simplification of implementation results in details being omitted or forgotten. In addition to this is the reality that much of what is known about BYOD comes from a general look at learning technologies or a one-to-one specific lens. As a result of the BYOD approach being in its infancy, minimal research exists about its implementation in comparison to other approaches. BYOD is fundamentally different than one-to-one and deserves to be independently researched, not just understood through the one-to-one perspective (Gaines & Martin, 2014). Gaines and Martin further emphasize the uniqueness of BYOD by stating,

> BYOD programs can be challenging for districts and schools to implement because it is difficult to determine which devices will be present at any given time on a school network, and in turn, the classroom. Further, the ecosystem of student-owned devices is dynamic and ever changing. As a result, BYOD programs are highly unique and may look different in various districts and schools. (p. 12).

As schools continue the rapid adoption of BYOD, it is ever more imperative to discuss the importance of implementation, not just as a theoretical construct, but also as a systematic practice. Implementation is truly an all-encompassing process that must be completed effectively to reach adoption and use by educators and subsequent sustainability of the program (Fixsen et al., 2005; Ruedel, Brann, Gray, & Zorfass, 2013). Often the activities that are known to support and strengthen implementation are seen as optional tasks that can be easily overlooked in the race towards manifestation of outcomes. As a result of this behavior, evidenced by examples from the Los Angeles Unified School District, Hoboken School District, and Fort Bend Independent School District, it appears that schools that were once celebrated for their innovative and groundbreaking efforts of implementing learning technology programs may now be facing the consequences of their poor implementation practices. Ruedel and colleagues (2013) found that despite the integral role technology plays in the classroom, "many schools continue to face challenges related to developing and rolling out a school-wide plan to implement technology" (p. 6). The literature shows that by halting, shifting, or abandoning implementation plans, school districts are squandering money and increasing the financial burden on an already cash-strapped system. What is more, students disproportionately feel the cost of poor implementation. As schools waste time with flawed implementation practices, students lose out on the potential benefits of technology in the classroom.

For schools to be successful in the implementation process, they must first understand that despite all the discussion pertaining to hardware and software, implementation of a learning technology program is much more human than technological (Mean, 1993). Implementation is "about helping people, primarily teachers, integrate these technologies into their teaching as tools of a profession that is being redefined through the incorporation process" (Scheingold, as quoted in Holland, 2001, p. 264). Proper implementation should lead to specific usage that transforms, rather than enhances, instructional practices and is also capable of bringing about positive academic change (Puentedura, 2010). If schools do not understand this basic rule, the potential of learning technologies to help educators transform their classrooms, improve their instruction, and increase student achievement will remain out of reach (Klein & Knight, 2005). This study aims to (1) expand the context-specific knowledge of implementing a BYOD approach by providing a narrative example of the process, (2) determine the degree of similarity and difference between one-to-one and BYOD implementation strategies by comparing the process of the selected site to that described in the literature, and (3) surface potential new strategies to support the implementation of BYOD initiatives.

Research Questions

Toward the aims listed above, this dissertation examined the process of implementing a Bring Your Own Device approach in a high school context as a means to answer the research questions below:

1. What happens when a school implements a BYOD program?
    a. What initial processes does the school employ when launching a BYOD program?
    b. How are the strategies for implementing a BYOD initiative similar or different from implementation of a one-to-one initiative?
2. What, if anything, is unique about the implementation of a BYOD program?

Contributions of the Study

This dissertation contributes to the field in three significant ways. First, it helps in shifting away from the arrows and boxes depiction of implementation frameworks, to start filling in the narrative of how real schools are implementing BYOD programs. Second, it determined the overlap between one-to-one and BYOD implementation strategies. Lastly, it elucidated the unique implementation strategies for BYOD in a specific high school context.

As schools continue to demonstrate an eagerness to adopt and use learning technologies, specifically BYOD, as a means of improving academic achievement, education researchers and learning technologists have a responsibility to support their efforts towards successful implementation. BYOD is a unique approach, and more clarity about the process for implementation may improve the probability of successful outcomes of the approach. Previous history has taught us that the tools for learning should be tested and understood in real contexts that demonstrate the chaos and unpredictable nature of a typical school (Spector, Merrill, Elen, & Bishop, 2014). According to Spector and colleagues (2014), if we sit back and continue to watch schools progress down this path of compulsive and hasty implementation, the outcome will be nothing more than another pattern of sweet expectation followed by bitter disappointment.

Summary

This dissertation has been organized into six chapters. The current chapter, Chapter One, has introduced the study. It has described the background and supporting details of the problem. Chapter Two will review the literature on the practice of implementation as it relates to the implementation of technology in schools. Chapter Three will provide a detailed description of the methodology, including setting, participants, limitations, and analysis. Chapter Four will begin with a contextual description of the case, provide an in-depth description of the first-year implementation process, and qualitative findings from interviews. Chapter Five will present the survey findings from students and educators. Chapter Six will address the research questions and include a discussion of findings, implications for research and practice, and suggestions for future studies.

Definitions

21st Century Skills: Those skills believed to be necessary to contribute to workforce production and maintenance of a high quality of life in the twenty-first century, including skills related to creativity, collaboration, communication, critical thinking, information literacy, media literacy, and technology literacy. (Spector, Merrill, Elen, & Bishop, 2014, p. 952)

Digital Device: In this document, an electronic and Internet-enabled device that is used in classrooms to facilitate learning.

Digital Inequity: Situations where those unable to access the affordance of technologies are disadvantaged and marginalized in society and therefore digitally excluded.

Digital Natives: People born in or after 1982 (approximately) who are members of the first generation born after the advent of digital media and who have grown up with these media; also called digital natives. (Spector, Merrill, Elen, & Bishop, 2014, p. 960)

Bring Your Own Device (BYOD): An innovation in which students are allowed to bring personally owned devices, especially tablets and other suitable personal devices, into classrooms for the purpose of learning (Alberta, 2012).

Educational Technology (used interchangeably with learning technology): The integration of various electronic tools and applications to support the use of evidence-based instructional strategies that facilitate K–12 instruction and enhance academic achievement (Ruedel, Brann, Gray, & Zorfass, 2013, p. 3).

Implementation: "A specified set of activities designed to put into practice an activity or program of known dimensions" (Fixsen et al., 2005, p. 5).

Learning Technology (used interchangeably with educational technology): Devices (e.g., laptops, tablets) learners use to accomplish specific learning objectives and tasks (Spector, Merrill, Elen, & Bishop, 2014).

One-to-One: Also, referred to as 1:1, these programs aim to provide each teacher and student with a dedicated computing device for classroom use. The definition of computing devices has been expanded in recent years to include tablets and mobile devices. *One-to-one* refers to one computer for every student.

Tablet PC: A wireless, portable and mobile personal computer in the form of a notebook that is equipped with a touch screen interface.

Chapter Two: Review of Literature

The purpose of this dissertation was to examine one school's journey through the implementation of its BYOD initiative. Towards the three aims stated in Chapter One, the goal was to uncover ways to help schools strengthen their implementation efforts. This chapter will begin by defining implementation, discussing the importance of attending to it, and detailing proper and successful strategies for implementing a learning technology initiative in a high school context. Next, the chapter will review the literature on technology implementation in schools, highlighting the strategies and activities proposed to be critical elements of the process. The chapter will conclude with an overview of the Stages of Implementation Framework and its utility to this specific study.

What Is Implementation?

The purpose of the discussion below is to clarify the frame of reference that structured this study. This first section will provide a definition of implementation, discuss the difference between the practice of implementation and implementation science, and distinguish between implementation and integration. In Halle, Metz, and Martinez-Beck's (2013) text on implementation and early childhood programs, they describe implementation as the act of making something happen by means of a definite plan or procedure. This is similar to the definition put forth by the National Implementation Research Network, "a specified set of activities designed to put into practice an activity or program of known dimensions" (Fixsen et al., 2005). This understanding of implementation is context-dependent and can change based on the circumstances in which it is being discussed. Both descriptions provided focus on the practice of implementation, which should be distinguished from the science of implementation. Implementation science is a process that aims to understand the methods that contribute to the use of research findings and new knowledge in policy and practice. The purpose of implementation science is the creation of knowledge that is sufficiently generalizable to be informative in a variety of contexts. While the science of implementation focuses on understanding factors that facilitate and impede effective implementation more broadly, the practice of implementation narrowly and appropriately targets strategies and actions geared towards changing patterns of practice in a specific context to sustain innovative ways of doing (National Institute of Health, n.d.) The patience and science are built from and feed into each other, in that the success of any implementation practice is crucial to the knowledge development of implementation science, and the strength and validity of implementation science increases the likelihood of successful implementation practice (Franks & Schroeder, 2013).

To further clarify how implementation will be understood within this study, it will be distinguished from integration. Through the process of exploring frameworks designed to support schools that have adopted comprehensive, school-wide technology initiatives, it became clear that the majority of available frameworks are intended to support the integration of technology at the classroom level rather than the implementation of technology at the school level. Moving forward, the term *implementation* will be used to describe the meta-level process of infusing a technology initiative at a school and will encompass all the activities that occur outside the classroom. The term *integration* will focus on the micro-level process, specifically concerning the use of technology in the classroom by educators to support teaching and learning. In this context, implementation is a process that feeds into integration. The degree to which implementation efforts are successful directly influences the degree to which integration occurs.

The Importance of Attending to Implementation

Defining implementation and how it is to be used in this context stops short of getting to its real value. Attending to implementation is more than planning for a process of bringing about change. Researchers have argued that implementation is the strongest link between an intervention and an outcome (Durlak & Dupre, 2008; Meyers, Durlak, & Wandersman, 2012). In their 2008 quantitative study assessing the impact of implementation on program outcomes, Durlak and Dupre demonstrate that proper implementation can increase program effectiveness by 3 to 12 times. This finding is further supported by Franks and Schroeder (2013) who state, "[T]here is credible and extensive empirical evidence that the level of implementation affects program outcomes" (p. 6) and that the fidelity to which a program is implemented will no doubt affect a program's level of success (Fixsen et al., 2005; Fixsen, Blase, Metz, & Van Dyke, 2013).

Implementation is essential for successful outcomes, but it is also complex. Implementation researchers have identified eight distinct aspects of implementation and at least 23 different personal, organizational, or community factors that can influence the implementation process (Meyers, Durlak, & Wandersman, 2012). These aspects and factors further complicate an already complex process. Thus, if organizations are to progress with evidence-based interventions and aim to achieve the full potential of the intervention, well-documented sustainable implementation is necessary to that goal. In addition to increasing the likelihood of success for the intervention, adhering to implementation, as stated by Fixsen and colleagues (2005), serves to help avoid three major implementation problems: (1) when little or no treatment is provided, (2) when the wrong treatment is provided, and (3) when the intervention is non-standard, uncontrolled, or varied. Avoidance of these issues will help an organization avoid a Type 3 error: evaluation of a program that was never implemented (Franks & Schroeder, 2013). Thus, the importance of implementation in this context is substantially elevated given the ambitious goals schools hold for the potential of learning technologies. If the goal of BYOD and other learning technology initiatives were to just put devices in the hands of students, there would be limited need to agonize about implementation. However, BYOD initiatives are implemented with short- and long-term academic and professional goals (to be described below) that are highly dependent on the quality and strength of the implementation process. Giving attention to implementation will serve to increase the likelihood of the success of the intervention.

Although the literature on implementation has provided sufficient knowledge for researchers and practitioners to understand the science and practice of the field, knowledge of implementation stages and activities alone cannot sufficiently support successful implementation of context-specific innovations. To build broad understanding, the implementation process has commonly been depicted in conceptual frameworks lacking narrative and contextual detail. Most examples include various strategies and factors related to implementation, but discuss them independently rather than in relationship to one another. These frameworks are sufficiently broad to accommodate the variety of settings in which implementation can occur. As a result of this generality, the frameworks used to describe implementation often lack the context and content-specific knowledge that warrants the attention of practitioners when implementing an initiative. With this understanding, the focus of the discussion will now shift from general implementation knowledge to looking at the specific implementation strategies of learning technologies in K-12 schools.

Implementing Technology Initiatives

Proper and Successful Implementation

Before addressing the specific strategies of technology implementation, it is important first to understand what proper and successful implementation of a learning technology initiative entails. The road to proper and successful implementation begins with the understanding that it is not a one-time event, but a mission-oriented process involving multiple decisions, actions, and corrections, which researchers speculate can take anywhere from two to five years (Fixsen et al., 2005; Levin & Schrum, 2012). Additionally, in her 2012 article, Walsh describes the strategies of proper technology implementation as vision and planning, high levels of support from internal (educators, non-teaching staff, and administrators) and external (parents, families, and school districts) stakeholders, adequate funding (purchasing hardware or software, funding professional development [PD], etc.), and adequate training and ongoing coaching. According to Walsh (2012), these factors are the most common, which, when absent, lead to poor implementation practices.

Proper implementation practices are essential to successful initiatives. Simply put, the activities of proper implementation lead to successful implementation, which is necessary to obtain successful initiatives, also referred to as the goals of the program or initiative. Proper implementation acts as the input, successful implementation as the output, and successful innovation as the outcome. The output is determined by the degree to which the implementation utilizes effective strategies (input), while the outcome, the actualization of the goals of the initiative, occurs as a result of the quality of the output.

Figure 1. Visual Relationship Between Implementation and Program Goals

As mentioned above, in this context, there are short and long-term goals schools are working towards with their adoption and implementation of a BYOD initiative. Levin and Schrum (2012) identify a list of short-term goals learning technologies are said to aim towards. These include increased access to technology, increased student engagement, increased student achievement, and the development of a student-centered learning model as a means to a stronger culture of collaboration. As discussed in the previous chapter, the long-term goal that inspired the push for modern day technology into classrooms is the desire to equip students with the necessary skills for the information age.

The goal that is most often mentioned in the literature is students' development of 21st century skills (Levin & Schrum, 2012). Twenty-first century skills were first identified in 2002 by The Partnership for 21st Century Skills (P21) as a set of skills necessary for the preparation of high school graduates for higher education, future employment, and success in a competitive workforce (www. p21.org, 2002). The skills are organized into three skill areas: life and career skills, learning and innovation skills, and information, media, and technology skills. (www.p21.org, 2002; Trilling & Fadel, 2009). Interest in 21st century skills began in 1991 when by measure of spending, the United States transitioned from the Industrial Age to the Knowledge Age. During that year, expenditures for computers, servers, software, and other communication technologies exceeded spending on engines, machines for agriculture, and construction by $5 billion (Trilling & Fadel, 2009). This shift signaled new demands of the workforce and new demands on education and preparation of students. In 2011, Manyika et al. (2011) hypothesized that in the future, 85% of jobs would require knowledge and use of technology in some capacity. As the hypothesis materialized, the goal of ensuring that students possess a proficient level of digital literacy and technological literacy was no longer an option, but a requirement.

Schools have always had the responsibility of preparing students for the next stage of life, be that post-secondary education or participation in the workforce. With the current exploration, experimentation, and adoption of learning technology programs, schools are now aiming to provide students with the skills, expertise, and competence to compete and succeed in an ever-changing technology-driven society. The methods employed for this preparation have changed through the different ages – Agrarian, Industrial, and Knowledge (Trilling & Fadel, 2009). In the age in which we find ourselves, schools are looking to replace brawnpower with brainpower, and mechanical horsepower with electronic hertz power (Trilling & Fadel, 2009). The demands of today's graduates are different than in previous generations, thus the knowledge and skills they gain should reflect those differences (Spector, Merrill, Elen, & Bishop, 2014; Levin & Schrum, 2012).

When it comes to articulating short- and long-term goals, the unique characteristics of each school will profoundly influence their stated goals because not every school will be working towards the same outcome. Some will be interested in student achievement, some in student engagement, and others in access and 21st century skills. Thus, there is no single approach or model that is appropriate for every school. Contrary to what some device and software programs would lead one to believe, successful goal attainment is not magic and will require careful planning and fidelity of implementation, starting with the selection of an appropriate model.

Bring Your Own Device Definitions and Models

With schools looking to BYOD as a viable option to improve access and as an academic tool in the classroom, it is important to understand the different models that fit under the BYOD umbrella. Some may argue that the BYOD framework is intentionally broad as there are many different models that fall under the approach. The models range from standard options where all students are required to acquire a single device, to flexible models where students are allowed to bring any Internet-based device for the purpose of learning (Stavert, 2013). The key distinctions between the different models are the options provided to students about the type of device they can bring, the level of technical support the school provides for defective devices, and the decisions about use of specific software (Dixon & Tierney, 2012). The decision about which model to implement will have ramifications for all stakeholders, including students, educators, parents, and school leaders (Alberta, 2012). Schools implementing a BYOD approach will need to think long and hard about the tradeoffs between the standard models and the flexible models and be mindful of the curricula they use since not all devices may be capable of the same processes (Alberta, 2012). Additionally, some schools will choose to retain greater control over software, while other may leave the decision to the individual student. A complete list of described models from Sweeney (2012) and Dixon and Tierney (2012) can be found in the appendix.

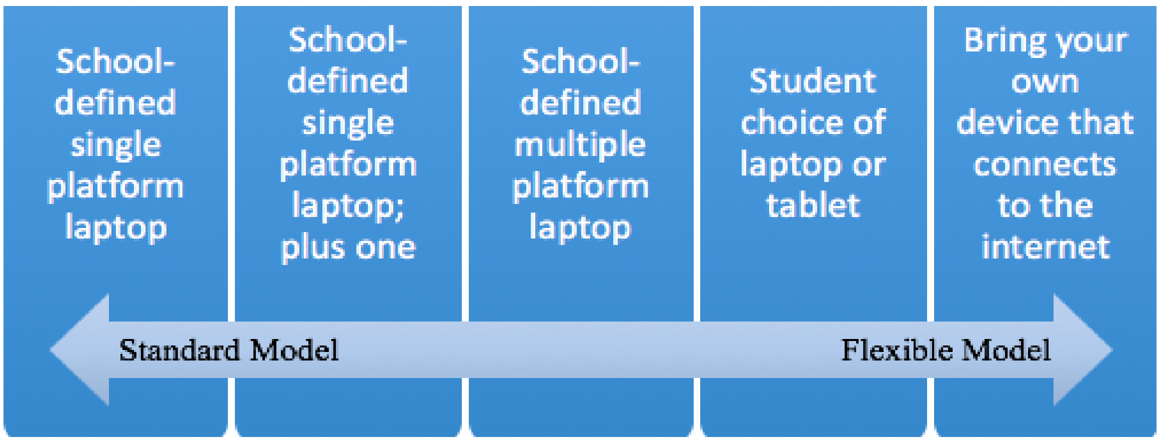

Figure 2. Dixon and Tierney's (2012) Models for BYOD

Drawbacks to the BYOD approach

Discussion of approaches, models, and devices are important, but so, too, is a discussion about the potential drawbacks of the BYOD approach. As mentioned in the previous chapter, the BYOD approach is not without weaknesses and disadvantages. The most commonly cited disadvantage of BYOD is the issue of equity (Ruedel, Brann, Gray, & Zorfass, 2013; Stavert, 2013; Alberta, 2012). Those who oppose the approach argue that despite the belief that all students are continuously connected to hand-held digital devices, through planning and implementation, schools may come to realize that is not always the case (PDST, 2014). Schools may be surprised to learn that not every student will own an appropriate digital device (capable of supporting learning in the classroom), have permission to bring a device to school, or have Internet access at home (CDWG-White Paper, 2012). This reality leaves many questioning how effective the BYOD approach can be if it stands to exacerbate the already present issue of digital equity. Additionally, even if all students were to bring personally owned devices to school, there remains the concern that students from high-income families will be at an advantage by being able to afford the best and newest devices on the market (Gaines & Martin, 2014; Stavert, 2013). Dixon and Tierney (2012) caution that if students bring starkly different devices into a classroom, educators will be forced to cater to the least powerful device. This may create issues where educators are limited in the level of integration they can achieve and find themselves integrating at simple, rather than advanced levels.

Concerns have also been raised about the myth of the BYOD approach being a cost saving alternative to the one-to-one approach (Dixon & Tierney, 2012). Although schools can count on savings from not having to purchase new devices for every student, BYOD programs do come at the additional expense of updating networks and security for school-wide technology management and the potential need for charging stations in classrooms (Dixon & Tierny, 2012). Specifically, the use of various devices increases the complexity of what is needed to ensure a school has enough bandwidth and access points to accommodate and allow for seamless access to wireless connectivity (CDWG-White Paper, 2012; Gaines & Martin, 2014; Stavert, 2013; Ruedel, Brann, Gray, & Zorfass, 2013). While BYOD may reduce, or eliminate the cost of purchasing devices, it requires additional costs in IT upgrades (Alberta, 2012), professional development for educators, and other expenses.

More accurately, Gaines and Martin (2014) argue that the approach should be seen as a cost-shifting measure. While schools can eliminate the burden of securing devices for all students, that responsibility gets pushed onto families (Dixon & Tierny, 2012). Additionally, as technology becomes an integrated component of a classroom, some worry about the effects on learning if students lose, misplace, or break their devices and families are not financially able to immediately replace them (Ruedel, Brann, Gray, & Zorfass, 2013). Opponents argue that this halts the learning process and creates a burden for educators who may be forced to alter lesson plans for students who are unable to engage in classwork and for families who may be pressured to supply a replacement device for their child.

The final point of concern regarding BYOD is the question of preparing educators to be proficient in a variety of different devices (Ruedel, Brann, Gray, & Zorfass, 2013). Given what is known about the challenges of developing and improving educator confidence in the use of technology, some argue that BYOD places an additional burden on them to integrate different devices and operating systems into their curriculum. Dixon and Tierney (2012) argue that it is safe to assume that most educators would prefer to avoid the time-consuming task of having to explain how to complete an activity across multiple different devices. Schools should remain mindful of what pressures BYOD places on educators and how to mitigate their reasonable concerns.

Even as adoption and use of BYOD in classrooms continue to grow, it is important to remember that the approach is not without its drawbacks and areas of concern. None of the issues mentioned above are reasons for any school to avoid adopting a BYOD approach; rather they are issues that schools should remain mindful of as they work through the exploration, planning, and implementation stages of their initiative. The remainder of this chapter will begin with a review of key implementation activities and strategies that are said to guide the process of successful implementation of learning technology initiatives. This will be followed by an overview of a selected implementation framework from the field. Together these final sections will provide foundational knowledge about what activities and strategies the field has identified as necessary for successful technology implementation. This knowledge will serve to guide what is to be expected at the site of the case study and help in comparing what the literature states as essential to technology implementation and what strategies are observed and identified at this specific site. Because the leading frameworks in the field were developed within the frame of the one-to-one model, prior to the emergence and rapid adoption of the BYOD approach, a review of current frameworks and their utility and applicability in a BYOD context is critical as schools adopt and implement this innovative approach.

Implementing Learning Technology Initiatives

Key Strategies for Learning Technology Implementation

A review of critical articles in the literature and technology planning books written for educators and school administrators was conducted to identify the main activities and strategies for technology implementation. The review concluded once a high level of saturation was reached, revealing a large amount of consensus within the field about necessary implementation activities and strategies. The activities and strategies that surfaced most often include: (1) empowered leaders, (2) shared school vision and planning, (3) engaged community as a resource, (4) an expanded network, (5) focus on access and equity, (6) professional development, and (7) assessment and evaluation. Below is an overview of each the different strategies.

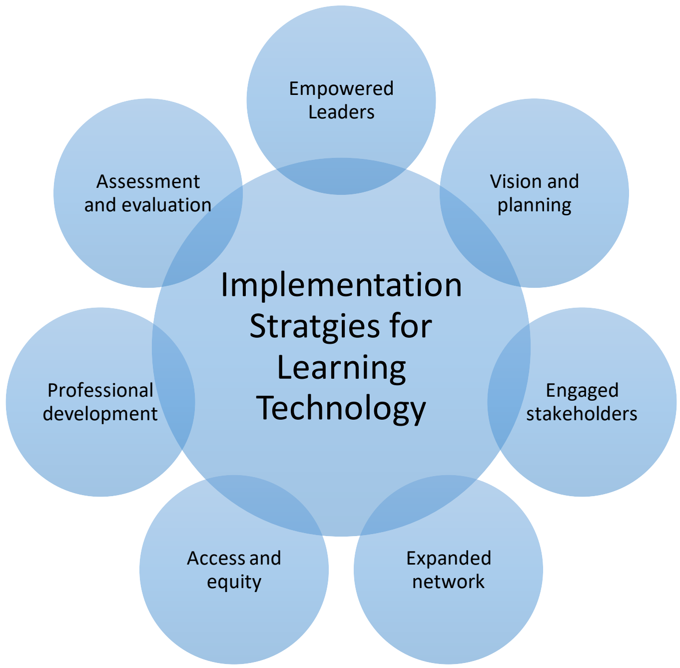

Figure 2. Activities and Strategies for Implementing Learning Technologies

Empowered leaders. With any change effort that takes place within the walls of a school, the principal will serve as the driver in ensuring the completion and success of the change (MacNeil & Delafield, 1998; Levin & Schrum, 2012), especially when the change effort is the infusion of technology within the school (Dawson & Rakes, 2003). As leaders of a school, principals and other administrative staff have a responsibility to lead, control, and continuously guide the implementation process (Hall & Hord, 2015; Ruedel, Brann, Gray, & Zorfass, 2013). The roles for leaders include directing the implementation process, providing the necessary resources and support, and creating a culture of change.

School leaders will play a part in every step of the process starting with the assessment of organization readiness and the development of on-going supports throughout the sustainability of the initiative. In a study conducted by Crandall and Loucks (1982), their theoretical framework espoused the knowledge that "(a) an innovation does not fail because the innovation is flawed, but because of flawed management or support by the school's administrators, [and] (b) if teachers are to successfully implement an innovation, they need the support of the principal" (Crandall & Loucks, as cited in Dawson & Rakes, 2003, p. 30).

It is the school leader's role to ensure that all the necessary resources are in place before the start of the implementation process (Carlson & Gadio, 2002; Dawson & Rakes, 2003) and to determine the speed at which the process will unfold. Holland (2001) and Meltzer and Sherman (1997) describe supports as words of encouragement, opportunities for training and development, modeling the use of technology, and acting as a champion for the use of technology in the school. As a school shifts from its previous ways of practice to new ways of doing, MacNeil and Delafied (1998) advise leaders to ensure that the school culture is conducive to technology implementation. Weiner (2009) describe this process as creating a culture (1) that embraces innovation, risk taking and learning, (2) that has flexible organizational policies and procedures, and positive organizational climate, and (3) with positive past experiences with change. Levin and Schrum (2012) add that school leaders must work to ensure that educators are supported in their effort to take risks, make mistakes, and learn from them. Educators who are comfortable exploring innovative ways of doing will serve as evidence for the effects of this culture change. A leader who has a pulse on the culture of the school will remain aware of dysfunction and be proactive in addressing it (Hall & Hord, 2015). Lastly, a school climate that is encouraging and a culture where change is welcomed will be beneficial to the implementation of a learning technology initiative. To emphasize the critical nature of this strategy, Dawson and Rakes (2003) conclude that, no matter how much training educators receive to prepare them for technology integration, most will be unable to successfully employ that training without the leadership of the principal (p. 30).

Identifying a vision and developing a plan. Successful implementation of a learning technology initiative will require everyone in the school to have a unified vision of what the future of the school will look like (Hall & Hord, 2015; Meltzer & Sherman, 1997). According to Hall and Hord (2015), many change efforts fail because not everyone has the same mental picture of what the school is striving for. In each of the eight exemplary schools studied by Levin and Schrum (2012), the leadership mentioned the necessity of having a vision for the implementation and the importance of clearly articulating the purpose for using technology in their school. Similarly, in their 1995 study, Means, Olson and Singh (1995) shared that schools that were most successful at infusing technology throughout their school were ones that devoted effort and resources to reaching consensus about instructional goals and philosophy of the initiative, along with the activities to support said goals. As the implementation progresses forward, all stakeholders in the building should be able to articulate the long-term vision of the change and know where the school is in relation to it (Hall & Hord, 2015).

Successful visioning is simply the first step to developing a planning guide to facilitate the implementation process (Holland, 2001; Ruedel, Brann, Gray, & Zorfass, 2013). The planning guide should include both the program philosophy and process guiding the implementation. The term *program philosophy* is used intentionally to refer to Conrad and Miller's (1987) description as the beliefs, values, and goals that define the structure, process, and outcomes of a program. At the most basic level, the purpose of the planning guide is to provide a map for why the program is being implemented, how things should unfold, and what outcomes are expected as a result of the program (Frazier, 2012).

The responsibility for developing the guide rests on the leadership in the building. However, the guide should include the fingerprints of all key stakeholders from district level staff, educators, students, and parents (Ertmer, 1999; Frazier, 2012; Picciano, 2011, 2011; Whitehead, Jensen, & Boschee, 2013). As best developed during the exploration and adoption stage, the guide should be a living document, referenced throughout the years and edited as plans and ideas evolve (Picciano, 2011). This guide should include an action plan to address issues and concerns should they arise and information to sustain educator investment and to remind people of the potential benefits of the program. The guide can cover acceptable use policies and any other topics the school deems necessary for their particular context. If successful, the guide will serve as a checkpoint indicator during the implementation (Ertmer, 1999) and will help sustain buy-in from educators who question the motivation and impact of the initiative (Picciano, 2011).

Expanded network capacity. Any school not willing to invest in their broadband connectivity should avoid adoption and implementation of a learning technology program, especially a BYOD initiative. For most schools, the technical infrastructure will need to be significantly updated to an unprecedented level (Alberta, 2012). Many schools will need to spend significant amounts of money to expand their broadband and network capabilities to support the influx of all student devices (Alberta, 2012). The size of the school population and the variety of devices students are permitted to bring into the classroom will increase the complexity of managing the school's digital network and security (Dixon & Tierny, n.d.; Stavert, 2013), as well as affect the quality of broadband needed (Gaines & Martin, 2014;). If a school were to adopt a standard BYOD model where all students brought the same or similar devices, updates would not need to be as significant as if the school were to adopt a flexible model. If students are allowed to bring the spectrum of available devices on the market, a school should prepare to invest heavily in their broadband and network upgrades to avoid any hindrances to students' connectivity during the school day (Gaines & Martin, 2014).

Wireless network (Wi-Fi) has become the most popular and preferred method for school-wide connectivity due to the popularity of wireless devices. For security purposes, most schools will have a local area network (LAN) that connects directly to a wide area network (WAN), typically located at the district office (Frazier, 2012). There are many ways the LAN can be connected to the WAN, each of which comes with different speeds at different costs (Frazier, 2012). What may sound familiar to most people is broadband cable connection. This is what is provided by most cable companies, and it can pass 33 megabits of data per second (Frazier, 2012). On the lesser-known end, there is a T1 connection, which passes 1.544 megabits of data per second. Opposite from that is the fiber-optic connection, which is capable of handing the most active web traffic (Frazier, 2012). The decision about which connectivity is best for the school will inevitably depend on cost, as well as the number of potential connections, the type of activities that are expected to be accomplished over the network, and whether staff and students will be required to use video-on-demand services (Frazier, 2012). Overall, a schools' network infrastructure should be continually evaluated to ensure adequate support for student devices (Gaines & Martin, 2014). The pressure will be on school and district IT departments to increase network connectivity while maintaining a high level of digital security (Gaines & Martin, 2014).

Access and equity. As the instruments for learning advance from standard tools to digital devices, it has presumably become more difficult for some schools to ensure the equity of access to learning tools. This concern is sharply elevated for schools that opt to implement a BYOD approach. Providing equal access for all students to the necessary tools to reach their academic goals was a much simpler, albeit not easy, task when the necessary tools were textbooks, notebooks, and pencils. Despite the assumption that all students in today's generation are attached to their personal technological devices, schools should not expect that every student and family will be able to or choose to bring a device to school. Even among the students who bring a device, there may be issues of equity regarding those who have the latest device and those who are using older models. Thereby, schools should have a plan in place to address this concern prior to implementation.

Some schools will work to alleviate the issue of digital equity by providing devices for students with a demonstrated need for assistance. Some provide loaner devices from their inventories, while others offer stipends to help families purchase a device or pay for broadband access at home. For example, officials at Brebeuf planned to purchase devices for all students receiving financial aid for their roll-out of a mandatory BYOD program in the fall of 2012, a gesture that Chief Information Officer, JD Ferries-

Rowe, says is consistent with the school's mission to advance social justice (CDWG-White Paper, 2012). Schools that have accepted this responsibility liken it to a student who does not have access to a textbook in class. The aim is to avoid a situation where learning technology initiatives are only beneficial for students who are financially able to own and bring devices to school. If these initiatives create a system where the quality of education is differentiated between students who have devices and those who do not, the initiatives will soon be relegated to the closet of failed educational innovations (Dixon & Tierny, 2012).

Professional development. Among all the resources reviewed, the most consistent message is the need for quality professional development for educators (Whitehead, Jensen, & Boschee, 2013). Professional development (PD) in this context is built on the notion that learning technologies are just tools, and it is the use and adeptness of educators that help manifest the goals of any school-based technology program. History tells us that education technology cannot on its own improve student achievement, and integration is more complicated than putting devices in the hands of students (Earle, 2002; Levin & Schrum, 2012). Although educators are skilled in their respective content areas, many lack the proficiencies necessary for the proper integration of technology (Dexter, Anderson, & Ronnkvist, 2002). However, Barnes (2005) believes that providing on-going follow-up support to educators will strengthen the implementation process and impact the direct correlation between effective technology use and student achievement.

Professional development for educators should meet three standards. One, it should incorporate a variety of delivery modes to address the needs of all educators

(Ertmer, 1999; Picciano, 2011). A combination of lecture/presentation, small group work, plenary discussion, individual and collaborative activities, and opportunities for reflection will strengthen professional development sessions and increase educators' willingness to use technology to improve teaching and learning (Carlson & Gadio, 2002; Ruedel, Brann, Gray, & Zorfass, 2013; Picciano, 2011). Two, workshops should be tailored to the specific level of the educators (Hall & Hord, 2015). Not everyone will be at the same comfort level in their integration of technology. Schools should provide more than one type of professional development offering that focuses on the range of abilities (Holland, 2001; Frazier, 2012). Additionally, following the workshop, opportunities should be offered for educators to observe, learn, and improve their practice to cement their newly acquired knowledge (Meltzer & Sherman, 1997). Three, conversations about pedagogy should be married with any professional development session, as the primary focus of this process is and always will be mastering effective teaching practice *through* the use of technology (Carlson & Gadio, 2002; Dexter, Anderson, & Ronnkvist, 2002; Meltzer & Sherman, 1997; Ruedel, Brann, Gray, & Zorfass, 2013). As such, professional development should include strategies for "instructional design, media selection, modeling exemplary technology practices, and resource sharing" (Earle, 2002, p. 20; Ertmer, 1999).

Professional development should focus on taking educators beyond using the devices to access new information, to instead explore the instructional experiences that cannot be done without digital devices (Earle, 2002). Successful professional development that meets the above criteria will allow educators to develop core technology competencies and skills through the use of hands-on activities. As educators grow to understand the potential of technology in their classroom, their demand for ongoing professional development will increase (Carlson & Gadio, 2002). They will no longer be satisfied with the status quo of traditional training and will seek opportunities to continue their professional development. School leaders should have a long-term plan for providing opportunities for educators to expand their learning.

Engaged stakeholders as a resource. Leaders involved in facilitating the implementation are urged to utilize the strengths of all available stakeholders, including educators, students, and parents (Picciano, 2011). Despite their disconnect from the day-to-day activities of the school, parents should be invited to play an active role and serve as a resource when available (Whitehead, Jensen, & Boschee, 2013). If parents are encouraged to learn about the technology and how to use it, they will understand the potential benefits it can have for their child as well as provide at-home assistance when necessary (Carlson & Gadio, 2002). School leaders should work to cultivate the support and knowledge of parents and communicate with them early on about what the change will mean for them (Levin & Schrum, 2012; Whitehead, Jensen, & Boschee, 2013).

Given the tech-savvy skills of school-aged children and their ability to navigate technology at a faster rate than their educators, opportunities should be created for them to play a role in the implementation process (Carlson & Gadio, 2002). Students should not be viewed as a threat, but rather an advantage to spread and speed up the implementation process. At a basic level, students can help troubleshoot if issues with hardware or software should arise (Carlson & Gadio, 2002). At a more advanced level, students can assist in selecting new software and applications or help with classroom administrative tasks (Carlson & Gadio, 2002). By inviting a small group of students to join educators in skill-building workshops, the knowledge and skills of both groups can be developed simultaneously (Ertmer, 1999).

In addition to the two groups above, staff in the building can serve as the first line of resource for schools, as they typically possess specific skills that can be utilized by other educators in the building (Meltzer & Sherman, 1997; Picciano, 2011). This approach is often described as peer coaching. For the past 25 years, the use and utility of peer coaching to supplement professional development for educators has become widely accepted (Barron, Dawson, & Yendol-Hoppey, 2009). Peer coaching can take on many forms ranging from feedback provided from a peer observer or discussions aimed at developing or improving a specific action (Barron, Dawson, & Yendol-Hoppey, 2009; Barnes, 2005). Regardless of the form in which it takes, "peer coaching necessitates a confidential, collaborative, collegial and non-evaluative relationship that creates a context for experimentation, observation, reflection, the exchange of professional ideas and shared problem-solving" (Barron, Dawson, & Yendol-Hoppey, 2009, p. 83; Barnes, 2005). According to Barron, Dawson, & Yendol-Hoppey (2009) and Dawson and Rakes (2003), enhancing the use of technology by educators requires the supplemental task of coaching.

The use of peer coaching allows beginners to observe more experienced users and to adopt practices that can be suitable for their work. (Barnes, 2005; Holland, 2001; Hall & Hord, 2015; Hoffman, 2006). The benefit of this approach is that it offers the potential of continuous and immediate support throughout the entire day (Holland, 2001). Once a school reaches a point where the practice of teaching with technology becomes commonplace, it is the use of peer coaches that helps to sustain the knowledge and skills acquired from professional development sessions (Holland, 2001). Peer coaching can take place with three to six educators grouped by grade level, content area, or skill level who come together to exchange information, ideas, and strategies about technology implementation (Barnes, 2005). The absence of a peer coaching strategy hinders the opportunity for educators to collaborate with one another, which is a key differentiating factor between schools that are receptive to use of technology and those that are not (Holland, 2001).

Assessment and evaluation of implementation. Evaluation of the implementation was one of the least discussed strategies in the literature. This may be due to the belief of evaluation is an elective process that is unconnected to the success of the initiative. Others view evaluation as a process that begins after all other pieces of the initiatives are in place, only to realize that after the purchase of devices, upgrades in technical infrastructure, and professional development, there are limited financial resources left for evaluation. Of those who value and elect to conduct an evaluation, they often evaluate the impact of the program and neglect the implementation process. Despite the conventional idea that evaluating the process and impact of implementation is unnecessary, the literature explicitly states the importance of evaluating implementation for schools (Hall & Hord, 2015).

It is important, for schools that are concerned with program outcomes, to know that the best way to strengthen the relationship between implementation and outcomes is to measure and document the process. The contextual variance of real world settings heightens the necessity of assessment and strengthens its emphasis on complete comprehension of the impact of the program (Caroll, 2007; Picciano, 2011). As mentioned at the beginning of this chapter, lack of or inadequate assessment holds the potential to create Type III error, where the program is not properly implemented, the wrong program is implemented, or variations of the implementation are unknown (Fixsen et al., 2005; Rossi & Freeman, 1985). Evaluation of the implementation should allow stakeholders to uncover the strengths and weaknesses of different implementation strategies (Picciano, 2011). Each implementation activity depends on another, and, as such, an understanding of their individual impact is necessary to assess the strength of the implementation as a whole (Picciano, 2011). Hall and Hord (2015) suggest that schools should begin by gathering the concerns of stakeholders, collecting information about developing knowledge and skills of implementers, collecting feedback at the end of workshops, and engaging in informal conversations with educators about their individual integration progress. Evaluation of the implementation process is not optional for schools that wish to continue their adoption and use of learning technologies as an instructional and developmental tool for students. If one believes in the adage of 'what matters get measured, and what we measure ends up mattering," then one, too, can understand why it is so critical that schools have a mechanism and plan in place to monitor and assess the implementation process.

Evaluating the implementation of the initiative will require a proficient knowledge of implementation fidelity. Implementation fidelity is defined as the degree to which an implemented program adheres to the research or original program design (Carroll, 2007; O'Donnell, 2008; Harn, Parisi, & Stoolmiller, 2013). Implementation fidelity is made up of five key indicators -- adherence to an intervention, exposure or dose, quality of delivery, participant responsiveness, and program differentiation

(Mellard, 2010; O'Donnell, 2008). A review of implementation fidelity is beyond the scope of this dissertation, but those interested should turn to the works of O'Donnell (2008) and Harn, Parisi, and Stoolmiller (2013). The same attention and diligence that is used to evaluate the impact of the initiative should be used to evaluate the implementation. The next section of this chapter will provide an overview of an implementation framework developed by the National Implementation Research Network (NIRN), with details to root the framework in a learning technology context.

Theoretical (Implementation) Framework

Stages of Implementation Framework

The Stages of Implementation is a commonly referenced framework in the field of implementation science. Developed by the National Implementation Research Network (NIRN), it is one of the few frameworks with a generalizable focus on the social service sector that can be used to frame implementation of learning technology at a meta-level (school level) rather than a micro-level (classroom level). Other frameworks focus on integration, specifically adoption and use by educators, typically using a system that describes stages and steps of integration (e.g., SAMR Model (Puentedura, 2010), LoTi (Moersch, 1995), and RAT (Hughes, Thomas, & Scharber, 2006)). This has, in turn, become the method by which researchers, districts, school administrators, and educators describe and discuss the adoption and use of learning technologies in schools. This prevalence of integration frameworks and lack of implementation frameworks highlights one source of the problem: Such significant amount of attention is given to what happens in the classroom with technology that stakeholders fail to recognize the importance of *a priori* activities that occur outside of the classroom.

The six stages of the framework describe the identifiable points in time during implementation of an innovation. The framework begins with (1) exploration and adoption, is followed by (2) program installation, (3) initial implementation, (4) full operation, (5) innovation/refinement, and concludes with (6) sustainability (Fixsen et al., 2005). The stages are not mutually exclusive and will overlap throughout the process (Fixsen et al., 2005; Franks & Schroeder, 2013). According to the NIRN, to have a significant impact on human services that reaches a broad range of people, it is a requirement to understand the components of implementation as well as factors promoting its effectiveness. Attending to each of the stages will increase the likelihood of sustained implementation of the adopted initiative. Below is a brief overview of each of the six stages.

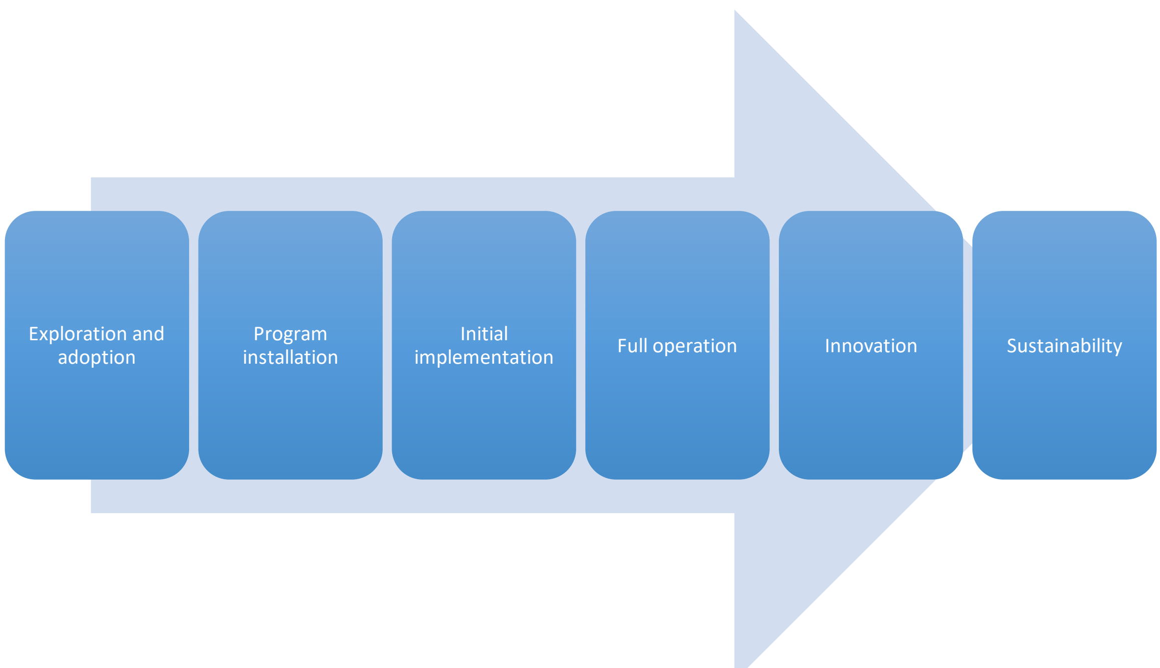

Figure 3. National Implementation Research Network Stages of Implementation Framework

Stage one: Exploration and adoption. Awareness of a problem and a desire to fix it will lead staff to explore innovative initiatives. This is the stage at which key stakeholders will gather information and resources, conduct a needs assessment, determine the appropriate fit between organization and initiative, and mobilize support (Fixsen et al., 2005, p. 15). When successful, this stage secures buy-in and support from relevant stakeholders and helps develop a detailed implementation plan and timeline to facilitate the process (Fixsen et al., 2005; Fixsen et al., 2013). The implementation plan will help build buy-in from educators who might question the dedication of the leadership as well as the impact the initiative will have on their practice. This plan should include strategies that will govern the use of the device for students and educators and anything else the school deems necessary.

Stage two: Program installation. Once the initiative is selected, adopted, and has the necessary support, the process of acquiring resources is the next step for implementation. The aim of this stage is to create an environment that is conducive to the selected initiative. The resources procured will fall into one of three categories (competency drivers, organizational drivers, and leadership drivers) described in the literature as implementation drivers (Fixsen, Blasé, Naoom, & Duda, 2013; Fixsen et al., 2013). Acquiring and planning for the allocation of long-term funding will be a crucial task during this stage. Schools should avoid the urge to solely focus on procuring funding for hardware and software and should also ensure that budgets are secured for additional resources such as professional development.

Stage three: Initial implementation. At this stage, staff will begin to adopt new practices, but will face challenges if resources were not secured and details were not addressed in the previous stage. What further complicates this stage is that changes are occurring unevenly at the individual level, as well as in administrative, educational, financial, community, and other external contextual levels (Fixsen et al., 2005). Success in this stage is an accomplishment to be acknowledged, due to the various irregular and unpredictable forces at play.

Stage four: Full operation. At this stage of the process, the activities that were once foreign and fragile will become accepted practice. The staff will gain comfort with the tools of the initiative, and the progress of the implementation can be observed by the identification of new exercises and applications. This is when the leadership in the organization will learn to take ownership of their processes and practices, which may have been previously supported by external consultants.

Stage five: Innovation and refinement. This stage provides the opportunity to refine and modify the implementation to fit the context of the organization (Harn, Parisi, & Stoolmiller, 2013). As the staff become more familiarized with the process of the initiative, they will want to make modifications to better fit their needs. To avoid threats to the validity and uphold a successful implementation process, the Dissemination Working Group (1999) advises waiting until after full operation before attempting any modifications to the initiative (Fixsen et al., 2005; Winter & Szulanski, 2001).

Stage six: Sustainability. The sustainability stage filters through each of the previous stages, thus practitioners should remain conscious of sustainability throughout the entire process. It is common that the organizational staff will cycle through, the external climate will shift, and priorities will change. What needs to remain constant is the commitment to sustaining and progressing the specific initiative. According to Fixsen et al. (2005), “The goal during this stage is the long-term survival and continued effectiveness of the implementation site in the context of a changing world" (p. 17).

The NIRN framework adequately describes a general process of implementation that can be used in multiple contexts and with various types of initiatives. The framework falls short in providing context and content specific learning that would be useful for schools working through the process of implementing a BYOD program. For example, the NIRN writes extensively about gathering adequate support from all stakeholders, but does not speak to the role of the principal to support implementation through each of the specific stages. Another example is that the NIRN framework discusses the need for change in skill, practice, and culture to institutionalize new practices of an initiative, but does not discuss how those changes will occur in any specific context. Lastly, the NIRN framework offers the impression that staff within an organization will readily accept new ways of doing simply because the implementation process is underway. This is a questionable assumption given much of the knowledge in the literature about the difficulty of getting educators to make changes in their practice and integrate technology into their classrooms.

What this framework does well is provide a shell for organizations to better understand the process of implementation as a whole. The framework allows one to see how a change in practice will unfold at the organizational level. What the framework is missing is context-specific knowledge for implementing BYOD initiatives and details on how to institutionalize new practices, precisely the actions required to fundamentally alter previous norms and ways of doing. Cementing new ways of doing is not only pivotal for successful implementation, but according to Fullan (2007), it is also necessary for sustainability and institutionalization of the initiative.

Conclusion

As more schools decide to follow the current academic trend of adopting and using learning technologies, and as some choose to implement the BYOD approach, it is critical that they understand the journey upon which they are entering. Complete understanding of that journey will require contextual knowledge not just about implementation or about implementing learning technologies, but specifically about implementing a BYOD approach. This chapter has outlined what implementation is, why it is important, and the activities and strategies promoted in the literature as necessary for successful technology implementation. This information will be critical when examining the implementation practices of the specific site of this study and how well those practices fit into the current knowledge of the field. The next chapter, Chapter Three, will discuss the methodology of this study.

Chapter Three: Methodology

By exploring how the Bring Your Own Device (BYOD) approach was adopted and implemented in a suburban high school, this study sought to (1) expand the context-specific knowledge of implementing a BYOD approach, (2) determine the degree of similarity and difference between one-to-one implementation strategies and BYOD implementation strategies, and (3) surface potential new strategies to support the implementation of BYOD initiatives. The specific research questions were:

1. What happens when a school implements a BYOD program?
    a. What initial processes does a school employ when launching a BYOD program?
    b. How are the strategies for implementing a BYOD initiative similar or different from implementation of a one-to-one initiative?
2. What, if anything, is unique about the implementation of a BYOD program?

This chapter will cover the research approach and design used to answer the questions, provide a description of the site, review of methods for data collection, detail the analysis plan, and conclude with researcher positionality.

Use of a Qualitative Approach

To best answer the research questions stated above, a qualitative approach was identified as the best methodological option. As explained by Noor (2008), a qualitative approach is a process where "researchers are interested in insight, discovery, and interpretation rather than hypothesis testing" (p. x). According to Yin (1981), qualitative studies are known to allow for a thorough examination of the knowledge utilization process through its connection with context. The rationale for choosing a qualitative approach over other methodological options, such as a quantitative or mixed methods approach, is due to the frequent occurrence of quantitative methodology deliberately divorcing a phenomenon from its context in a desire to isolate and focus on a specific set of variables (Yin, 1981). This practice can be beneficial depending on the phenomenon under study, however, it proved unfitting for the purpose of this study. Additionally, "experimental and quasi-experimental studies are limiting in their ability to provide descriptive details about the phenomenon under study" (Tellis, 1997, p. 1), which was a specific aim of this dissertation. The strengths of a qualitative design, coupled with the limitations of other research approaches, provided the rationale to move forward with a qualitative approach.

The decision to conduct this study using a qualitative approach was not simply a matter of design, but also of paradigmatic fit. According to Horvat (2013), qualitative research lies within the interpretivist paradigm. Horvat describes this paradigm as “concerned with the understanding and unmasking of the meaning that individuals assign to their actions in a social setting” (p. 4). Building on a similar argument shared by Noor (2008), Horvat (2013) adds that researchers situated in the interpretivist paradigm shy away from hypothesis testing and the concept of a single objective truth. It was with this understanding of interpretivism that the decision to move forward with a qualitative approach was affirmed. This paradigm accurately represented the focus of this study, moving away from a universal concept of how learning technology initiatives are implemented and towards a more specific understanding of how the BYOD approach should be implemented in specific contexts.

Research Design: Case Study

Given the methodological decision stated above, a case study design was selected to frame this study. Yin (1981) defines a case as "an event, an entity, an individual or even a unit of analysis" (p. 101). Noor (2008) further explains the study of a case as "an empirical inquiry that investigates a contemporary phenomenon with its real life context using multiple sources of evidence" (p. 1602). Situated under the qualitative umbrella, case studies are concerned with answering questions related to 'how' and 'why' things happen, while specifically allowing the investigation to occur within the contextual realities of what was planned and what happened (Noor, 2008; Baxter & Jack, 2008; Yin, 2003). Case studies have been used in multiple disciplines, including but not limited to psychology, sociology, anthropology, economics, social work, education and evaluation (Johansson, 2003). The knowledge that can be gleaned from case studies can be applied to many different disciplines, thereby increasing the usability of findings.

Case studies can be utilized in a single case or a multi-case approach. The use of a single case allows the researcher to focus on a single issue within a bounded context. Multi-case studies, while still allowing for a single-issue focus, come with the added advantage of purposefully selecting multiple cases to demonstrate the variety of potential perspectives of the focal issue (Creswell, Hanson, Clark, & Morales, 2007). The literature also discusses multiple types of case studies. Yin (2003) describes three different types of case study research: exploratory, descriptive, and explanatory (Noor, 2008; Tellis, 1997). Stake (2009) proposes three alternate types of case study research: intrinsic, instrumental, and collective. Although they describe different case types, both theorists ground the case study approach within a constructivist paradigm. The constructivist paradigm is built on the notion that reality is socially co-constructed, and that knowledge as we come to understand it is pre-existing, interpreted, and frequently reinterpreted by researchers and participants in a given study (Mertens, 2009). This differs slightly from the interpretivist paradigm Horvat (2013) discussed in her qualitative text, but both paradigms are subjective and highly dependent on the perspective of individuals to uncover meaning and truth (Baxter & Jack, 2008). These characteristics are of key importance to this study because the design allowed the researcher to create space for multiple stakeholder groups to share their perceptions of the BYOD implementation process.

One of the major strengths of the case study approach is the ability to provide a comprehensive perspective through the use of multiple sources of evidence (Noor, 2008). Review of documents and archival records, interviews, physical artifacts, direct observations, and participant-observation are only some of the various methods that have been used to collect data for case studies (Baxter & Jack, 2008; Johansson, 2003). Another benefit of the case study approach is the ability to triangulate the research (Tellis, 1997). According to Tellis (1997), the process of triangulation serves to improve the validity of the study (Tellis, 1997; Johansson, 2003).

The decision to use a case study methodology was in direct response to the purpose of the research question. Many of the key characteristics of the approach were essential to the success of this study. For example, case studies are designed specifically to elicit details about the perspectives of stakeholders. This served as an advantage to this study because it was necessary to hear from students, educators, and administrators in order to develop a comprehensive understanding of the implementation process that took place. Another example is that case studies allow the researcher to pay attention to individual perspectives and to the perspectives of groups and interactions between and among them (Tellis, 1997), allowing for "multiple facets of the phenomenon to be revealed and understood" (Baxter & Jack, 2008, p. 544). The ecosystem of any school's culture is one where the potential success of an initiative is greatly dependent on the interactions within and between groups. Thus, understanding how the implementation of this initiative unfolded and would continue to unfold required an assessment and understanding of the within and across group perceptions of stakeholders. Lastly, use of a case study is advantageous if one wishes to deliberately "cover contextual conditions—believing that they might be highly pertinent to [their] phenomenon of study" (Yin, 2013, p. 13). This was critical to this study where the expected findings were borne out of the assumption that there were unique characteristics about this school (culture, climate, setting, etc.) that would affect the way the implementation process unfolded. Through the three examples shared above, it is clear that many of the essential qualities of the case study approach fell in line with the purpose and focus of this study, thereby making it the best fitting approach.

Study Design

Description of Site

The selection of a case study site is one of the most important decisions to be made. Occasionally, a site will be selected after the study has been designed, requiring the researcher to seek an appropriate site to answer their stated research questions. Other times, researchers design a study based on something unique that is occurring within a given site. This case was a combination of both. There existed a general idea of what was to be explored, and that idea led to the identification of a specific site, but unique occurrences unfolding at the site served to refine and shape the original idea to better fit the specific context.

The site selected for this study was a Midwestern high school serving grades 9-12 in a large first-ring suburb in the state of Minnesota. During the 2015-2016 academic year, the school had a student population of approximately 1,600. The demographic breakdown included 33% students of color, with a further breakdown of 12% African American/Black, 11% Asian/Pacific Islander, 7% Hispanic, 2% two or more races, and 1% American Indian/Alaskan native. Thirty-six percent of the student population was eligible for free and reduced lunch, and the Advanced Placement participation rate was 35%.

Since the 2014-2015 school year, the school had been exploring and planning for the adoption of Connected Classrooms – a BYOD initiative that they hoped would "connect today's learners with the skills and tools they will need for success in tomorrow's world."[1] This initiative was part of a larger district goal to "provide students and staff with the instructional technology needed to become 21st Century learners."[2] In what was described as a pilot phase, the school officially launched Connected Classrooms on March 9, 2015.

The selection of this site was due in large part to the school's utilization of a pilot phase and its decision to begin the pilot towards the end of the 2014-2015 school year. Although the piloting of initiatives and interventions is standard practice in other contexts, use of piloting when implementing learning technology initiative is largely

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[2] http://www.isd622.org/Page/9561

absent from the literature. Common practice calls for schools to begin implementation of a new program or initiative at the start of the school year and not at the end of the academic year as things are winding down. It may be that starting an initiative at the beginning of the school year is optimal for students and staff who are primed to expect new ways of practice at the start of the school year. Though it is often done to avoid placing additional responsibilities on educators mid-way through the year, it can also be filled with potential drawbacks. One of the drawbacks to starting an initiative (or pilot) at the beginning of the year rather than at another time is that schools may find themselves bound to a problematic or ineffective initiative or implementation strategy with little time to pause, think, and address burgeoning problems. The school year can be hectic from start to finish, and finding time in-between teaching, testing, disciplining and celebrating to make adjustments to an implementation that has gone off course may prove impossible. This may leave schools burdened with inefficient processes without the proper time to address them. These inefficiencies will inevitably erode support and buy-in from stakeholders.

The assumption in selecting this site was that the pilot phase and subsequent three-month period between the conclusion of one school year and the start of another to re-strategize would be an advantage to the implementation process. Unlike other schools that may be forced to endure implementation challenges for an entire school year, this school would have the privilege of summer break, three months into their implementation, to assess strengths, weaknesses, opportunities, and threats. The lessons learned from the pilot phase could then be used to make the necessary improvements for the next school year. The curiosity about what effect, if any, this pilot strategy had on the school's implementation was a main driver in the decision to conduct the study at this site. Understanding whether the use of a pilot strategy was beneficial to the implementation process could be added to the list of unique strategies necessary for implementation a BYOD approach.

Sampling

This study used a purposeful sampling technique as described by Patton (2001) in his qualitative text. Participants were selected based on their ability to contribute meaningful information through different data collection methods. Gathering data to inform the understanding of students' perception of the implementation of Connected Classrooms was done through the use of surveys. Students were invited, by proxy of their homeroom educator, to complete an online or paper survey. An email was sent to all homeroom educators informing them about the study and requesting permission to take up a portion of their homeroom time for the administration of the student survey. Twenty-eight of the 81 homeroom educators responded and agreed to participate. An additional two educators asked to participate while hard copies were being distributed to specific homerooms. Of the 30 participating educators, 27 requested paper copies, and three requested links to the online version of the survey because their homeroom was held in a computer lab. The sample of 30 educators resulted in approximately 661 students who were given the opportunity to complete the survey. However, the specific reach of the survey is unknown given that the link may have been shared with other educators or other students whose homeroom educator did not opt to participate in the survey.

For educator perceptions, all 81 educators in the building were first invited through email to complete the survey. Forty-two of those completed the survey. To determine the sample for educator interviews, a final question on the survey asked participants if they were interested in taking part in a follow-up interview, so only educators who participated in the survey were aware of the interview. Ten individuals self-selected into the interview sample. The decision to have participants self-select into the sample assumed that they would have the most to share and provide meaningful feedback. Of the 10, only six chose to move forward with the interview process, representing both male and female demographics and subjects including Math, English, World Languages, History, and Special Education.

Finally, the sample to provide information about implementation-specific activities included all those who were directly involved with the planning and organization of implementation activities. This included members of the technology integration team and the school principal, all of whom were invited through email to participate in a one-on-one or a group interview. All data collection methods will be described in greater detail in the next section.

Data Collection Methods

A benefit of conducting a qualitative case study is the wide range of data collection techniques that can be employed in a single study. This study utilized survey, individual interview, document analysis, group interview, and classroom observation methods to collect data from students, educators, and administrators. Data collection took place from January through June 2016. Since the Connected Classrooms initiative was already underway, this timeline provided the necessary time for the school to work through any initial challenges it may have faced with implementation during the pilot phase. This helped to shape the conversations so participants were more reflective of their perceptions, while also talking through challenges and successes they had already experienced. Below is a brief overview of each method and how it informed the study.

Survey. According to Scheuren (2004), a survey is best understood as a systematic method of gathering knowledge from a sample of individuals. The size of the sample is typically dependent on the size of the population and purpose of the study. Surveys can be completed through many different formats, including in person, by mail, or over the phone. For this study, surveys completed by educators and students served as the primary method for gathering data about their perceptions of the implementation process. Surveys proved to be the best method for collecting these data as compared to other more time-consuming methods because they provided the opportunity to reach a large sample of respondents within a reasonable span of time.

Educator survey. In February, all staff in the building were invited to participate in an on-line survey asking about their knowledge and experience with the Connected Classrooms initiative and their perception of its implementation. The goal was to uncover educators' beliefs around technology in the classroom, their perceptions of the strengths and weaknesses of the implementation process, and their experiences with integrating technology in their classroom. All participants were notified of their right to decline and to exit the survey at any time. In all, a total of 81 staff members received the email invite. Forty-eight participants completed the survey, and, after eliminating submitted surveys with no completed questions, 42 surveys were utilized in the analysis. This resulted in a response rate of 52%.

Student survey. Given the propensity for low participation of high school aged students, the goal was to survey the entire student population rather than a sample of the population. However, given the logistical challenges associated with finding time to administer a survey to the entire student population, the decision was made with input from the principal to administer the surveys during homeroom. Students were invited, by proxy of their homeroom educator, to complete a paper or on-line survey. Thus, only students whose homeroom educators opted into the survey were given the opportunity to participate. The survey asked questions about students' knowledge and perception of the Connect Classrooms initiative and their use of devices during the school day. This survey contained only close-ended response options and did not gather any private student academic information. Lastly, although demographic information was collected, responses were not connected back to individual students.

Semi-structured individual interview. Yin (2013) refers to interviews as one of the most important sources of data collection for case studies. The semi-structured interview typically resembles a guided conversation rather than a highly rigid set of questions (Yin, 2013). The use of interviews with staff and key informants, specifically the technology integration team, allowed detailed information about the implementation process to be documented. Furthermore, the use of a semi-structured interview protocol allowed for flexibility in how different respondents were approached based on their engagement with the implementation and their role in the building (Noor, 2008). In contrast to the surveys, the interviews allowed the researcher to probe for clarity and understanding. Interviews also provided the opportunity to ask follow-up questions, while also allowing for a degree of privacy not found in some of the other methods of data collection. Lastly, the interviews focused on identifying shifts in the school's organizational culture (i.e., an increased value and appreciation for technology as a learning tool that participants could affirm was not present prior to the adoption and implementation of the initiative) that may have occurred as a result of the initiative, as well as confirming the existence of the key strategies identified in the literature.

Educator interviews. Similar to the surveys, the interviews delved deeper into educators' beliefs around technology in the classroom, their perceptions of the strengths and weaknesses of the implementation process, and their experiences with integrating technology in their classroom. The purpose was to provide participants with the time and opportunity for in-depth responses and identify what, if any, changes they had observed in the building since the implementation of the program.

Key informant interview. An interview was conducted with the principal of the school. The decision to interview the principal assumed that as the leader of the school and the leader of the technology integration team, he possessed a wealth of information regarding the motive for adoption, background history of the implementation process, future directions and plans, and intended outcomes for Connected Classrooms. The assumption was that, more than anyone, he would be able to provide a broad overview of the process, its strengths, and weaknesses, and plans to address those weaknesses. Interviews with other administrative leaders were suggested, however, in speaking with staff in the building and the principal himself, it became clear that the two remaining assistant principals did not possess a sufficient degree of knowledge about the initiative and its implementation to warrant an interview. This provided insight into the degree to which the program had been embedded into the culture of the school.

The interview with the principal occurred in May 2016. It was important to conduct the interview with the principal at the end of school year, providing him the opportunity to respond with the perspective of a full year of implementation to support the comprehensive nature of his responses. Additionally, the decision to conclude the data collection process with his interview was intentional to ensure that information shared and data collected through previous methods could be used to inform the interview protocol and to solicit feedback and reactions from him about what was being heard.

Group interview. Qu and Dumay (2011) define a group interview as a process where "several people are interviewed together utilizing a flexible and exploratory discussion format emphasizing interactions between participants rather than between the interviewer and interviewees, with the interviewer serving the role of moderator" (p. 243). This method is beneficial as it saves time from having to interview multiple different people at different times. Also, because the researcher acts as a facilitator of the conversation, rather than an active participant in the conversation, as it the case with individual interviews, there is a decreased likelihood of the researcher biasing the responses (Qu & Dumay, 2011).

Technology integration team interview. The data collection process kicked off with a single group interview conducted with the technology integration team in January 2016. Given the collaborative nature of this group and the work they had engaged in, it was most beneficial in the interest of time and depth of information, to collect data from this team in a group format rather than with individual interviews. As members of the technology integration team, these participants were assumed to hold the best insight on the implementation process and could provide knowledge about the decisions that were made and their plans for future implementation activities. The assumption was that members of the technology integration team would hold a more favorable perception of the implementation strategies than the rest of the staff, and thereby would also have higher levels of technology integration than other staff. Thus, it was important to contrast the technology integration team's perceptions of the implementation process and their experiences with integrating technology with that of the general population of educators who were not as directly involved with the implementation decisions and activities.

This method of interviewing was also intended to shed light on the diversity of opinions within the integration team, while also providing participants the advantage of building upon each other's responses. The methodology allowed the researcher to document a more holistic picture of the process, rather than collect pieces of the processes if individuals were interviewed separately. Finally, it should be noted that the interview did not include the principal, who regularly led the group. The decision to exclude the principal from this process was first due to the fact that a specifically tailored individual interview was already planned to be conducted with him. Secondly, he was excluded under the assumption that his presence, as an authority figure, would alter the responses participants would share by hindering their ability to provide honest and authentic responses.

Site observations. Another data collection method used in this study was site observations. Site observations are best understood as a "way of gathering data by watching behavior, events, or national physical characteristics in their natural setting" (CDC Evaluation Brief, 2008). Observations can occur overtly where participants are aware of being observed or covertly where the observer blends into the setting and participants are unaware they are being observed. While the process of observing is something many people do in their day-to-day lives, the use of observation for data collection does not just involve vision. Rather it includes all senses, as well as the interpretation of those senses (Fox, 1998). What this means is that unlike daily observations where people simply record actions in a particular environment, this process required the active collection of data where the researcher was forced to record actions and immediately make sense of them in the context of what was occurring when the action took place (Fox, 1998).

Classroom observations. For this study, classroom educators were asked for permission to have a class observed. Educators were ensured that the observation would in no way be an assessment of their curriculum, content, or teaching style, but rather would focus on determining how and to what extent software and digital devices were being used in classrooms, specifically looking at the number of students using devices, the types of devices being used, and the level of integration of technology in the classroom. In total, two educators and three class periods were observed. The educator whose two class periods were observed informed students of the researcher's purpose in their classroom, while the other educator did not. Two of the three observations lasted the entire class period, with the third observation lasting half of the 55-minute class period.

There was a lot of value in using this method of data collection. For starters, the researcher was able to set the stage and understand the culture in which these educators and students operated. Classroom observations helped bring to life the surveys and interviews as a way to truly understand the context in which the initiative was being implemented. In addition, the observations served to validate the information educators and students shared through other methods. It served as a check on the degree to which integration was occurring in the school and the level of integration that educators were having in their classroom.

Document analysis. This method, sometimes referred to as content analysis, is a review of text and documents to assess for emergent themes (Ratcliff, n.d). A report by Cardiff Metropolitan University describes the documents used in this methodology as "any substance that gives information about the investigated phenomenon and exists independently of the researcher's actions. The documents are typically produced for specific purposes other than those of the research, but they can be used by the researcher for cognitive purposes" (pp. 3-35). Corbetta (2003) describes a few benefits of document analysis as a methodology. To begin, he states that the information gathered from the analysis is non-reactive and is not biased by the presence of the researcher. Secondly, document analysis allows the researcher to collect data before the start of the study. Lastly, it is a cost-effective process because the information has already been developed.

District document review. Given the historical nature of this study, an attempt was made to learn about processes that occurred in the past. The use of document analysis allowed the researcher access to real-time documents that shed light on values, plans and actions as they occurred, rather than colorful descriptions of what stakeholders recalled. This methodology was used to help uncover implicit ideas and served to ground the researcher in the information that was present but not shared. Specifically, it provided context for why certain actions were taken and helped to understand the values and motivations that pushed those activities and actions forward. The documents reviewed were primarily district level documents about the 2015 proposed levy. Review of the documents shed light on the broader context of the school and the context within which the initiative was unfolding.

Piloting

To substantiate the survey instruments used in this study, the student and educator surveys were pilot tested with individuals from the school. A total of four students and two educators were invited to independently participate in the pilot. Each participant was instructed to complete the survey as they would if the researcher was not present. Those testing the survey were also asked to engage in a quasi-think aloud activity where they were encouraged to think out loud about the cognitive process of question interpretation and response formation. Thus, if a participant read a question that did not make sense, they were asked to state out loud that the question did not make sense, why, and how they interpreted the question. Through the piloting process, errors related to word choice, response options, formatting, and structure were shared with the researcher and used to edit and improve the protocols. As a result of this process, there was an increased degree of confidence in the reliability of the survey questions to be interpreted by respondents as intended by the researcher. Although interview instruments were not piloted through a formal process, a staff member at the school reviewed them for clarity and relevancy. Table 1 illustrates a timeline for when each of the data collection methods occurred.

Table 1. Data Collection Timeline

Data Collection Methods	Jan	Feb	Mar	Apr	May
Group Interview Tech Integration	X				
Educator Survey		X			
Student Survey				X	
Educator Interview				X	
Principal Interview					X
Classroom Observations					X

Data Analysis and Interpretation

The analysis of data for this study was a two-fold process. The first part of the process was an informal analysis of responses for the purpose of informing future protocols. The second part was a structured, intensive, and formal analysis process to review data and answer the specific research questions. During the informal analysis, responses from the educator survey were numerically coded and calculated for descriptive statistics. The findings were then used to make additional changes to the educator and principal interview protocols. For example, questions where the findings revealed near 100% consensus were eliminated and replaced with new questions on topics where the findings illustrated greater variation in their responses with no clear majority. Additionally, initial analysis of the responses from the group interview were also used to finalize the educator and principal interview protocols.

Once all the data had been collected, the formal analysis process began. Qualitative data (interview data) were transcribed verbatim, and the quantitative data were numerically coded using Microsoft Excel. Topic areas from the protocols were used to develop a preliminary coding structure, with the expectation that codes would be added, removed, or modified as necessary. In assessing the qualitative data, transcripts of each data set (educator interview, administrator interview, tech integration group interview) were coded for emergent themes. After the transcripts had been coded, the codes were reviewed and interpreted for clarity and accuracy. The codes were then grouped under overarching themes that would answer specific research questions relating to activities or perceptions (attitudes and feelings, thoughts, beliefs, and judgments) of the implementation. Following this, the perceptions-related themes from the data were used to uncover narrative and depth to the process of implementation. Additionally, the activities-related themes from the data were matched, to the best degree, to the implementation strategies and stages identified in the literature. This process served to reveal the degree to which the school's implementation process aligned with the process described in the literature. Themes that did not align with the implementation strategies and stages were then coded as emergent implementation activities and strategies from this specific context.

Survey data from students and educators were numerically coded, and descriptive statistics were produced. Each data set was first analyzed independently, then analyzed in conjunction with one another to identify areas of congruence and conflict between what student respondents shared and what educator respondents shared. Survey data were then analyzed in parallel with the qualitative data, again paying close attention to areas of congruence or contradiction. Lastly, the data from the classroom observations, as well as site reflections documented by the researcher, were reviewed to determine the degree to which they were in support or of opposition to the interview and survey findings.

This method of analysis strongly supported the process to determine (1) the motivations, path, and processes that were taking place to facilitate and support this implementation, (2) which general learning technology implementation strategies (as found in the literature) were being utilized in the Connected Classrooms- BYOD implementation, and (3) which new strategies were emerging within this specific context.

Researcher Positionality

I am an African-American woman with a passion for the power of education that was cultivated by my parents and supported through the experiences and support given to me by mentors, friends, and colleagues. Not only have I committed myself to being a life-long learner, but I am also committed to the education of others and believe that my work will never be complete if it does not open doors and provide opportunities for a younger generation of scholars. I am deeply passionate about K-12 education reform from a programmatic and policy perspective. My experiences have led me to become an advocate for the use of technology to support the delivery of curriculum in schools. I believe in the potential of technology when paired with student-centered pedagogy to transform the ways students are taught and the benefits they can obtain as they prepare for their next stage in life.

My contribution to the use of technology in K-12 contexts will center on implementation and evaluation. I believe that the potential of technology to increase student achievement begins with proper implementation and ends with evaluation. I strive to uncover strategies that are proven to produce results, and I have no patience for the persistence of practices that are failing our students. Lastly, I have a unique personal relationship with the school selected as the site for this study. I attended high school at the site and graduated in 2007. As a result of this, I have been a student of many of the educators in the building and have maintained personal relationships with a small number of the staff.

Conclusion

As it stands, much of what is known about implementing learning technologies comes from the perspective of the one-to-one approach, lacks detailed narrative, or is more directly focused on integration than implementation. To improve the information and knowledge available to district and school administrators, this study was designed in such a way to address the identified gaps (the lack of contextual knowledge about BYOD implementation in the literature, and the imbalance of knowledge about integration vs. implementation) in the literature. The use of a qualitative approach and a case study design provided the necessary depth to answer each research question. Additionally, the broad range of methods and participants ensured that the voices of each key stakeholder group were represented and that information was gathered in the most appropriate and least obtrusive manner, while also allowing for the opportunity to triangulate the data. Looking ahead, Chapter Four will present the findings from the interview data, Chapter Five will present the finding from the survey data, and Chapter Six will include final discussions of the finding and suggestions for future research.

Chapter Four: Interview Findings

This chapter will present the qualitative data and findings generated from interviews with the principal and six educators and the group interview with the Technology Integration Team. Before diving into the narrative of how the first year of implementation unfolded, a contextual description of the school will set the stage of the context in which the initiative took place. This will then be followed by a description of the pilot phase and explanation of the first full year of implementation. Data and findings from the surveys of students and educators will be presented in the following chapter.

The Case: Presenty High School

Presenty High School is a Midwestern high school in a first-ring eastern suburb serving grades 9-12. The school has a student population of approximately 1,600, with 67% of White students and 33% students of color. Specifically, the students of color breakdown is as follows: 12% African American/Black, 11% Asian/Pacific Islander, 7% Hispanic, 2% two or more races, and 1% American Indian/Alaskan native. The school has a diverse student population, including Hmong, Somali, and Hispanic students, along with a growing English Language Learner population. Close to one-third (36%) of students are eligible for free and reduced lunch, while a similar percent (35%) are participating in Advanced Placement courses. Academically the school ranked 34th (out of 610) on the list of Minnesota's Best High Schools[3]. This ranking is based on (1) student-educator ratio, (2) college readiness, and (3) average math and reading proficiency scores on the state exit exam.

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[3] http://www.usnews.com/education/best-high-schools/minnesota/districts/north-st-paul-maplewood-school-dist/tartan-senior-high-10982

In interviews with participants in this study, student demographics surfaced as important contextual information to understanding the landscape for implementation. One educator shared her opinions about the role of SES as it ties to legal status and how the influence of individual student priorities could potentially influence the implementation. According to a participant, for many of the school's immigrant population, Hmong, Somali, and Latino students, who may not have been in a formal education system in years and may speak limited English, procuring a device for school is simply not at the top of their priority list.

> *And so for a lot of the students we get, and this is going to be more and more every year, education is not number one on their list. And those are, you know, minority and cultural groups. And then you've got a lot of the low-SES where they feel like they need to work a job. Like, they feel like they have to get that money.*

There existed a belief by some that for many of the school's low SES, minority, and immigrant population, access to a device was not their top priority as other things were much more pressing, thereby undermining many of the underlying assumptions related to the success of the initiative. Others added that providing devices for these students presented a challenge, on top of students who were not FRL, but who may also require assistance inquiring a device.

> *When you're depending on families to provide resources for their kids … because if you look at 40% free/reduced of our total student population and you make the assumption that those students will not be able to put a device in their kid's hands, we don't have the stockpile to even address that. Furthermore, there're families who don't qualify for free/reduced, too, also, but we really need to reframe the conversation with families.*

At the time when the pilot phase kicked off, the current principal was finishing up his second year at the school. He transitioned from another suburban school that is more racially homogenous and financially affluent than Presenty. His previous school had successfully implemented a one-to-one iPad program for its 5-12th-grade students, and it is the success of their program that spurred his interest to implement a similar initiative at Presenty. However, a limited budget, lack of support, and low school morale colored the context for which this new initiative was to take place.

The school was operating under new district leadership, with an incoming superintendent for the 2015-16 school year. Support from the district or lack thereof was a reality of the context that was described by the principal. In his opinion, the school was capable of successfully implementing a technology initiative independent of district support, but "*it's far easier if you've got district level vision and resources committed to this path*." According to the principal, the district was aware of the school's initiative, but did not show support by way of resources or assistance.

> *It's a game changer, and I bet if you look at that literature and you look at the schools with successful implementation, I bet if you dug deeper and you looked at the alignment with the district strategic plan, I bet there's tight alignment.*
>
> *Well, I think leadership is pretty ... How do I say this? We don't have a lot of leadership in terms of what technology should be like in an education setting. We have leadership in how it works, how this network is set up, what type of filters we should have. We have that, but we don't have what does technology in an educational setting [look like]? What should our students be accessing and how should they be accessin? We don't have any of that in the building. Then it's tough to pull that stuff off if you only have building resources.*

This lack of alignment in school goals and the district vision coupled with the lack of support created a less than optimal implementation context for the school.

The district, as evidenced by budget cuts, spending freezes, a more than $30 million cut in the budget, and many failed levies over the past decade, was facing challenging financial times. During the first year of implementation, the district sought voter approval for an operating levy referendum. The first of two questions focused on an increase in the current $913 rate of per-pupil spending, the lowest among the top 20 largest districts in the Twin Cities metro area. The second question, Authorization to Fund Technology, sought voter approval of a "*$3 million technology levy that will provide dedicated funding to support important bandwidth and infrastructure improvements as well as increased safety and security measures*."[4] Given that a voter-approved operating levy had not been passed since 2002, the district faced an uphill battle in getting the levy passed. The need for this levy was crucial given the fact that since 2005, an overwhelming $32 million dollars had been cut from the district budget, resulting in decreases in the number of educators, administrators, support staff, and many other resources.

According to the district website,

> *Setting aside dedicated funds for technology not only allows us to keep more money focused on classrooms (technology funds currently come out of our district's general fund) but also acknowledges the significant role technology plays in the education of today's students and the investment we have made to ensure our students have access to technology tools and resources."*[5]

Specifically, if the Authorization to Fund Technology levy were approved, the funds would be used "*to maintain a dedicated, consistent source of funding for educational technology*."[6] This included, but was not limited to, support for curriculum integration and support, staff computers, lab and mobile laptop computers, high-speed fiber network connections between buildings, an email system, an email filtering system, an Internet

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4 http://www.isd622.org/cms/lib07/MN01001375/Centricity/Domain/539/Sept%2024%20PSC%20-%20Christine%20Osorio%20Meeting.pdf

5 School District 622 - Levy Ballot Question 2

6 http://www.isd622.org/cms/lib07/MN01001375/Centricity/Domain/53/2015%20October%20622%20News_FINAL.pdf

filtering system, a district firewall, wireless, and ongoing maintenance of computer systems, SMARTBoards, projectors, servers, and a network.

Unfortunately, on Election Day, voters voted in opposition of both levies, leaving the school and district facing a worse financial future, despite being in the middle of a resource-heavy implementation journey. The reality of this failure had the potential to affect the tenure of educators in the building, the quality of instruction, and the opportunities for academic initiatives.

In addition to the financial woes of the district, there were also school-level occurrences that impacted staff and student morale. Interviews with staff revealed that school morale was at a low point at the conclusion of the pilot phase when the school year was coming to an end. Morale was significantly affected by a specific incident where the safety of those in the building was put at risk. In this incident, two students were charged with felonies for bringing a loaded weapon into the building. This event, on top of the burnout of a long school year, created a challenging environment that may have been counteractive to the implementation of a new school-wide initiative.

Going into the first full year of implementation, then, the school was cutting personnel as a result of a limited budget, working to develop and sustain programmatic and financial support from the district for its initiative, dealing with staff burnout, and incidents that weaken the safety and morale of the entire school body. This is the reality of the implementation context within which the school was working.

Connected Classrooms: The Beginning

What was Connected Classrooms? According to the principal, it was an initiative meant to support students in utilizing tools in meaningful ways to further their post-high school aspirations.

> *The idea was to get our students to start using tools of technology as a means for readying for what's outside of your official school. . . The concept was we would get all of our students to take a step this past year, getting the majority of our students using devices of some sort, some software of some sort, 'though generally around the Google platform throughout all of their educational experiences.*

In deciding between the one-to-one model and the various versions of BYOD, the principal opted for the BYOD model that allowed students to bring any device with wireless capabilities. This model was selected due to available resources and a strategic decision about what would work best with the school's Google platform.

> *We don't have the resources. That's a big piece, and there's a certain degree of ownership that goes into your own device. The platform we have works with any device, so then we tried to leverage those two elements to make a useable model for our students. I'd love to do a longer one that's sponsored by the district, but we don't have the resources to pull that off.*

Speaking about how the idea for Connected Classrooms came together, the principal shared that "*it was pretty well planned out, step by step throughout the process."* He was no stranger to the implementation of a learning technology initiative as his previous school underwent a similar process. Although that was a one-to-one model, he was a part of the process, observed how it played out, and was a champion of learning technologies in schools. With that experience, he had been working strategically since his first year at Presenty for the district leadership team to see his vision and support him on that journey. His enthusiasm was met with what he characterizes as a "*really conservative* *district technology team, and so tons of resistance*." This forced him to begin amassing devices for students that were owned and funded through school dollars and pulling together a team of educators who shared in his enthusiasm and excitement for making his idea of the initiative a reality. Many of the individuals he brought together had an interest in technology and a broad perspective on what implementation would and should look like at their school. The group, formally known as the Technology Integration Team (TIT), was able to develop a vision for what Connected Classrooms should look like moving forward. While the principal admits that they "*did not do a ton of work with students and parents*," the team was able to push forward and complete the tasks at hand. Through observations and research, they were able to establish an implementation plan and a training program in preparation for their initiative.

To assess whether the conceptualization of Connected Classrooms was aligned at all levels of the school, interview participants were asked to provide a description of the initiative. A few respondents described the initiative as an effort to improve student access to devices, increase opportunities for students to "*use technology and also to use the resources that become available when you have that technology,"* and streamline student activities during class.

> *Connected Classrooms is – well, the idea is a one-to-one ratio between students and having some sort of technology in their hands, either a tablet or a laptop.*

Other respondents described the initiative as a means to improve educators' integration of technology into their curriculum and to facilitate the process of students learning new skills.

> *Connected Classrooms. I guess I would – at Presenty, I would say it means that teachers are exploring ways to use technology and that we're encouraged to let*

> *students use devices in ways that enhance their learning. It's not very prescriptive.*

Asked if there was a requirement for educators to utilize and integrate technology into their curriculum, one participant shared that despite the belief that Connected Classrooms was about increasing educator integration, there was not a requirement for educators to utilize and integrate technology into their curriculum.

> *I definitely haven't felt like there's much pressure to do it. Just sort of, like, regular reminders– we're being offered PD on it on a regular basis, but it's just not something, like, that we're being told you must do X number of technology activities in a trimester or something like that. . .*

Overall, participants viewed the initiative as an integration of technology in their classroom that enhances not only what they are doing, "*but also allows students to learn how to use various aspects of technology."* Specifically, many talked about meaningful integration over an ad hoc use of technology for the sake of technology. In their words, the technology they used should reach the same goals they previously worked towards, but more effectively and more efficiently.

> *It's not just, well, let's do the same things we were doing, and here's this technology. But, okay, let's do the same things we were doing, but could we use technology to push this information in a different way.*

> *I mean, schools are trying to prepare students, obviously, for what they're going to do next.*

In discussions about the expected outcomes of this initiative, participants mentioned that for educators, at a minimum, the expectation was that they would find ways to pull technology into their curriculum on a fairly regular basis. However, a lot of the conversation around motivation for the initiative focused on getting students to be proficient in the use of software and technology in a meaningful way. Much of this stemmed from the belief that students' proficiency with technology lagged behind the educators'. Students knew what was necessary to navigate social media, but they were not adept enough with technology to use it meaningfully in an academic or professional context. For students, the expectation was that they would learn to use technology responsibly in multiple settings, specifically focusing on digital citizenship and increasing students' comfort level with technology.

> *I think there's a lot of talk about just 21st-century skills and workforce. For me, I hope they are getting to understand what it means to share something in a more meaningful way – what is a cloud? I mean, these are terms that a lot of people use without – I mean, and they're comfortable somewhat using them, but they don't really understand what they are.*
>
> *But I think there's a – the second benefit of motivation is just always to, students need to be comfortable with technology. I think that we assume that they are because they're the digital natives, but actually, that doesn't mean they are comfortable with technology.*

When asked what the success of this initiative would look like for students, one participant said that in theory it would not change what students learn, but rather the process through which they learn. When probed about whether or not a component of the initiative was dedicated to students' acquiring new skills or just changing the process of how they learn, the individual added,

> *I would think that it would open doors for them to be able to learn things and explore some interests on their own. But, I mean, if your targets are A, B, and C, . . . whether you did it traditionally or . . . incorporated technology, you would still want the students to show that they understand and know, A, B, and C.*

Technology Integration Team

The Technology Integration Team (TIT), as mentioned above, was a group of educators who came together to help spearhead the implementation of Connected Classrooms. The team was made up of about eight educators, spanning subjects within the school. Individuals on the team were initially identified through an email invitation sent out by the principal and self-selected onto the team.

Implementation pilot. One of the top priorities of the team--and a key motivator for why this school was selected for this study--was its use of a pilot phase prior to full implementation. The school's pilot phase occurred during the spring of 2015 (third trimester), starting in early March and lasting through the end of the school year. The plan for the pilot period was to slowly phase in the initiative, allowing students and staff to gradually buy-in and prepare for the full implementation, which was to begin at the start of the next school year. Part of this pilot phase was also to use the summer months to review challenges from the pilot and revise the plan for full implementation in the fall.

Figure 4. Visual Depiction of the Implementation Phases

Part of the intrigue in selecting this site was to understand the decision to kick off a school-wide initiative towards the end of the academic year rather than at the beginning. According to participants, there were many reasons why this decision was made, one of which was shared by the principal. According to him, the goal was to slowly ease students and parents into the idea of technology integration rather than hitting them with new changes at the start of the year. In his opinion, it is a detrimental fallacy that school-based initiatives need to start at the beginning of the year. Unlike other sectors, schools have a tendency to operate with a beginning and an end, but given the three-month summer break with schools, that mindset leads to wasted time.

> *We wanted to get the idea in parents' heads in spring, so then they would have all of summer and five months essentially to plan, and that was the idea behind it and get it in our kids' heads, too, versus trying to do everything at the start of the following school year*.

Additionally, one member of the TIT shared that with all the new initiatives that get rolled out at the beginning of the year, the principal did not want Connected Classrooms to get lost in the competition for priority. In this individual's opinion, it was best to let people come to things voluntarily. The pilot phase was not intended to be a "make-it-or-break-it" process, but rather an opportunity to let people test the waters and for them to determine who would naturally get on board by diving right in and who would stick to the shoreline. Overall, it was less about getting people to make changes in their curriculum than a process to assess stakeholder perceptions and interests and support them through initial transition.

> *It was way more laidback. Just kind of, let's explore – more exploratory, I guess, is the way I'd put it. Just kind of see who's using what and who's a good resource for things and then have those conversations over the summer about how can we really incorporate this into our curriculum.*

While it was described as exploratory, make no mistake, the plan was still to hit the ground running in the fall and move forward with the initiative with real expectations and accountability for staff to begin integrating technology into their curriculum. According to one member, the TIT had conversations about creating accountability measures by making technology integration a part of staff members' year-long goals and growth process. So, if anything, while the pilot phase could be described as exploratory, it was more appropriately understood as a grace period for staff and students to buy into the initiative.

> *That was the expectation, that this year, "You've had opportunities throughout the spring of last year to explore this, to feel comfortable with this." Now you're at the point where we're saying, "You need to do this."*

The original plan was for the pilot phase to begin at the start of the second trimester (December). However, as that date quickly approached, the TIT recognized that they would not be ready for the initial roll out, so the date was pushed back to provide more time for planning. In conversation with the TIT, what was gleaned was that in January, despite not being ready to kick off the initiative, staff and students were allowed to use technology as they would like. During this time, the initiative was not yet properly defined. After the roll out in January, it was decided to once again press pause on the official kick off until the start of the third trimester (March), allowing people more time to work through some of the issues they saw from January. After missing previous kick-off dates and as the end of the school year slowly crept closer, there appeared to be a consensus to begin the pilot phase and see how it all would unfold. The plan was to get the initiative out there and make ongoing improvements, the strategy being that the staff would have the summer to revisit the plan and make adjustments as necessary.

> *Because it's the start of third tri. It's a great time – just try something. If it doesn't work, so what? It's break. Nobody cares. Literally. That was our reasoning was, like, it's just a good time to try stuff and see what happens… Because you can always do something, and if it doesn't work, people will forget about it over the summer, and you can start with something new in the fall.*

> *And it's one trimester, and we can make adjustments going forward.*

As stated, the process of the pilot phase was to be used in conjunction with a period of review and revisions that were to take place during the summer months in preparation for the fall. However, when asked about pilot phase and how the tech integration team ended the year, people shared that "*It just kind of ended, and we were done*." As a result of a turbulent pilot phase full of challenges they faced with integration, student access to devices, and a host of other issues, much of the team was exhausted by the end of the year and ready to call it quits and begin their summer. One of the members of the TIT mentioned that the team ended the year on a less than positive note. While the TIT did meet about a week after the school year ended, the conversation was not uplifting or forward thinking. During this final meeting, the principal was reported to have conveyed a degree of disappointment with the initiative and its implementation. His apparent dissatisfaction significantly affected the morale of the group and left many of them feeling disheartened.

> *I remember [the principal], he kind of finished on a negative note. Like, I felt like he thought it would be more successful and didn't realize how challenging it would be to implement technology school-wide. And so that kind of was difficult, too, to have your leader saying, "Well, this was a failure." And those weren't his exact words, but also, at the same time, you got the sense that he didn't feel like – because this wasn't 100% implementation, he didn't feel like it was successful. So that was kind of tough, too, I think, to cap off the year. When it's, like, well, we should have looked at what was successful, with this and assess what we need to change.*

Additionally, there was no directive from the leadership about whether staff should continue exploring the use of technology during the summer months. According to one TIT member, it would have been nice to have a bridge between the end of the year and a start of the next school year, but nothing like that happened, despite that being part of the original plan.

> *And I think it would have been nice just to have some sort of assessment in the summer, either at – like, with the technology committee or different pockets of teachers, or even just, like, one-on-one. Like, what really worked well for us in*

Spanish, versus, maybe what worked well for us school-wide. But I don't – I don't recall any of those conversations being had in the summertime.

When asked about what was done to review, revise, and revamp the initiative during the summer months, TIT members shared that the process was more individual than collaborative. There was some confusion about whether or not they met as a group during the summer, with some saying they never met, and others saying they had one meeting prior to a workshop day in mid-late August. However, the consensus was that none of the reviewing, revising, or revamping happened as a group, but rather individually. Asked specifically about what they did during the summer, a few staff members shared activities related to reflecting and adjusting previous academic practices in ways to support the use of technology in their classroom.

I mean, over the summer, I kind of looked at a few things that I could modify and make it more – using technology more…I had some time to create things and to modify things and to adjust what I'm doing currently and make it fit more into technology.

But for me, it was – it was that modification, but it was also looking at my current classes that don't use – that can't use Google. That have to use Microsoft or different software and kind of deciding how to implement from teaching strategies into that, too, because the kids are coming in with devices, so I have to support that learning as well.

Contrary to what was heard from the TIT, the principal shared that the team met about two or three times during the summer. However, no additional tech-related trainings were offered for the staff. Despite the lack of structured meetings for implementation review during the summer, the principal reported that shifts were made to the implementation. He described a change from the previously prescriptive model towards a more "sensible approach" with control given to educators to pick an area and explore it. Part of the reason for this scaled-back (less intense) implementation style was a result of the reality of device saturation in the classrooms, a topic that will be covered in a subsequent section.

Continuation of the technology integration team. According to TIT members, during the planning year (2014-15) school year, the team met regularly, every other week. However, at the time of the interview in April 2016, they had convened less than three times that school year, with their last meeting being sometime between September and December.

> *We haven't really had regular meetings ever. So it's been more – because no one was really put in charge to say, "Let's lead the group." And no one took that lead. I don't think that we ever really said we have a group, [and] we meet at these times.*

When probed about why the meetings were no longer occurring as frequently, the TIT explained that their initial purpose was for planning and the majority of their meetings were to develop a 12-week plan of implementation activities for the pilot phase. After those 12 weeks had concluded, the priorities and purpose of the group became unclear. Another shared that their lack of meetings was due to the initiative falling off the principal's priority list. While there was evidence of frustration from this individual, she also expressed understanding of the principal's increased workload and how other pressing administrative duties had taken over his time.

> *I know, like, for example, he's been tied up more with some district things. And so, he just doesn't have the opportunity – he's got way too much on his plate. And without delegating that to someone, he just – I get it. I get it from a leadership standpoint that he just doesn't have time to be the leader in that – in that aspect.*

While there was a high degree of understanding for the many responsibilities on the principal's plate, one member of the TIT wondered if there was more he could have done to move the group forward.

And maybe we should have stepped up and said, "We're the leaders of this group. Here's what will happen." I think that was probably the biggest piece that never really –perhaps, had that happened, then maybe there would have been other things in place. Because I didn't feel like I was the leader of the group. I felt like I was charged with making this 12-week plan and kind of pushing that out to teachers and helping teachers with that aspect. But I didn't feel like I was leading the technology, the Connected Classrooms, push at the school.

According to participants, the principal called a meeting in December with the TIT and stated that no one was integrating technology into their classrooms and that he was ready to end the initiative. Members of the team expressed contrary opinions, stating that there were indeed people who were on board, that there were students who were on board, and that his expectations were way too high.

We were all shocked because he called us into a meeting in December. And he was, like, are we – nobody's doing this. Are we just going to quit? Or am I – or maybe not December. I think it was December. And we were all kind of, like, what do you mean? Hey, what do you mean nobody's doing it? There are people who are doing it.

As could be expected, this kind of language served to demoralize the group charged with implementing the initiative.

We were all kind of in shock. We were all kind of – didn't quite know what to do with that information. Because we kind of were, like, things are happening. Slowly, but things are happening. And no, it's not changing things immediately and drastically, but ... nothing in education happens that is immediate or drastic.

Assessment of the pilot phase. Despite the challenges associated with the pilot phase and the lack of intentional and strategic follow-up during the summer, one member of the TIT remained sustained in his opinion that the pilot phase was a success. From his perspective, the students understood the pilot process and recognized that changes would be made. Even though the pilot was "not perfect" or "pretty," staff was able to learn from it so that the implementation would be much better come September. Another participant shared the belief that the pilot was a success, adding that the start of the school year is fraught with a set of challenges with getting used to things and starting a new school year without adding a technology initiative in the mix. In her opinion, a fall launch would not have been as successful as the spring start. Additionally, she shared that she believed the pilot phase was the best approach to ease educators who would be a bit more apprehensive about integration into the initiative. Lastly, another participant expressed that "*it's easier to kind of survive an implementation for 12 weeks as opposed to a full-year thing*." In his opinion, the pilot process was easier to buy into than a full implementation at the start of the year because the stakes were not as high. This helped to ease the fear of staff members who felt as though if they did not immediately jump on board, which would have been expected with a full-year implementation start, there would have been personnel repercussions. However, the 12 weeks meant it would not be part of their formal review process.

Next steps for the TIT. There remained confusion about who was leading the TIT. Some respondents hinted at the school's digital coach as the leader, but essentially most were unsure who, if anyone at all, was leading the initiative. Conversation surfaced about whether other staff members with more time and enthusiasm for the initiative should step in and take ownership and leadership of the team. One staff member stated that she was hesitant about whether it should be a staff member because it would be hard for others to see him or her outside of their assumed role as an educator, which might create challenges or a barrier for people to come to them with issues. She believed a digital learning consultant should take charge of the implementation. As it stood at the time of data collection, half way through the first full year of implementation, the team was no longer meeting, and there was no clear indication as to who was leading or would be leading the team moving forward.

Implementation

Activities

This section will provide an overview of four implementation activities that occurred during the planning and pilot phase of Connected Classrooms.

Learning from other schools. During the planning stage for Connected Classrooms, one of the activities the TIT engaged in to support their implementation was to visit and observe other schools that were successfully engaging in the BYOD implementation process. Two members of the TIT visited schools in two affluent school districts in the east and southern metro to learn how to better support the development of their own implementation plan. The decision to observe and learn from these schools was in part because the schools were a year or two ahead of them in their implementation and had dedicated a lot of human resources towards their initiative. However, what they discovered was that the schools were not much more successful in their implementation than they were at that time. According to members of the TIT, what they realized is that a step-by-step plan for how implementation should unfold did not exist. Additionally, each of the schools they visited was in the process of working through the challenges of implementation, but none had mastered the process.

> *I didn't see anything that was, "This is ground-breaking, this is earth-shattering, this is really changing the whole dynamic." I saw people who were in the process.*
>
> *Because they had a program in place, and they have – they've dedicated a lot of FTEs and a lot of people to it. And seeing it, I would not say that they were really any more successful than we were, to be – than we are at this point, to be honest. And we walked around and went to a few different classes where kids were using*

> *technology. A lot of kids have devices, but there were kids who didn't. And in some classrooms, it was kind of, like, you're just doing word processing. You could do this in a lab.*

Another motivator for visiting the schools was a desire to develop a program with tech interns based on one school's model of utilizing a peer-to-peer tech support program. Part of the success of the peer-to-peer program was due to the implementation of a one-to-one model. Having provided devices for every student meant there was a lot of work for their interns, and through the sale of insurance, the tech interns were independently profitable. The challenge with developing a similar program at this site was that the lack of devices provided minimal work for the interns, and there were potential issues regarding students handling the devices of other students. While enthusiastically supported, the tech intern program was simply not feasible in this context.

12-week plan. At the start of the pilot phase in March 2015, a key aspect of the kickoff was the use of a 12-week plan. Each week, for the 12 weeks of the trimester, staff members would receive an email about a specific technology topic to cover with students during their first hour. The topics ranged from how to set up a Google calendar event to tips on how to draft a professional email. The goal was to provide quick lessons for students using their devices to learn specific 21st century skills. When asked how well the plan worked, a member of the TIT admitted to having taught the first week lesson, but not many beyond that. In their opinion, with everything else that needed to get done in the classroom, the lessons of the 12-week plan did not naturally fall into place. Additionally, the content of the lessons was more appropriate for other classes where it was logical to teach students skills such as how to write a formal email to an admissions counselor. This participant was not the only staff member who admitted to not having fully participated in the 12-week plan. Other participants spoke about how they did not follow the 12-week plan because some of the lessons were things they were already doing with their students.

> *I wasn't going to work on spreadsheets with my French students. To be quite honest, I really thought that that was a sort of one-size-fits-all. And it was, to me, too ambitious to do that. And initiatives at the end of the year, I think, are really hard. Especially if you – if I have a group of kids that I follow all the way through. So I find it hard to completely change something in midstream.*

> *I did some weeks. I can't – I wouldn't even say I did the first four weeks and then quit. I did some weeks. And I did it in my resource [class]. So I mean, a very small population, but just kind of, I was, like, you have a school email. I know that was one of the weeks that I did. I know there were a couple weeks that I looked at it. And I was, like, this just doesn't apply to the group of students that I work with. So I just moved on.*

The lack of support and participation in the 12-week plan appeared not to be isolated, but rather representative of a vast number of the staff. One respondent shared, "*We had a 12-week plan. It, in hindsight, was kind of a waste of time."* This individual added that no one did the lessons and followed through with all 12 weeks. When asked if the 12-week plan should be viewed as a failure, this individual believed that more than anything the 12-week plan served as a reminder for staff to continually be exploring new ways to pull technology into their classroom. So despite the fact the staff did not adhere to the expectations each week, the process still served a valuable purpose in "*pushing people down the path a little bit further*" and was a "*cool idea*" to get people to pay attention.

> *Because it wasn't the right things that people needed at that time. And it was baby steps, but it just wasn't the right thing. But I think it worked to get people to think, this is what I need to do. I need to think about technology this week. I need to think about a way to do it this week. I need to think about, how can I use technology in my classroom this week?*

Asked about what could have been done to improve the plan, one member of the TIT suggested the use of lessons that varied for specific departments rather than a prescriptive plan across the entire school. For example, students in Advancement Via Individual Determination[7] (AVID), a globally recognized program committed to supporting students who are the first in their family to attend college, could focus on how to write a formal email to an admissions counselor or how to put meetings and events on a calendar, while English courses could focus on the use of Google docs to support essay writing and cross collaboration.

> *I think it's good to have something for – to hand to a teacher and say, okay, here's – here are some things that you could use. But I think for somebody who really wants to integrate technology into their curriculum, they should be looking at more specialized . . . content-specific technology.*
>
> *I think what's difficult is when you take something that – like Google docs that's so broad, and expect, music to be using this and phy-ed to be using this.*

Given the low level of success, it was not surprising that the TIT agreed not to make use of another multi-week plan for the 2015-2016 school year. Instead, the decision was made to send out a few general ideas as necessary, but ultimately to let people work at the initiative on their own.

Vendor fair. The third implementation activity that occurred during the pilot phase was a vendor fair. Some local vendors, including Best Buy, were invited to showcase products for families during conferences, with discounts being provided on a select number of devices. This allowed families to pick and choose a device that would work best for their child.

They sent over a couple of salespeople … and a couple of Geek Squad people,

[7] http://www.isd622.org/Page/196

too. So, I mean, I had a sizeable contingent here on conferences night.

A lot of parents were asking questions, and they were really happy about it. And I got to have a session where I answered questions … It was good. It was fun. It was like a – like an education session, and they all drilled me for, like, a half an hour, which was hard. They asked really good questions. . . So parents loved that.

According to the TIT, by bringing in outside vendors and tech professionals, the vendor fair demonstrated how committed the school was to this initiative, and it was said to have gone a long way to encourage parents, increase their awareness, and foster buy-in for the initiative. When asked why a similar event had not been hosted this year, the principal shared that it was due to their desire to take several steps back and reassess their implementation process.

Professional Development

The final implementation activity was professional development. Regarding the offering of PD for staff, the TIT shared that time had been dedicated to focusing on integrating technology. In discussing the type of professional development that was offered to educators at this school, what stood out was that the primary focus of the professional development was related to Google Classroom. This was a result of the school's transition from a Blackboard format to the Google Classroom format. When asked about the emphasis on the Google Suite over other training content, the principal shared that the goal was to start by building a sound basis for everyone.

Well, the concept was everything flows through Google Classroom, and that's like the hub. If we can get that hub, then we can splinter in 1000 different directions from there, but we need the hub. We need the common framework … Where I was before, that was a critical element, too, was to build the hub first, build that critical shared foundation that everything flows through, and then you'll get bang for your buck both on the student side and on the teacher side.

Many of the professional development offerings had been wrapped into staff development days. On these days, educators were typically presented with a number of staff-led training options and were invited to attend two out of four sessions of their choosing. Not all options were related to technology integration, as some might be related to ELL curriculum, Google Classroom basics, transitioning from Blackboard to Google, etc., but Google Classroom was a standing option on many of the training days. To provide further assistance to educators, five or so staff members in the building had been fully trained in the Google Classroom suite and, as such, were the Google Helpers for the school. Although the helpers were no longer being utilized to the same degree they once were due to increased proficiencies, some staff members still turned to them for assistance.

In discussions about how often educators were offered professional development related to the integration of technology, one participant referenced a full-day training in March 2015 and a fall workshop day that was dedicated to technology. During the March 2015 training day educators were offered many technology workshops to support their development of new skills. Also, some professional learning communities (PLC) in the school met one day a month, and there was typically a technology option on that day mixed in with other topics. Educators were also given time during the back-to-school week to explore new skills. However, this time was also slated for setting up classrooms, having other meetings, and socializing after a long summer away, pushing skill development to the bottom of the priority list. Although many staff members appreciated the time they were given, they would have preferred it during mid-summer when there was less activity occurring.

According to the TIT, time was a major challenge to providing professional development offerings. The challenge with providing time and creating opportunities for staff to come in and explore new tools and learn new skills was that 95% of the staff would not come in on their own time and explore new tools. This was the case when during the previous year, the school offered weekly professional development sessions before and after school, but they were poorly attended.

Another professional development issue raised by educators is that what was being offered was the one size fits all approach. As a result of the various skill levels across the school, some staff members were beyond the proficiency of the training sessions being offered, while others were far behind what was being offered. This was most frustrating for those who were ready to progress further in their skill development and felt as though the slate of offerings was a waste of their time.

> *And so then when you put people in professional development, and it's not absolutely meeting their needs or respecting their time or their intelligence, or – yeah, it's – yeah, it's a tricky thing.*

Although a session on Google Classroom was to be expected during training days, because there were many people who still needed it, other sessions requiring higher proficiency or content knowledge would have been appreciated as well.

> *And [the professional development offerings are] not all necessarily technology-based tomorrow. There's just a couple that are tech-based for people that want that. So we've done everything from the specific – like, how to use Google Forms and how to use Kahoot and Google Classroom and things like that. But really nothing that's necessarily content-based.*

As a result of the limited professional development training offered at the school level, some staff members were attending local technology conferences or utilizing informal sharing with colleagues in their department to aid their skill development.

> *We do a lot of talking within our own department. So one of us will try something*

out, read something on a blog, or read something online or get – we have memberships to things, and then they've upgraded the –a lot of the teachers in world language had Quizlet because it works well with vocabulary.

While some were turning to their peers and colleagues, others were frustrated about not knowing where to turn next. The school had done a great job at helping staff members set up the foundation with using Google Classroom, but had not done enough to help educators continue moving forward. All they had been given was a foundation and no direction or option as to where to move next. This left some having to explore and learn skills on their own. The difficulty of this was that the overwhelming amount of information, software, and tools available made it difficult to find the time to sift through it all and determine which was most useful. And when there was the time, there was a lack of self-motivation. What was needed to further integrate technology into the classroom was the support of a champion motivating the process of seeking new tools.

Outside of, like, gaming and things like, Kahoot – well, a lot of us, people just don't know what they don't know. And so until somebody says, . . . here's this great technology you could be using, or here's this device that you should be using with your students, most people, I would say, are not going to go out and seek things on their own time.

Despite the lack of advanced training options or subject specific tools being taught, the consensus was that the professional development was meeting the majority of staff where they were. Moving forward there were several changes participants would like to see in the types of professional development being offered at the school. One participant expressed a desire for more in-depth content. In her opinion, subject-specific training was not being offered or talked about, despite there being people in the school who were ready for that next step.

I think we need to start seeing more, like, in-depth. I think we've had a lot of *superficial stuff, which you still have to have. I mean, there's always, like, new people. But I think it'd be nice if there was more – more advanced material.*

Recently, one of the departments "rebelled" during a professional development session and proposed the addition of a department-developed session that would better meet their needs. While the focus of their session was reading strategies and not technology, there were tech tools that were shared among the group, which was better aligned with their needs. Additional PD sessions suggested for the future included the flipped classroom and the use of group sessions or week-long technology boot camps with the goal of long periods of uninterrupted time to work.

> *I really, really want more training on flipped classrooms. I want to go somewhere and have training on flipped classrooms. I want someone to really give me some very specific things that I can do, especially in a math-based – but my problem is I want to flip my algebra classes. I think there are a ton of kids where that would actually be way more beneficial than having them struggle and stuff at home. They would just take notes and come in to me. But let's go back to, they don't have computers at home.*

Other suggestions included a week-long technology camp, focused on nothing but technology.

> *I think many people would get a lot more out of a week of four hours in the morning every day where there's nothing to do except create because we all have lots of really good lessons. We just need time to change the format.*
> *Just, here's 20 hours. Over the summer, come on in, sit down with your PLC. Sit down with your co-teachers and start to look at this and plan this out and spend some time on it. And not time where you're sitting here worried about, oh, you got four kids who need help with an assignment, or you have a test that you have to write, or grade for the next day kind of stuff. But actual, okay, just sit down and work on this.*

While most would like to be paid for this time, one TIT member mentioned that he would be willing to attend with no compensation for his time if he knew experienced staff members would be there and he could collaborate with them. Time and money proved to be the challenge to providing this level of training, as the financial resources were simply not available. But while that option seemed out of reach, more realistically, the TIT would have liked to continue adding technology sessions before the start of the school day.

> *I think many people would get a lot more out of a week of four hours in the morning every day where there's nothing to do except create. Because we all have lots of really good lesson. We just need time to change the format.*

Integration

To better understand the integration practices of educators, participants were first asked to share their opinions about the role of technology in the class. Many believed that the role of technology in the classroom should be to provide additional opportunities for students to access information in fun and interesting ways. One participant shared that the school should, if anything, be the first step for students towards digital fluency. This intent towards digital fluency was motivated by the fact that despite the penchant to label all youth as tech-savvy digital natives, many of the students lacked the skills required to be intelligent users of information in ways that improved their lives.

> *And what's worse is we have this generation that has literally been brought up with technology, but they are not as smart about it. In some ways, they are actually more naive than my generation because they don't know how to sift through all the information and get actual facts, actual research. A lot of times, they'll know how to do the basics. But you ask them to do something more complicated, and it really stumps them.*
>
> *Yeah. There's not a lot of logic. There's not a lot of if A then B, if B then C, A then C, type of thinking of the students. So I think that's our job.*

Additionally, to understand if educators felt comfortable and confident to integrate technology into their classroom, they were asked to reflect on their skill level and confidence in integrating technology in their classroom. Asked if they could effectively integrate technology in their classroom, one participant stated, "*Yeah, I definitely think so."* However, one limitation of his integration was in assessing the added value of the technology tools and software used.

> *One thing I don't think I do is consistently assess my skills as far as, like – like, I'll use a technology, but I just assume, like, oh, it's good enough for now. And it gets – it gets the job done. I don't necessarily look for really how effective it is at the student level. . . Are kids really benefiting from this additional piece? Or were we okay with the more traditional system?*

In response to the same question, another stated, "*I do. Yeah. I'm pretty – I guess I feel very confident in my tech skills."* This confidence was shared by many others. Another shared that while she was confident in her ability to effectively integrate technology in her classroom, she did not think she was doing it "*absolutely effectively right now*," but, given the time and a reasonable pace, she believed she could get there. In describing the overall proficiency of the staff, one individual stated, "*I think we're still working with a lot of beginners. I think a lot of people are okay with technology and okay with using technology – like, they see its value. But not necessarily as an in-the-classroom aid to my instruction.*" It is this individual's belief that much of what the educators were doing with technology in their classroom were things they had done with technology for 20 years. It is important to note the individual versus school-wide skepticism of technology proficiency. Specifically, individuals were confident in their competency, but questioned the competence of the staff as a whole.

As a major component of implementation, interview participants were asked to describe how they were integrating technology into their classroom. One participant shared that she did not use a lot of technology in her classroom because the subject she taught was not highly supportive of technology. Rather, students in her class utilize their devices to take notes. However, this individual shared that "*of this whole school year, I think one student that consistently is, like, a notes-on-his-computer-type person*," but most her students did not utilize devices. When she did pull technology into the lesson, it was through the use of Google Classroom or Google Maps.

> *So we do that. We have a couple labs that we typically give, like, maps for Earth Science. And so –we give them maps, and then if we say tomorrow you bring your technology. And then if you have technology, we give it to them with coordinates for Google Maps. And then they can look at it that way, and so they use it then.*

Use of Google Suite was a common way educators were integrating technology in their classroom, with many stating that they used it almost daily with students. One educator shared that in his classes, students were asked to read an online article, and then respond to questions on a Google Doc.

> *We're using Google Docs every day. We use Google Slides frequently. We're obviously using [Google] Drive and sharing things with each other. Google Classroom is pretty much an everyday activity for me for distributing information, for polling, for questioning. So that's heavy. And then, I guess we've used some Google Sheets. Little bit of spreadsheet work, just tiny. And I'm not a math teacher, but there's been a couple places where it makes sense.*

> *And my resource class is essentially a homework class – organizational skills. They – this year, I've started doing a Google Classroom. And so I put some of my assignments on there. And some of my – and my assignments are very basic. What's your – what are your goals, how do we make goals, that kind of stuff. So I do that online, so most of those things, they can use just their phones.*

Alternative integration practices included moving a lot of what was previously done on paper into digital formats. One example of this was students shifting from creating an activity poster to developing a PowerPoint or Google Drive Slideshow. This has been helpful for educators as well as saved instructional time on things that could be developed more quickly and more practically.

> *I can just pair [a video] with a Google Form, which I do quite frequently with*

> *some questions, so they can watch the video and be answering the questions, and then that compiles all the answers for me really quick, and I can just put that in the grade book.*

Technology integration led to positive changes in the classroom format. One participant shared that Connected Classrooms had allowed her to increase the amount of content covered in her classroom because she had been able to flip[8] her instruction, making it much more tech-based than other subjects she taught. The process was simple because it was a junior-senior level course with students who were on a college-track and were more likely to bring and use devices in the classroom. Another participant spoke about the opportunities Connected Classrooms provided for educators to incorporate activities that would have been impossible prior to the integration of technology. A member of the TIT and an avid supporter of the initiative expressed that technology served an important and necessary means to visualize concepts in a new way. Specifically, this individual spoke about how the integration of technology had allowed her to plan lessons that would have been impossible to teach otherwise because it would require hours of blocked time rather than the 50 min-period blocks.

> *I mean, just – and the learning outcomes are still the same, what we want them to do. But hopefully they can see some things and make some connections in a better way between –our topic is quadratic functions and parabolas and the different forms of these … And with technology, we're hoping that they see that better.*

Another participant described her use of technology as random and that "*it's not always really structured and necessarily part of the lesson plan*." One barrier mentioned was the plethora of online resources for the particular subject. While this could be a

[8] Flipped Classroom: An instructional model where traditional classroom practices and homework are flipped. Students spend classroom time working on "homework," while time at home is spent watching instructional videos of academic content. (Arfstrom, 2014)

benefit, it also created challenges in deciphering what is reliable content and what is an opinion shared from a blog.

> *Today was a big device day. And everybody was on and watching videos. But usually it's more of a, look these definitions up. Or go to the Classroom – go to Classroom. We use Classroom. There's assignments on there quite a bit. So kind of as a portal to get to work.*

Lastly, a participant shared that she was able to bring so many real life things to the classroom. Previously she would have spent a lot of time purchasing and gathering resources, but now these were all things that were readily available on the Internet. Being able to bring variety into her curriculum without having to spend limited resources was a bonus for her.

> *And then I have them do, like, WebQuest-type things where I have them go find things through the Internet through links I've sent them. Video –having them independently be able to go look at different clips and interpret things. Audio. We've done a little bit of stuff with, like, online – like, websites – like, sort of Web 2.0 kind of stuff where you can, like –like we made mind maps online, and we did timeline websites.*

> *Or there's some third-party sites that you can pull in. Like Zaption is one where you can pull in the YouTube video and then create the questions at the part you want. So it'll play that much, and it'll stop, and a question will pop up.*

When asked about the degree of technology integration across the school, one educator shared that there were certainly some classes in the school where technology was being heavily used. One example was the school's Science and Tech-Education program that was expanding to include three to four periods during the day dedicated to students' learning how to write code.

> *We also have a –kind of route – like, there is technology – like, the tech ed department uses a CAD program. And there's laser printers and 3D printers that are used pretty extensively. I think that's more of an exploratory – just trying to figure out how this all works as opposed to let's actually design something and*

make something really, really cool and really useful here, but yeah. But it's getting there.

The photo classes are pretty steeped in technology as well as far as incorporating it into regular classroom. You need to be able to do this in order to pass this class.

Software was another topic that surfaced when educators spoke about integrating technology to their classroom. One educator described a software she often used in her classroom called Quizlet Live. This was similar to Kahoot, another commonly referenced app by educators across the school. Quizlet Live was an app that allows students to answer questions posed by the educator through response options on their device. Only a limited number of students had access to the correct answer, so students were expected to determine the correct answer and collaborate to identify who had the right answer option. Other apps that were mentioned included Desmos and Poll Everywhere. While they were reportedly perfect for students, there was concern that their use could be counteractive to the vision of the initiative because they relied on the use of phones, a direction the school was aiming to move away from.

I understand those – those are also kind of catch-22 because they get kids involved, and they can use their phones. But we're trying to, with our Connected Classrooms, to say that phones are not the technology we want them to have. So then we've got that, well, they've got the phones.

Stakeholder Buy-In and Perceptions

Administrative Leadership

As detailed in Chapter Two, having a leader, specifically a principal or an individual in an administrative role, spearheading the implementation is crucial to its success. In conversation with the principal about his leadership role in a school and specifically in championing a school-wide initiative, it was apparent that he possessed a clear understanding of the associated challenges and the importance of his presence and support. Contrary to other disciplines, leadership does not work when you say, "*This is what we're doing.*" In school settings, that is not how to create buy-in and not how to build support.

Priorities, support, and enthusiasm. During informal conversations with staff in the building, educators made mention of the declined priority of the Connected Classrooms initiative at the school level. This was said to be a direct result of the way the principal had been championing the work and the level of enthusiasm he put towards the initiative. The initiative was started and initially supported wholeheartedly by the principal. He held high expectations about the initiative and was an active champion of its implementation. However, his enthusiasm appeared to decline after the pilot phase and his perceived support began to wane after the start of the full implementation school year. Soon after, Connected Classrooms slowly began to fall off his priority list, and he was no longer seen as an active champion of the initiative. The declining priority of the initiative was evidenced by the lack of planned activity for Connected Classrooms, the lack of conversations about the initiative, and the lack of meetings with the TIT. Additionally, there were concerns about new staff in specific departments who were unaware of the initiative and its role in the school. The lack of knowledge by new staff members was indicative of the initiative's decreased school-wide importance.

A lot was learned from the educator interviews as a result of additional questions being added to the protocol to explore the pervasiveness of this idea. A major finding surrounding this theme was that while the majority of the staff recognized that the principal's general enthusiasm surrounding the initiative had declined, many expressed understanding of this shift given his competing priorities. This was also reflective of the TIT's opinions about the principal's leadership of their team.

Staff perception. During educator interviews, participants were asked to reflect and share opinions about the principal's leadership efforts towards the initiative. One staff member stated that the principal was not championing the initiative as heavily as he did in the beginning. This was echoed by another staff member who agreed that the initiative had fallen off the priority list, but immediately expressed a sense of understanding, stating that the diminished priority of the initiative was just the reality of running a school. As the school year progressed and other priorities emerged, the initiative slowly become background noise, especially in the face of contextual challenges at that school and district level.

> *Because I think there's other bigger things to worry about in a time of cuts than how we're going to get more devices out there and just using technology more…. More about, how are we going to maintain a school with less money?*

To understand why enthusiasm waned, one staff member cited the failure of the levy, the lack of cooperation and participation from educators and students, and other potential obstacles. Although this individual expressed a sense of understanding for the external factors that might have caused the reduced enthusiasm, she also stated, "*But I feel like it was a short period of time to try out a big initiative and then not follow through,*" reflecting that the excitement was too short lived despite the specific obstacles.

Some expressed that the principal's declined engagement was the reason the initiative was no longer viewed as important. It led to staff members feeling a lack of direction about where and how to move forward.

> *It hasn't been his number-one priority. It's pretty clear…..Yeah, he was – kind of got it started, and then kind of let us go. And nobody really had a great idea of where to go or what to do. But he hasn't really championed it. He hasn't really made an expectation for teachers.*

One participant offered a mirrored situation that reflects what she believed was currently happening to the Connected Classrooms initiative. As a staff member who had been on a school-wide committee to implement programmatic change, she understood that new changes were *"going to be met with resistance, frustration, exasperation, and skepticism."* Overall, she believed that the *"administration is both trying to make sure we do the best that we can while not trying to overwhelm us in an overwhelming situation."* This individual expressed understanding, recognizing that the principal was doing what he could, that there was no right way to do this, and that whoever was in charge would face some pushback no matter what they did. This sense of complete understanding was further evidenced in this statement, *"I feel like there's been so many changes that administration hasn't been able to really focus and support every single one because it would be too overwhelming for the staff. But in doing so, they have not supported any of them enough, and it's a no-win situation. And I don't think it's a blame situation."* Although this participant understood and appreciated the desire not to want to overwhelm the staff, she wished for more accountability from the administration, to provide assurance that if she was doing the work, the person next door was doing it as well. She was not alone in her concern of being an outlier in continuing to integrate technology in their classroom.

Principal perception. To provide an opportunity for the principal to speak on the opinions expressed by educators, he was asked directly if the initiative had indeed fallen off his list of priorities. Contrary to what was expected, he responded in the affirmative. This was surprising given the expectation that he would defend his continued support of the initiative, but instead, he spoke candidly about how the priority of the initiative changed for him. He shared that the initiative was no longer a priority because the school was so far from his expected goal, indicating a feeling of hopelessness.

> *I think it's because we were so far away from what we thought, and we weren't right there. We were like, "Wait a minute. We really have to rethink this," and so had we been closer, much closer, I wouldn't let it fall, but because we had such a gap between what we wanted to see and what we did see, I let it fall.*

Additionally, he mentioned that this diminished priority was a result of a staff that was trimmed significantly that year as a result of budget cuts. He recognized that they were spread far too thin and any additional activities would create challenges for the success of academic priorities. Acknowledging his response as an excuse, because if something mattered enough, it would continue to be a priority, he also acknowledged the reality of the cards they were dealt, highlighting the challenging context of which they started in. Moving forward, staff members agreed that in order to get educators to be excited about the initiative or to believe that it was a school-wide priority, the principal needed to renew his sense of support and enthusiasm and begin pushing the Connected Classrooms agenda with the same vigor as it was during the pilot phase.

Leadership Expectations

Part of championing the implementation of a school-wide technology initiative is setting clear expectations to guide the process. One expectation that the principal conveyed was the assumption that the school would have a 60% saturation level by December 2015 – three months into full implementation. Specifically, the principal expected that 60% of students would bring and use devices for academic purposes in the classroom on a regular basis by that point in the implementation. In actuality, by December that saturation rate was closer to 30%. In response to the principal's 60% expectation, one participant stated, "*I think he overestimated … by a long shot."* Additional thoughts about whether the expectations were too high included one respondent who said, *"I think that, in general, when he came into Presenty, he might have thought he was going to make it [affluent school in the metro area],"* highlighting a high-level expectation beyond the initiative.

When asked about additional expectations for Connected Classrooms, a staff member described the expectations as "*very open-ended. I mean, I don't think it was very, like, this is where we're going to be by Year One. This is where we're going to be by Year Two. I don't think there was that kind of expectation."* The respondent stated that the lack of clear expectations and goals made it difficult to assess whether the principal had expectations that were too high because, in their words, "*I don't know what the expectations were."* The issue as specified by this participant was that although they were moving forward and making progress, it was hard to decipher the value of that progress. Thus, educators did not know what the end goal was, and not knowing what the goal was served to complicate the process of reaching that goal.

> *We didn't have benchmarks, or we didn't have checkpoints. So I don't know that we failed to meet them.*
>
> *Because we didn't really have a plan. We didn't really – and, it was – and so it was kind of, "All right, well, we'll just go ahead and do this." "Well, what it is this?" "Well, we're just going to figure it out along the way."*

Educators

Educators are a key stakeholder to any school-based technology initiative. Buy-in and support from this group are essential to the success of the initiative and an essential component of the implementation. As such, to assess the degree of buy-in, educators were asked to share their perceptions and opinions related to Connected Classrooms and their general attitudes around the use of technology in the classroom.

Perceptions of the initiative. When educators were asked about their initial opinions of Connected Classrooms, there were many participants who expressed having positive perceptions or support for the initiative from the start. Those who reported having strong positive feeling at the onset of the initiative were typically educators who were already experimenting with integrating technology in their classroom. They had already bought into the idea of technology integration and were simply excited that it would now be widespread. One self-proclaimed "*full-supporter of technology*," who integrated technology in his classes "*pretty much every day,*" expressed excitement about the initiative because it connected well with the work he was already doing inside the classroom.

> *I was excited. I was excited. I'm pretty – I'm very comfortable with technology I've said, so the idea of having kids using devices more and the idea of having devices available would really appeal to me. And we knew these Chromebooks had been bought, and so I was very enthusiastic.*

For many, expressing support for the initiative did not mean they were without concerns and hesitations. Concerns about the initiative were so widespread that even members of the TIT, who presumably would be the ones in the best position to ease the concerns of others, had hesitations about the initiative. When a member of the TIT was asked about his initial opinions of Connected Classrooms, his response was, "*Well, I **am** Connected Classrooms*." Despite this individual being "*fairly well-steeped and well-versed in Connected Classrooms*" and playing an influential role in the planning of the implementation, he too worried about how to effectively get educators on board, how to effectively implement the initiative, and what the initiative would look like.

One participant who was already using technology in her classroom and understood its benefits also expressed some logistical concerns she had about what integration of technology would look like on a school-wide scale. Others expressed concern about the divide between early adopters and supporters and those who would struggle to grasp the use of technology, accessibility of devices, and connectivity of the wireless Internet. As a result of these concerns, there was a hesitancy in excitement for fear of what the initiative would be.

> *Just various problems with our network and desktops and things like that made me a little cautious of just trusting too much. And one thing goes wrong, and then I have a group of freshmen in front of me that have nothing to do, and it's a scary place.*

Other participants expressed feelings of nervousness upon hearing about Connected Classrooms. These feelings stemmed from concerns about moving from Blackboard to Google Classroom, obtaining the level of proficiency needed to integrate technology in the classroom, the already present distraction with cellphone use, and a general lack of information that was being shared. It was clear from the responses that many educators were comfortable with their current teaching practice and feared the challenges and frustrations they might face in attempting to master new practices.

For some their perceptions were related, in part, to the public narrative about implementing a learning technology initiative. One individual shared that her hesitation was quelled upon learning that the school was implementing a BYOD model and not a one-to-one model - which had become notorious with examples of implementation challenges. This individual was pleased that the school went the BYOD route and felt it was the best way to build an organic initiative. To this, she added, "*I don't think you can really create sustainable year-by-year plans with a big district, I guess. … I mean, technology is organic. It's changing all the time anyway. So if you ever try to create some training program, you'd have something new in four years, right?"*

While the majority of educators expressed simple concerns, others expressed having severe concerns about the initiative. One individual shared that after laughing out loud when he first heard about the initiative, his immediate thoughts were, "*How are we going to do that in our district, in our school? We don't have the money. We've got classes of 40-plus. How are we going to have this? I mean, we can't even buy enough calculators for the kids that don't get their own calculators."* This individual was not against the initiative, but questioned its feasibility in their specific context. Another participant who also expressed relief that the school would be implementing a BYOD model, rather than the alternative where the school would provide and issue each student their own device, expressed concerns that if students were given a device, some would sell it for profit.

> *So if it's their responsibility to bring it in, then they're responsible for it and they want – like, they've had to either work to get it, or they've had to make a deal with their parents or something that it's their – it's a responsibility on them, not on the school.*

Beyond hesitancy, there were some educators who had chosen to informally opt out of the initiative. According to one interview participant, there were some educators who were operating within the mindset of "*I'm just going to sit this out*," with the assumption that this was yet another trend that they could ride out until it was over and something new was tried.

> *More realistically, people close to retirement who are saying, "I'm just not going to do this. I got three years, I got two years, I got one year. I'm just going to ride this out." And so that is something. But with all the other things that are new, I can't even blame them.*

Overall it appears most the staff were invested and supportive of the initiative. While there would always be a few who exhibited resistance, "*most teachers are pretty enthusiastic about technology as long as it's – yeah, I think it has to be simple. And, again, asking them to do small things. Providing them lots and lots of nudges, but not a lot of . . . hard pushes*."

Shifts in staff excitement. From the data, it appeared as though the principal was not the only stakeholder in the school to exhibit a change in attitudes toward the initiative. This decline in excitement around Connected Classrooms was also observed among staff members. The general sense was that there was less conversation about the initiative between the beginning of the pilot phase and the data collection period. One interview respondent shared, "*I don't know if there's as much enthusiasm about it this year as there was last year when we were so excited to start. And we did, we kicked it off and – pretty good response."* At the start of the initiative when everything was new, many staff exhibited high levels of excitement, but as they faced challenges and setbacks, that excitement appeared to diminish. It was apparent that this decline in the degree of excitement began during the summer, as the staff did not come back after the summer with the same upbeat energy about the initiative, which was further perpetuated by the lack of activity and conversation in the school. This reveals the tension between having enough activity and communication to facilitate excitement and progress of the initiative, while remaining cautious to not cross the line and overwhelm staff.

> *But the enthusiasm was high last year. And then we haven't done the same things this year. There hasn't been [a]weekly information notice. There hasn't been – it doesn't – hasn't happened, and it wouldn't make sense to continue to do that because then it would be kind of overkill.*

Parents and Families

In addition to the support from leadership and buy-in from educators, a high level of support from parents and families is essential to the success of any learning technology initiative, especially BYOD. When asked about parent perception of Connected Classrooms, the principal shared that there were parents who supported the idea of technology integration and also those who opposed the idea. In his opinion, what separated the two groups of parents was not an economic or financial divide as many might assume, but a philosophical divide about people's understanding of the purpose of school and education.

> *Initially, when we started down this road, I heard, "It's about time," and then, "Look around, it's obvious, thank you." Then it could be an hour later, "I can't believe you're going down this path. When I went to school, paper and pen was good enough for me. It's good enough for my kid." I mean just fascinating, but you're talking about a whole public population, and you're going to have polarity in the population.*

According to the principal, efforts to inform parents about the initiative and gain their support were made through letters sent home, the school website, phone calls, and parent information nights. The challenge the school faced, which persisted prior to the initiative, was in communicating face-to-face with families. In his opinion, that was *"something that we haven't got better at. In fact, we've gotten worse at that probably in terms of results."* According to what was shared, as a parent, if your child was not the type to come home and say, "*This is what we're doing, and I need a device*," and you were not the type to visit the school website regularly, then your best way to learn about the initiative was conferences, and, if not, then you were in the dark. Despite multiple mediums being used to inform and engage parents, the principal believed there was more that could have been done, because while a few things had been done online and at conferences, the key focus had been on "*student/school implementation, not really considering families."*

> *We could have communicated more. I think we could have done those things multiple times. Some we did, but I think we could have done more, and we could have done communication. We didn't look at it as a communication plan over the course of time. We looked at it as a series of things to do. Any good communication plan looks at the timeframe and regularly picks their spots. We didn't think about it that way. Communications is kind of an ... Wasn't given as much attention as implementation, training. ... in a BOYD model, you better have parents with you and kids with you, otherwise you're out.*

Staff members shared similar sentiments about parent perceptions. According to participants, some parents expressed serious concerns about the initiative. Some were concerned about the academic effect on their children if they were unable to afford a device, and others were curious about how pervasive the initiative would be. Other families shared financially motivated pushback. Regardless of whether parents had the means or not, some parents did not want to spend the money on a device and did not wish for their child to use a school-issued device because the burden of responsibility for the cost of damages and theft would fall onto them. Lastly, others did not see the value in the initiative because they were unclear about why students needed devices at all when they themselves did not need devices decades ago when they were in school.

> *In the beginning, there was mixed feedback because there were, I think, lots of parents that said, oh, they need a – they need a device? Okay. We'll do that. And then there were others that really pushed back. I didn't have any. But I hear stories of other people who had said, "Nope, my – they're not having one."*

To assess what efforts had been put in place to garner support from parents and families, a series of questions and probes were asked about the ways in which parents were informed about the initiative. According to respondents, little had been done at the school level. Efforts to increase parent buy-in came mostly from individual educators speaking with individual parents. One example of this came from a member of the TIT who shared that after engaging with a few unsupportive parents and explaining the purpose of the device, the two children of those parents had devices by the end of the week. While this may not have been a common experience, it goes to show the impact of personalized communication.

> *It would be nice if parents were able to see, like, this is how they're using it. Because it is very different than their experience. When they were in high school, or now in their hometown.*

Despite parents' not understanding the need and value of devices, many participants believed the administration did what they could to convey the value and purpose of the initiative to parents and families, highlighting that parent sessions during conferences were often poorly attended. Inadequate efforts to reach parents and families led to parents' limited awareness of the initiative. When the TIT was asked about parent awareness of the initiative and if parents understood the expectation that students were being actively encouraged to bring devices to support their learning, they overwhelming said no. They attributed this to the fact that no information had been shared with parents that year.

> *Some parents – a lot of them don't have computers at home. Some parents do not use a computer at all at work. It's a different situation. I think we need to have parents, understand why we're doing this. But it's much more difficult than a place like [an affluent suburban district] where there's 99% buy-in.*

It should be noted that not all participants believed parents were unaware of the initiative. One individual believed parents were aware and supported the model as evidenced by the number of personally-owed devices present in the school.

> *They get the idea. The parents that I've talked with, at least. Whether or not they support, I think you would see that in the number of devices that are brought in since – especially for –juniors and seniors might have financial resources where they could buy their own device, but I would say that probably primarily it's parents providing the device.*

Lastly, one participant who admitted to not knowing much about what had previously been done concerning parent buy-in shared that she did not believe parents knew about the initiative. In her opinion, it would take a full cycle (4 years of incoming freshmen) before parents would buy into this because *"every time you make a change, it takes four years."*

Students

The final key stakeholder group of utmost importance in implementing a learning technology initiative is students. Support from this group is an equally necessary aspect of implementing a learning technology initiative, especially one that is highly dependent on the actions of students to provide their own devices. So much of a BYOD initiative is built on the assumption that students want their technology infused into the curriculum, but this may not be the case for all students. While some students may welcome the opportunity not to have to power-down at the school entrance, others who have mastered the art of traditional learning may not be supportive of the integration of technology. In assessing students' perceptions of Connected Classrooms, the principal was asked about his sense of what students knew about the initiative. Specifically, did students love it, hate it, or were they even aware it was happening? In his opinion, there were students represented on every point of the spectrum.

> *Probably all of the above. Some probably do, and they're the ones that are in the classroom with devices figuring out ways to integrate because their 9th-grade teacher is pushing them, and now, they're bringing it everywhere. They know. Some kids have no idea, and some kids don't like it, like actively fight against the concept. We have all three camps, no question.*

In his opinion, if you were to walk into any classroom in the school, each of those groups would be represented. You could easily spot the student with his or her device and school-approved sticker; you could identify the students who had no clue what was happening around the initiative, and, albeit maybe difficult to spot, there would also be students who were actively against the initiative. This belief was supported in part by another staff member who believed Connected Classrooms was business as usual for most of her students. Last year, when the initiative was new, everyone had an opinion about it, but now students had moved past their initial opinions, so *"the kids that use them love it. The kids that don't use them don't really seem to have an opinion."* In general, the perception was that students were largely in favor of the initiative and their degree of support had improved from the beginning of the year when students would complain about why they had to do this. Other participants stated that most students were on board and that their buy-in was directly correlated to how often educators were requiring use of their devices in the classroom.

> *And a lot of my kids, at the beginning, they were asking, like, why are we doing this every day? Why are you making us do this every day? And now it's – they don't ask that question.*

> *I would say – I guess it depends on – I would say most students would be on board with it. I think when you talk to a student who has a class where they're filling in lecture notes, and it's a very traditional PowerPoint versus a class that's more interactive and has uses of technology kind of built in or incorporated in.*

Beyond perception of support, there was also an understanding of the benefit the initiative had for students. One benefit is student organization. It has reportedly been very helpful for some students to electronically send assignments and have a digital confirmation, rather than risk losing assignments. Others added that students appreciated the flexibility and variety the initiative offered them.

> *I think students like –they have a little bit more freedom. It changes –it's a lot of variety, I think. Or it adds variety. Maybe not a lot of variety, but it adds a variety to what they do. So it's not all sit, listen, take notes. They have times where that's what happens, but they also have opportunities to be a little bit more self-directed in their work.*

Although not directly about student perception, one participant spoke about how students were using technology to take more ownership of their work. In their opinion the difference between students who were utilizing technology and those who were not was evidenced through how the different grade levels engage with school: *"Freshmen ask me, 'What am I missing? What am I missing? What am I missing?' Seniors come to me with the app on the phone and say, 'What's this thing that's missing? How do I do that?'"* This was a reflection that students in older grades were more likely to utilize devices in schools and use their device to exhibit ownership of their learning. Lastly, one participant shared that she found this initiative was natural for students *"because they've been connected to technology all along, so why shouldn't they be connected to it in the classroom in school?"* For many students, integration and utilization of technology were not an added benefit, but a basic expectation. Although not all students had bought into the initiative, staff and administrators believed they were doing the best they could given the reality of working with high school aged students.

Access to Devices

The implementation of any learning technology initiative, be it one-to-one or BYOD, rests on the success of getting devices in the hands of students. If this goal is not adequately met or sustained, any initiative will inevitably fail. From the data that were collected, it appeared that a major contributor to the challenges the school faced during implementation were the low levels of device saturation in classrooms and at the school level. There appeared to have been several assumptions that went into this initiative, including the assumption that a greater number of students would own devices and would want to bring them to school and use them to support their learning. Unfortunately, this proved not to be the case. The following sections will discuss students' access to devices, school and classroom saturation levels and detail the potential rationales why students chose not to bring devices.

Chromebooks

While the school believed a sizeable percent of its student population would have access to personal devices, staff knew they would need to fill the gap between students who would have access to a device and those who would not in order to reach a near 1:1

ratio. To this end, close to 450 Chromebooks were made available for students to check out at the start of the pilot phase. To be issued a device, students were required by the school to complete a user agreement assessment with questions related to basic use, common language, and expectations of technology use in the school. Students were required to obtain a perfect score on the assessment in order to receive a sticker, to be placed on their device, indicating completion of the assessment. The device was to remain in the students' possession for the duration of the school year. Priority of these devices was initially given to students with a demonstrated financial need as indicated by their free and reduced lunch (FRL) status, with the assumption that these students would have the greatest need for devices. However, after the realization that many of the devices were not being utilized, the financial need priority was lifted at the start of the full implementation school year. The guidelines were then changed to reflect a first come, first served basis regardless of expressed financial need. The decision to modify the priority guidelines was in part because not enough students on FRL opted to check out a device, and, as stated by the principal, "*Even though they were on free and reduced lunch, it didn't mean that they didn't have a device that they could bring*."

The change in guidelines was met with confusion as many thought it was simply a rumor, but once the new guidelines were properly communicated, the devices were quickly all checked-out. This change was beneficial for some populations of students and not others. For example, AVID students who were highly determined, but lacked the financial resources to buy a device, were eagerly motivated to obtain a school-issued device. But other students who may have needed a device, but lacked the same motivation and self-initiative found that the devices were all checked out by the time they decided to obtain one. Luckily, this was but one of two options for students to utilize school-owned device.

Technology (Tech) Carts

Another option made available for students to access devices during the school day was through the use of tech carts educators could check out for their entire classroom. There were four tech carts containing about 30 to 35 netbooks that an educator could obtain if they were planning a technology lesson for their class period(s). As a result of low personal device saturation, there existed a high demand for the carts. According to one participant, high demand for the carts meant needing to plan a trimester in advance before having access to a cart. Although the devices were a viable alternative, many mentioned they were of poor quality. One individual who admitted to having secured the use of the tech carts described the devices as akin to a cordless phone due to their speed and quality. However, having to use a poor quality option was the consequence of students failing to bring a device.

Why Students Did Not Bring Devices

As mentioned above, the lack of device saturation was the biggest challenge the school faced with the implementation of Connected Classrooms. Students were not bringing devices to school, and while there was a substantial number who did not own devices, the quantitative survey data to be presented in the following chapter revealed that survey respondents overwhelming owned digital devices, but chose not to bring them to school or use them for academic purposes. When the TIT was asked why students who owned devices did not bring them to school, the primary response was that the devices were not used frequently enough to motivate students to bring them, "*so a lot of kids are thinking, why bring it if we're not going to use it?*" Rather than carrying a device to school and only using it for one or two class periods, students preferred to use their phones, a smaller lightweight device they already carried with them, when possible. This aligns with what students shared in their survey responses.

Another common rationale heard by educators and expressed by students in the survey for why they did not bring a device was fear of theft or loss. The principal admitted that devices and phones at times did come up missing and added that part of the problem was a lack of responsibility for personal property. Despite the percent of stolen items being relatively small, he acknowledged that all it would take is one stolen device for the narrative of theft to become an issue.

> *I mean things do get stolen in schools, no question. We had a device get stolen this year, so kids' phones go missing, and I think that's probably a big piece of it.*

Another rationale that was brought up during the educator interviews was the role value of education plays in whether or not students brought devices. This value of education idea was typically coupled with the belief that the students who did not bring devices were generally the students who would not bring textbooks or other materials and thereby did not value their education regardless of the academic tools. The principal rejected this notion on the basis that students would sometimes show up prepared and ready to learn in one class and be completely unprepared in another. In his opinion, the degree to which a student values or does not value education is not comprehensive enough to help understand the differences between device-ready students and device-not ready students. This calls attention to other variables: educator, instruction style, degree of integration, etc., as potential explanations for why some students attended school device-ready while others did not.

When the TIT was asked about what was specifically being done to encourage students to bring devices, sounds of laughter could be heard in the room. According to them, not much was being done at the school level, but educators were employing specific tactics to increase device saturation in their individual classrooms. One member of the team shared that consistency in the days when students were expected to bring devices helped to improve the class saturation rate. For example, "*Every Wednesday, Thursday, Friday is device day. And they just know that they have to bring a device that day. There's really no incentive to it, but they just know that's going to happen."* Others mentioned that the structure of their classes was simply designed in a way where students were better off if they brought devices, and they quickly recognized the academic incentive to have a device.

> *So they might have to do [assignments] at home. They might have to come after school. They might have to go to do it at TITAN academy*[9]*. So I think that has kind of been an incentive for some students, if it's easier now to bring a device in my class.*

> *Well, in art classes, all the demonstration scaffolding for all the projects are [sic] available online. And so a large part of our class is walking around and . . . getting individual help. And there's only one of us and 35 of them. And so if you want your questions answered, and you want the knowledge, you can just have it right there. And . . . just always kind of advertise to kids that do use it, it helps a little bit.*

School-wide device saturation. Device saturation across the school was varied, inconsistent, and dependent on a number of factors not limited to classroom make-up,

[9] Titan Academy was a program intended to provide additional academic support for students. Teachers volunteered and rotated through to supervise and offer assistance.

trimester, grade level, etc. By December of the full implementation year, the school wide saturation rate was about 30%, much lower than was expected. This was a likely result of the school's flawed assumption of the saturation levels during the planning phase. Additionally, there had not been an intentional school-level push to improve saturation levels during the implementation process. According to the principal, only after they addressed the issue of saturation and increased those rates could they regroup and alter their practices and *"look at specific focal areas in getting devices into kids' hands versus this one-to-one model."*

> *That was our big issue, and so if we can't get the 60% saturation in every classroom, then the teacher is not going to dependably integrate these elements. … I can't remember our estimates, 30s, 30% because we didn't do any polling, we didn't … I should have said we had some small scale polling with 9th graders, but beyond that, we didn't do it.*

Device saturation levels between classrooms were equally varied. Some classes experienced a high level of success with device saturation and others did not. One educator shared that her classroom device saturation had declined, and while it was difficult to give an accurate number, she estimated a 50-60% saturation rate. Others echoed similar rates. Another participant shared that in two class periods of mostly freshmen and sophomores, the device saturation was close to 100%, but that was not the case in another class they taught of students at the same grade level. A math educator reported a 25% saturation level. An educator with high classroom saturation rate reported having 80+% of students with devices in the classroom. She attributed this to the fact that they were mostly English Language Learners, and there was a strong push to get devices in the hands of these students and encourage them to bring them daily.

> *But that's because we've been so intensive about it. We spend a lot of class time*

getting them on their devices and going. We went out of our way to make sure they got Chromebooks.

And my class is – so we've been using it – I mean, we use it every day because I push so hard them on the technology. So I have them – I have my laptop. My co-teacher has his laptop. We have this computer. We get kids on a computer. We find a way to get everybody on a device. But that's because we have small classes, and we pushed so hard in the beginning.

One member of the TIT believed the reason the saturation rate was so high in three of their classes was a result of the type of students in the class. The majority of students in those classes were accelerated or Advanced Placement (AP) students from affluent backgrounds where more students had access to a device. The devices in those classes ranged from school-issued Chromebooks to personal MacBooks. The saturation rate of this class was completely different from other classes where educators needed to constantly badger students to bring devices. However, another participant shared,

I think I have better luck with my AVID students who come from very diverse backgrounds and socioeconomic statuses. I think it's almost ... easier to get them to bring a device. So their families understand the importance of that. And I don't know that there are underlying cultural things to that. But I have found, actually, when I polled my AVID students that more of them had devices than my – than the three classes, which are predominantly white.

This comment was followed by a conversation about AVID students who were college-bound and seen as having a mindset that recognized the importance and value of education – another presumed contributor to the varied classroom saturation levels. One respondent stated, "*The kids that are on the college track are knowing that they need it for college. . . so they're a little more likely to get one because it's important to get something and learn how it works before you go.*"

I had a student the other day in my ... class who was complaining because she didn't have a Chromebook. And I said, well, why didn't you go get one when they were free to check out in the fall? Well, I just didn't want to do that. So I think

> *there is a lot behind – it's not necessarily an access issue. It's more of a mindset issue.*

The participants from the TIT agreed that more than an issue of income and access, another factor in the difference between saturation levels across classrooms came down to the mindset of the student and the degree to which the student and their family valued education.

Given all the various factors that go into whether students would bring devices to school or not, it was hard to predict or determine a pattern for which classes would have high device saturation and which would not. The complexity of this saturation formula created serious challenges for the school in determining how to increase saturation rates, because in order to increase the rates they must first understand the factors and individual barriers that stand in the way.

Shifts in student device saturation. As the implementation progressed, changes occurred in the saturation rates. Respondents spoke about how students who previously brought devices at the start of the initiative no longer brought them as the year progressed. There are a number of potential rationales for this year. For starters, as students began to realize that other students who were not bringing devices were getting along just fine, those who did bring devices started to question the need. The desire to bring a device started to wane and created a domino effect as more and more students opted not to bring devices. Another potential rationale for the change in device saturation was a result of broken and unrepaired devices. One respondent stated that in one class they had a saturation rate of 80% at the start of the year, but that number had fallen as devices broke and did not get repaired or replaced. A third potential rationale was that as students transitioned between trimesters, if the degree to which their educators integrated technology into their class decreased, students would change their habits to match that level of integration. Specifically, if a student moved from a trimester where four or five of their educators required the use of a device, to a trimester where only two or three of their educators required the use of a device, they might no longer feel the need to bring and carry a device for such limited use. This notion was supported by the principal who believed students did not bring devices because they had no need for one. Not enough of their educators were integrating technology in a way that warranted the daily use of a device in the classroom. He also added that some students had successfully mastered the art of schooling without the use of a device, and they were not interested in changing the game. The use of technology and devices pushed some of the students out of their comfort zone and complicated a process they had already mastered.

Understanding the cause of saturation level changes is one thing, but measuring changes in saturation over time proved be challenging due to the question of what gets counted as an approved device. During the previous year (pilot phase) cell phones were not an approved device, however, during the first full implementation year, the guidelines changed and students were allowed to use cell phones as an authorized device with educator permission. So, if an educator had a classroom saturation rate of 60% during the pilot phase and an 85% saturation rate during the full implementation year, it is not accurate to assume a 25-percentage point growth. Specifically, the 60% might include only approved device (laptops and tablets), whereas the 80% might include 40% of students with a non-phone device and the remaining 45% with cell phones. So in actuality, the saturation of previously appropriate devices may have declined by 20 percentage points.

Assessment of Implementation

Overall Successes

Despite the challenges associated with the first year of implementation, it was important to discuss the successes and achievement of the implementation. The TIT was extremely proud of the prep work they completed to support the implementation of Connected Classrooms, including the development of the implementation plan, the buy-in of the staff, the engagement of late adopters and potential obstructionists, and the role of their technology specialist.

> *We went to [affluent suburban district] and [affluent suburban district], and we put together a great plan. I think – I don't know, just all of our teachers coming together is really unique . . . But it's a ton of work.* ***…****I am really proud of all the stuff that we did.*

> *We just had one today talking about old dogs learning new tricks. And he wouldn't mind being told that, but he came into our lunch today, of all places, to ask about a Google form-related question. And … you're talking about a guy who's, number one, a [subject] teacher. Number two, about two years away from walking out the door forever, and he's still at least interested in it.*

In addition to group level successes, examples of individual successes from the TIT included one participant who achieved a 100% saturation rate in one of his classes and another who started seeing evidence of 21st century skills in their students.

> *One of my greatest successes that I've just seen in students is their ability – kind of like what [educator's name] was saying – to think about, okay, the teacher isn't here. How can I – where can I find this information? And I think that is a – is a huge 21st century skill that these kids are finding that collaborative. And not just collaborating with the people – with my teacher, but the people that are in the outside of the world that are doing things very differently. So I think it's opened a lot of doors to other perspectives somehow, and they can find information from other sources.*

Others shared successes of designing an online lesson where technology was required and watching the students find creative uses of technology to complete their assignment, and another participant mentioned their students asking for access to more information on Google Classroom. For this individual, it meant that students were taking the content seriously and wanted more material to use and explore on their own.

> *I think when I had, like, 20% of my students asking me to put more stuff up on my Google Classroom so they could watch it at home. Middle of last trimester I was floored. Like, you want to listen to me talk more? On your free time? That's, like, crazy. You should transfer. [laughter] … I just threw the Google Classroom together and all the videos because I figured, well, I mean, I should follow through completely with the implementation, and the kids really like it.*

> *We have iPads that we got for ninth-grade science. And so those have helped a little bit. But just seeing the online – the actual online assignments, I like that. And I haven't done a ton of them, but we have done some, and when those start coming in, that's just a – then it's like most people are getting this done . . .*

The implementation successes shared by the principal included a steady increase in the degree of technology integration from the previous year to this year and the positive experiences some students were having with the initiative. Additionally, the training around the use of software for educators had been a huge success. Overall he saw the work they had done over the previous year and a half as laying the groundwork for something later. They had been able to bring a team together and create a path for something more specific. It helped to have the concept in the minds of the community and the school. But while he was able to see the highlights of the previous year, in assessing the past year, he had this to add: *"But in the end, if you are to say if it's a success or failure, certainly a failure. I mean no doubt about it. We're not where we wanted to be, and I don't like that. I don't like those, I don't like failure."*

Challenges

Pulling off a school-wide implementation without any challenges would be almost unheard of in the K-12 sector. However, when the principal was asked if some challenges and failures were to be expected given that they were merely a year into an implementation process that can take upwards of 6-8 years to be stable and sustainable, he firmly stated, "No." When asked what he thought they could have done better, he said,

> *I think if we had done a better job of conducting our needs assessment, we probably would have broadened our plan. Probably would have went [sic] into a 2-, 3-year plan.*

In addition to the principal's admission of the need for a needs assessment and multi-year implementation plan, others shared other perceived challenges as well. Below is an overview of key areas in which challenges were discussed.

Lack of devices. The first set of challenges was the lack of devices. Not enough students owned or brought their own devices to school, and the school-owned supply fell short of the number of students who needed devices. With four or five computer labs, four technology carts of about 35 devices each, not all of which could be expected to be functioning, and around 80 to 90 classrooms full of students each period, there simply were not enough devices to go around. One individual admitted that the school *"overestimated how many kids would bring their own. Like, we thought we would have a lot."* As a result of the lack of devices, educators shared that when checking out a technology cart, it was best to plan for a 2:1 ratio of students to netbooks, because so many of the devices in the carts were not functional. Additionally, before the mobile carts, getting access into one of the computer labs "*was like buying your weight in gold,"* especially when competing with English classes that often utilize time in the labs for writing.

The effects of low saturation. The lack of devices caused a trickle-down effect of additional challenges related to low device saturation in the school or classroom. One of the biggest consequences of low device saturation was lesson planning. Since some students had devices, while others did not, some educators often felt the need to create a lesson for each group. The additional burden of this meant that for some educators, if the saturation levels continued to decline, the burden of integration and creating dual lessons would easily outweigh the positives, leading them to stop integrating into their classroom.

> *. . . if I start reaching a point where it's under 80% saturation, I'm going to probably have to stop requiring – and it'll change my teaching. I'll have to go back to more paper-and-pencil. I'll have to go back a lot more hands-on stuff because it's just – I can't expect kids to do things. It's not fair.*

A second effect of low saturation was inconsistent integration across the school. This inconsistency was a result of limited expectation for educator integration. The principal admitted that they "*didn't systemically build any expectation around integration. We backed off it . . . because of what we saw in the classrooms with our students."* When asked why basic expectations were not initially put in place for integration, he shared that it was because of the belief and assumption that educators would independently wish to integrate technology or be compelled to do so to meet the demands of their students' actions. The assumption was that "*If you have 60% of your students in your room with devices, you'd better be on board or you're lost, you're in trouble*." However, with the reality of low device saturation, few educators felt any pressure from students to integrate technology into the curriculum, thus integration was low and inconsistent, giving students reason to not being devices.

Urgency of the need for devices. A contributing factor to the low number of devices in the school was the lack of urgency students felt about the need for a device. However, every alternative or leeway that was provided to supplement access to devices served to fracture the sense of urgency for students to truly buy into the initiative and do their part to bring devices. In reality, the alternative options only served to cement in students the mindset that they did not need to bring a device; "*I don't actually have to bring one. Because if I really need one, the teacher will make sure that I have one."* According to an interview participant, students heard that they needed a device, "*but then they're also hearing 'but I'll kind of give you one*'" if you choose not to bring one. To this end, an active contributor to the fractured sense of urgency for students was educators' use of technology carts. While some participants believed the more carts they could have, the better (to increase access to devices), one participant suggested the school eliminate the use of tech carts entirely because *"they're enabling. And . . . they're horrible. They're the worst – I mean, they're just not in good shape."*

> *. . . I think we would really need to get the students to bring things. We would have to stop giving them devices. Right? We have all these connected classrooms, but people still sign up for the labs. And people still sign up for the mobile carts so they can take the mobile carts to their classroom. Well, if I'm a student, and you're going to bring me a computer, even if it's a crappy netbook from the mobile cart ... you've done the hard work for me.*

This surfaced the question of where the line should be drawn in providing devices for students. When asked if the availability of carts stifled the pressure on students to bring their own devices, one participant did not believe so. According to her, even when educators intentionally did not secure a tech cart, there remained no sense of urgency for the students to bring a device.

Quality of devices. The quality of school devices posed a challenge to the implementation. The Chromebooks were described as poor physical quality and fragile, and while they were of better quality than the Netbooks, they were still far from the best on the market. When the devices were working, they were great, but there had been so many issues with chargers that many of them were constantly defective. In the opinion of one educator, the fact of the matter was that you get what you pay for: "*When you buy the $170 Chromebook, you're getting a piece of plastic that's fragile*."

> *There are about 35 laptops in each one cart. About 28 of them are in working order. And those, you often have to start – the student has to log in, you have to realize that it didn't work, you have to do a hard shutdown. You have to restart it. Every time a new person logs in, it takes, like, three to five minutes to load their profile. It can take 10 minutes for a kid to get on the computer.*

The challenge of poor quality devices was not isolated to school-owned devices, but also to students' devices as well. The challenge with students' lack of access to a device was not always about not being able to afford a device, but rather not being able to purchase a quality device with a reliable battery that could hold a charge for the duration of the school day.

> *I mean, a lot of our kids can maybe afford – I have kids who have computers from Pawn America. But those things are broken all the time. And they're crashing all the time, so I think maybe, from a sort of 30,000-foot view, you say, oh, look, like, 30% of the kid have devices. But another – half of those kids have devices that really aren't up to snuff.*

Poor quality devices decreased reliability, increased the likelihood of students experiencing problems with their devices, and decreased the complexity of activities educators could plan when integrating technology into their curriculum.

Expectations and accountability

Students. Another challenging area that surfaced was in accountability of students who checked-out school-issued devices, but did not bring or use them at school. In defense of those students, one participant stated that students were essentially asked to purchase or check-out a device that was never being used, so they could not be faulted for never bringing it. Similarly, unless an educator made use of a textbook and required students to open the textbook, most students would not bring their textbook to class and they would never open it. In that vein, students *"learn pretty quickly they can leave it in their locker or at home . . . and they learn pretty quickly, why am I lugging this thing around?"* Those who referenced this issue saw it as a grave concern and offered potential solutions to keep students with school-owned devices accountable for bringing them to school regularly. One participant suggested a system that allowed educators to know which students were in possession of a school-issued device. That way educators could intervene and provide the necessary accountability by informing students that if they were not going to use their device as intended, it needed to be returned so another student could have access to it.

Educators. Similarly, there were challenges around the degree of integration educators were expected to achieve, specifically, whether or not there should be an expectation for integration and subsequent repercussions and sanctions for non-compliance with those expectations. One staff member expressed hesitation with this line of practice given that adequate training had not been offered to educators. So while there was no requirement or expectation of integration from the principal, some educators felt a level of pressure from students themselves.

> *I think there is a little pressure from the principal, and I think there's a lot of pressure from students. Like, I – initially, last year, when I was using Kahoot and, like, Google Classroom, and I was probably one of the first 10 people in the building--maybe not even that--and I would hear students saying, like, "Oh, I'm going to go tell my social studies teacher."*

Although some participants felt a hard fast requirement of integration might lead to negative consequences, they would have appreciated some accountability measures put into place to ensure that educators were adequate in their integration of technology.

User agreement assessment. A tangential challenge to getting devices in the school, as shared by one participant, was the process to obtain permission to bring and use a device in school. As previously mentioned, all students had to complete a user agreement assessment in order to use a device (personal or school-owned) during the school day. The purpose of the assessment was in part a contractual obligation to demonstrate that students were aware of the rules and expectations around technology use in the classroom. One participant described it as an "*absurd test. … it's a super, super difficult test with complex language that stumps our students."* According to this participant, the 30-question assessment was made up of poorly written questions, increasing the difficulty for ELL students. This individual admitted that due to the poor quality of the assessment and because students were not able to pass it on the first attempt, they would often assist students in completing the assessment.

> *I've been taking it for kids, and we talk through it, but I'm not going to torture them, and I want to give them a device. And if I had to let them do it on their own, it would be months before they would – I mean, they would give up. They would stop trying.*

While educators agreed it was important for students to be held accountable to the rules, it was questionable whether the assessment did an effective job of teaching students the rules and expectations of use. Rather the assessment measured how well students could read and answer questions. Additionally, this participant perceived issues of equity related to the way the assessment was set up because students were expected to find time outside of the school day and have Internet access in order to complete the assessment. For students with limited or no access to Wi-Fi at home, barriers were already being met with the first step.

Professional development. The lack of opportunity provided for educators to develop skills to effectively integrate technology into their classroom created a challenge and a hindrance to increased levels of integration. Even when professional development opportunities were offered, some educators found little need for the low-skill level offerings due to their advanced proficiencies. And while unstructured time was provided in the labs to work, the lab was often packed with educators of various skill levels, and those at expert levels were asked to help those with lower skill levels, leaving them no time to complete their work or advanced their skills.

Participants also vocalized an issue about the scheduling of professional development offerings. Professional development days were typically held on staff development days and were scheduled with back to back meetings. The challenge this presented was that educators needed time to complete work in their classroom. So when trainings were added to staff development days, it was done at the expense of educators' work time, forcing educators to choose between completing tasks in their classroom or attending a training – which may or may not prove to be a worthwhile use of their time.

A final issue participants expressed about professional development was the lack of feedback or input that was solicited from staff. Educators had not been asked about what trainings they needed or what skills they wanted to develop, leaving staff members to reject what was being offered because it did not meet their needs, and leaving them to choose between sessions they did not need. The challenge of finding appropriate professional development training for staff was that while some staff members were ready to forge ahead, others needed more practice with the basics.

> *I don't think there's a lot of consideration being put in for what might be needed. It's just, oof, we gotta do something. All right, let's do this. I've heard so-and-so needs this, so let's all do this …– we do have choices, but the choices – if I only have four choices, and I have to choose two of them, and none of them are going to help me, they're not really a choice.*

Wi-Fi connectivity. Although the Wi-Fi network had been updated three or four times in recent memory, many were still dissatisfied with its quality, and, even if one was able to connect, the slow pace was unbearable. The unreliability of the Wi-Fi made some participants hesitant to integrate technology into their classroom. As a result of such poor connectivity in the past, many were unaware of whether it had improved and thus chose to avoid Internet-based lessons altogether. A participant shared that recently, there was a district-wide issue with the Wi-Fi for the first half of the day. Situations like this left educators who had planned a technology day with no idea about what to do with students during that period. One big failure in connectivity is all it took to leave some educators feeling defeated and not wanting to take the risk again.

Burnout. Connected Classrooms was just one of many tech-related shifts that had occurred at the school over the previous four years. Previously educators were using Outlook email for communication, and about three years ago, they shifted to gmail, requiring everyone to move everything to a new system. During that time, the school operated a Blackboard classroom system and gmail email system. It was only recently when the decision was made to shift from Blackboard to the entire Google Suite, requiring staff to learn how to migrate everything to Google Drive. The back-to-back software changes led to frustration and burnout from educators and a hesitancy to jump on board with the new initiative. Ultimately, this impacted the degree and pace at which educators bought into the Connected Classrooms.

Miscellaneous. The final challenges that surfaced included the distracting nature of technology in the classroom, issues of Internet access for all students at home, educators' level of technology proficiency, and lack of communication and clarity around the initiative. In the absence of leadership and clear outcomes, the lack of communication and clarity of details served to create implementation challenges around getting buy-in and support from educators. Many saw this as a direct result of a weak plan that did not address all of the necessary implementation components.

> **...** *especially early on in the process, people were a little confused as, like, who's setting the expectations, who is communicating about this, when are we starting things, who's making decisions about it. And there's still some unclarity about kind of communicating with the staff in a large way about what we're supposed to be doing and how are things going to flow.*
>
> *No one's really in charge. And there is no, this is where we'll be in so many years. That's just not present. … There's no plan. And that's, I think, what we need to – need to have.*

Additionally, conversations surfaced around the challenge of educators' lack of comfort with technology and low levels of technology proficiency. As a result of their low proficiency levels, a lot of time was spent getting the staff to a place of comfort with improving their skills. The issue with this was that people who perceived that they had too much to learn quit before they even started. They shifted from being a potential late-adopter to a never-adopter.

Overall Effectiveness of Implementation

Educators were asked to rate, on a scale of 1-4 (with one being low and four being high), their perceived effectiveness of the Connected Classroom implementation. All participants rated the effectiveness of the implementation at a two. Below are the rationales participants provided for their ratings.

When one participant was asked about her rating, she spoke about how only half of the staff had bought into the initiative, with few others showing interest in doing so. In this same vein, another participant, who reported that she would have rated the implementation a 1.5 if the rating did not have to be a whole number, also attributed her rating to staff attitudes buy-in and their lack of proficiency.

> *So without having gathered data, this is my perception, that I see some of my colleagues that do know how to use it, but have sort of given up on, well, they just don't bring it anyway, and it falls apart. And then I do have some other colleagues that are still a little behind –not able to use it proficiently. And so that's just my perception. And some of my students claim why they don't bring it is no one uses it. So two is probably generous.*

Another shared that what kept their rating at a two and not a four was that while educators were using technology, they were not using it in integrative and engaging ways. Although it was great that educators were using technology in their classrooms, it would not be as effective as it could be and students would not understand the importance of technology if the integration was not engaging.

> *I don't know necessarily if people are – myself included – really looking at technology that's engaging student learning. And I think – or strategies that go with technology that would engage student learning. So, like … it's great that some of us are using technology, but it's not all of us. …And so until some of us – or, until all of us are using technology, it's just not going to be as effective. You're not going to get that message across to a student that's this is what we need to do.*

Others also spoke about the proficiency levels of students and the lack of resources as contributing rationales for their effectiveness rating.

> *What I like is a lot of students are really familiar now with Google Classroom, Google Docs. They can do the Google platforms pretty well, just the basic stuff. Like how to collaborate, getting feedback, things like that. There's still times where I have to show them little quirks and things like that. But for the most part, I would say we're about 50%. We're –we've got – the majority of our kids are using these – the basic Google stuff for education.*

> *I think we're making – we have the right attitude towards it. I think people are – people want to do it. But I think it's just, again – I think it's all about resources.*

There was one individual who provided sub-scores and rated the effectiveness of implementation a three for educators and a two for students.

> *I would say, for teachers, we're at a 3. We're working really hard. We're getting together in groups and learning communities and collaborative teams, and we're trying to work really hard to get all of the staff on the same page. Students-wise, I'd say it's a 2. Obviously, getting them in everyone's hands has not been a successful endeavor thus far. And that's why I would say teachers are at a three because there's too many questions that are unanswerable. And there's no right answer. So I don't know if there's any way for us to ever get to a 4. I don't think it's possible with almost any education agenda [chuckles] to get to a 4 out of 4. But I think we are trying. But I do believe we're behind where we'd want to be or should be if we're going to make this successful.*

In her opinion, while the school was not where it should be a year into the implementation, they were where she expected them would be. Her explanation was couched in the fact that she was not part of the TIT and was not aware of the projections and implementation expectation, so all she knew was what she had heard and what they had attempted to do.

When others were asked if, after a year, this was where they expected the school to be with respect to its implementation, one participant spoke about how the lack of specific outcomes created a challenge for assessing adequate progress. This sentiment was broadly echoed by many who were also unsure of how far the initiative was expected to have progressed by that point in the year. However, in the absence of appropriate data or measures, many expressed confidence that the school as a whole was on the right track and that things were moving in the right direction.

> *Well, we didn't really have these specified outcomes, which I think was a problem from the get-go. Because it's tough to say, are we meeting where we wanted to be? Right? So I think – that's tough. In some ways, we are really struggling. And in some ways, I think we're okay. We're on track as far as – things are happening. We're struggling with things, but that's okay because things are moving in a good direction. It's not, if we were at four right now, if everything was perfect, I'd be more worried.*

> *I think we're – we've made progress. I mean, I think that's the positive side. We've definitely made progress. I think that some of kids are becoming more and more capable. I think some of our kids have really learned a lot about technology that they just didn't know before. Something as simple as, like, crafting an email, sharing a document collaborating on something digitally. It's something that they would not have gotten were it not for this initiative. So there's some really, really important skills – workplace skills. And talk about college and career ready. That's happening.*

Others who spoke about the effectiveness rating with more optimism highlighted that, given the context and the process, the school was right where it should be in its implementation efforts.

> *I mean, I think one thing that we talked about with [the principal] was that it is going to take a while. I mean, not just to get staff on board, but then to also counteract the changing demographics and some of the issues that we face, like, with our free and reduced lunch population and providing access to those students. The turnover from –we have a year, and then we lose these students. And then we get new students that have to be retrained and retaught. And so, in looking at the lower grades, are they doing things to help the process –ease the process into it, too? So I'd say it's pretty fair that we are where we are. I think we're in a really good spot. I don't think – I don't think we need to worry about it. I think we just need to stay the course.*

In discussing what more needed to be done moving forward to improve the rating score from two to four, the shared missing piece was about infusing the use of technology and skill building courses in the school-wide curriculum.

> *We have a long ways to go in terms of – saturation is a nice word for it. I think we should have more classes built around just technology in general. I think we kind of – we have a few. I don't think kids are even aware – I don't think they push them hard enough. I think they should be telling, like, you all should take word processing. And maybe you should all take, like, intro to programming to at least understand what a program is. I think there's a lot more – maybe if we had more classes built in to support the kids, then maybe we'd see even more success.*

Looking Ahead

As the first full year of implementation was coming to a close, the principal was asked about what the initiative would look like moving forward. He shared that if he were to continue in his current role, the school would take some "*significant steps forward*." However, given the reality that he would not be continuing in that role and what he knew, he saw the initiative "*staying where it is as best*." When asked if in his absence someone should step in and spearhead the process, he shared that it would not work because an initiative of this type needed someone with a "*certain degree of positional authority*" to make it successful. In his opinion, educators in the school lacked that power to do what needed to be done. His sentiments were echoed by others who expressed concerns that even after four years, the initiative would continue to look like it did at the end of the first full year of implementation. Additionally, this participant shared a hope that the school would continue to push forward with the implementation because any alternative would leave students completely unprepared for life beyond high school. This participant believed students would need to learn how to utilize technology, both hardware and software, and as frustrating as it may be for educators to teach them those skills, it would be much harder for students to have to learn on their own.

Others were more optimistic and believed Connected Classrooms would look better moving forward. One individual saw the implementation-related challenges as to be expected when working through a new initiative. They believed students simply needed to be given a reason to bring devices.

> *. . . [I]t's getting better. And so I think it's important that, five years from now, hopefully we won't be hearing some of those things. And I think – especially in this world, when people expect, like, these instant results they want – and kids do too – like, the instant feedback, instant results. We're not going to get that. It's a – it's a cultural shift. I mean, even, like, looking at, like, the Smartboard implementation. Eight years out, we still have two or three people using overheads. [chuckles] And it's, like, okay. Maybe next year will be your year.*

There was no fear the school would ever revert to traditional classroom model void of technology because "*I don't think society ever will say, this is how we're going to do –we're going to back to the old system."* This sentiment of never going backward as it would be counteractive to societal culture was shared by many participants, with some highlighting that even if the initiative were not specifically Connected Classrooms, it would be something else.

> *We don't have an option. You have to stay with it. No. We have to, there's no – we can't go backwards on technology.*

> *I can't believe we can go back to paper and pencil and not be completely outdated. I don't know – I mean, I'm thinking obviously, you look ahead three, four years, it's got to be better. Even if we didn't have this, I think we'd still have more people with computers and tablets and whatnot. Just look at technology in general.*

A few educators shared that the difficulty in predicting what the initiative would look like in the future rested on a number of unknowns at the school and district level. However, they remained hopeful that it would improve and recognized the need for strong leadership and prioritizing to make that a reality.

> *I hope that we're where we are now, at least. Hope we don't have to backtrack. But it's going to be a real – it's going to be a real fight, and we need – it has to be*

> *sort of – I mean, I think it – I like – I like the idea that it's organic here. But I think it has to have strong leadership advocating for it, still, that this is important and that we're going to make this work somehow. That has to be reinforced because if staff feel like it's forgotten or secondary, then it's going to be secondary to them, too.*

In respect to what more was needed moving forward to make the implementation and initiative a success, a couple of others shared insight about the needs for better leadership.

> *If our leadership rallies and says, "Whoa, wait a minute. We've really kind of let this slide. Let's regroup. Let's. . ." – then I think they would have a chance. ... But if we stay where we are right now and not try to rally, then I would say we would be where we are now or possibly worse.*

> *If we really want this to be around, then we need to say, okay, this person is taking the lead. This person will shepherd it through, figure out where we're going to be in a few years. And with a group –with the integration team, we'll figure that out – how to make that happen.*

Another perceived need moving forward was systematizing the expectation of educators to integrate technology into their classrooms. This would require including technology integration as one of the areas reviewed during educators' yearly growth assessment. Currently, technology integration might be part of some educators' growth goals, based on which administrator facilitated their assessment conversation, but in the experience of some, technology integration was not always covered during those conversations. In a separate discussion, another participant spoke about the challenges associated with requiring integration in such a formal manner. Despite those challenges, the participant shared the quotation below when asked if staff members would benefit from a requirement to integrate technology into their curriculum.

> *There's been some push to show some growth. Otherwise, I wouldn't have made a Google Classroom. [laughs] But I think – I think it's hard. Because I think if there was more push to do it, that would just increase frustration.*

Beyond leadership and systematic integration efforts, others from the TIT suggested the need for more buy-in, resources, and a change of school culture in order for the initiative to be successful.

> *I'm hoping a year from now, we're going to have much more teacher buy-in. But again, that's not going to happen unless we get the resources needed. And five years from now, I'm hoping it's going to be every kid having a computer, not because they have to, but because they want to. And that's going to come from a culture change. The culture in the school has changed. Ninth-graders are talking to their eighth-grade friends saying, yep, you got to get a computer because you use them every day. Eighth-graders will know, over the summer, you've got to get a computer.*

Ideally, this individual would like to see school-wide saturation levels increased to 40-50% during the next school year, with the belief that that was the tipping point when the culture would start to shift. Other comments from the group included the expectation that in a year the initiative should still be educator-driven, where educators were developing and designing assignments in a way that required technology. But in five years, it would be student-driven, where classrooms would become student-driven, and students would begin expanding the use of technology and developing creative ways to achieve academic objectives.

Supply or Demand?

As stated above, the major challenge to the implementation and the major barrier to the success of the initiative was the simple lack of devices. Educators pointed to this as the reason they hesitated to integrate technology, and the number one reason students chose not to bring devices was because they found no need for them, a sentiment stated and supported by some staff members. An interview participant summed up the dilemma from the students' and educators' perspective best when she stated, *"Because if there's* *no need, why am I going to bring it? But the teacher side of it is, if there's students that don't have it, why am I going to waste my time?"* This begged the question of what first needed to occur to move this implementation and initiative forward. Did students first need to start bringing their devices for educators to begin integrating technology, or did educators need to first change their lessons in a way that required devices for students to see a need? Group and individual interview participants were asked which had to happen first, and many said it had to come first from the educator.

> *I think it's got to come from the teachers. And before the teachers, we need the time to create and to modify, things like that. The way I see it is, if it's expected to have a computer every day, they're going to bring it. There's always going to be a few that won't.*

Accordingly, you would always have some students who do not bring a device, but one participant shared that in a senior-level course she taught where the use of technology was strongly encouraged, when students were asked to pull out a device, every student would have a device. Recognizing that this class might be an anomaly, there was a reason to believe that this success was possible across the school if educators increased the need of devices and the degree of expectation. According to one participant, what needed to happen first was increased student ownership of devices, followed then by educators making use of technology in their class. This belief was shared by another staff member who agreed that *"students need to see the why before they'll buy in."* Responses shared reveal that there was an interconnected trickle-down effect that needed to take place. According to participants, leadership must first demonstrate to educators (and students), with clarity, the purpose of using technology in the class, increasing the likelihood of educators integrating technology, thereby leading to students' bringing and using devices during class. One participant believed that some educators who had been teaching for 20+ years might not understand the professional sector outside the walls of the school. Those educators may lack an understanding of why they should integrate technology in the classroom because *"they might not know how the business world has changed if they don't have access to it."*

> *Teachers need to see the why, too. So it's almost like a domino effect. Like, teachers from the top need to see the why, or personally need to see the why, and then …that has them starting to change things little by little. And then students start to see the why behind it. And so I think it's really a trickle-down effect. It has to start, I think, at the top with our leaders saying this is why we need to do this. - CH*
>
> *I think for the kids to understand why, I think the teacher has to understand why first.*
>
> *There's a fair amount of messaging that has to go out that we haven't quite explored yet as far as getting the kids to do it.… And so there's still a lot of work to do there to find what's going to be effective at communicating that need. Because if the need isn't consistent throughout the building, it's going to fall apart.*

Contrary to opinions shared above, others believed that students had to first own devices and bring them to school before educators could be reasonably expected to make changes in their lesson. One respondent stated, *"Kids have to have devices first. I mean, I could ask them to do stuff with technology, but if they don't have it, they don't have it."* It is important to note that this individual believed that for many students, it was not an issue of owning devices and choosing not to bring them, but rather many of these students did not own devices at all.

Another educator was simply unsure about what to do because, in their words, "*I'm using technology, and they're not bringing devices."* And while this individual believed change needed to occur from both groups, her elaboration specifically focused on students being the ones to take that first action step and start bringing devices.

> *I think it's some of both. I think we're at a point where we have to start to change that. I mean, we've started to just kind of play around with it, and people are trying things. But I think, if we don't change that, and we don't say, okay, the expectation is that you're going to get one, then the students won't change.*

Additionally, from the perspective of TIT members, it again needed to start with educators' expectations because *"if students are expected to have a computer every day, they're going to bring it."* Lastly, the principal stated that he had seen evidence in classrooms across the school where educators who strongly required students to have a device and were using it all the time had students who were bringing devices. In some cases, the classrooms were close to 100% saturation, however, he did not believe that could be accomplished school-wide.

> *I don't think we're there yet. I think we're too far away. If we were 50%, I think we'd be closer, but we're so far away. It takes an enormous effort for those teachers to get to that point and these are technical users. I mean these are people who know what they're doing, so that's why I think it's the device piece, but maybe it's not either or but we also need to force our curriculum down that path, too. I just don't know what's the perfect blend.*

Conclusion

This chapter has summarized the findings from the qualitative data gathered during this study. A complete narrative of the school's implementation of their BYOD initiative has been shared, including but not limited to, activities, stakeholder buy-in, and student access to devices. The next chapter will provide findings from the survey data, and the final chapter will compare the findings to the literature to answer the stated research questions.

Chapter Five: Survey Findings

This study to explore the implementation of a BYOD initiative in a high school context included the collection of survey data. This chapter will cover findings from both the educator and student surveys. The purpose of the educator survey was to uncover educators' beliefs about technology in the classroom, their perceptions of the strengths and weaknesses of the implementation process, and their experiences with integrating technology in their classroom. The purpose of the student survey was to gather information about students' knowledge and perception of the Connect Classrooms initiative and their access to and use of devices to support their learning.

Educator Survey Results

Demographic Data

A total of 81 staff members in the school were invited to complete the survey. Forty-two staff members completed the survey, resulting in a 52% response rate. Respondents were asked three demographic questions related to gender, race and ethnic background, and years of teaching experience. The percent of respondents who identified as female (70%) was significantly higher than the percent who reported as male (30%). Ninety-eight percent of respondents identified as White/Caucasian (Non-Hispanic), and the remaining 2% identified as other. Lastly, 2% of respondents reported the 2015-2016 school year as their first year of teaching, 5% reported having 2-3 years of experience, 10% reported 4-7 years of experience, 47% had 8-15 years of experience, and 35% reported 15+ years of teaching experience. With a total of 83% of respondents reporting at least 8 years of experience, they more than likely completed their training before the use of wireless technology became ubiquitous in K-12 classrooms. Tables 2, 3 and 4 provide a breakdown of descriptive data for each demographic question.

Table 2: Educators' Years of Teaching Experience

Demographics	Frequency	Percent
Years of Teaching		
Year one	1	3%
2-3 years	2	5%
4-7 years	4	10%
8-15 years	19	47%
15+ years	15	35%
Total	40	100%

Table 3: Educators' Gender Demographics

Demographics	Frequency	Percent
Gender		
Male	12	30%
Female	28	70%
Total	40	100%

Table 4: Educators' Race and Ethnicity Demographics

Demographics	Frequency	Percent
Race and Ethnicity		
African American	0	0%
Asian/ Pacific Islander	0	0%
Hispanic or Latino	0	0%
Native American or American Indian	0	0%
White/ Caucasian (Non-Hispanic)	39	98%
Other	1	2%
Total	40	100%

Educator Attitudes and Beliefs about Technology

To assess educators' beliefs and attitudes about the implementation and use of technology in the classroom, a series of Likert-type scale response questions were asked at the beginning of the survey. Tables 5, 6, 7 and 8 display the descriptive information from the February 2016 survey. Responses to this question served to build a knowledge base about educators' attitudes towards learning technologies in schools, which was then used to assess their support of the initiative. In this section, key responses will be highlighted for significance.

Impact. Educators held strong positive beliefs about the potential outcomes for the use of digital devices in the classroom. A large majority of respondents agreed or strongly agreed with the impact statements in Table 5. Seventy-four percent of all respondents agreed that use of a digital device in the classroom increases academic achievement, and another 74% agreed that it was an effective tool for students of all abilities. Eighty-eight percent agreed or strongly agreed that digital devices in the classroom serve to accommodate students' personal learning styles, and 78% agreed or strongly agreed that they can motivate students to get more involved in learning activities. These data demonstrated that the majority of respondents strongly believed in the academic impact of digital devices in classrooms.

Table 5: Impact of the Use of Devices in the Classroom

The use of digital devices (e.g., iPads, tablets, e-readers, laptops, etc.) in the classroom...					
Statements	Strongly Agree	Agree	Disagree	Strongly Disagree	Total
. . . increases academic achievement.	5 (12%)	31 (74%)	6 (14%)	0 (0%)	42 (100%)
….is an effective tool for students of all abilities.	7 (17%)	31 (74%)	4 (9%)	0 (0%)	42 (100%)
…helps to accommodate students' personal learning styles	13 (31%)	24 (57%)	4 (10%)	1 (2%)	42 (100%)

…motivates students to get more involved in learning activities.	11 (26%)	22 (52%)	9 (22%)	0 (0%)	42 (100%)

Individual value. Responses to the three statements in Table 6 demonstrate that respondents understood how crucial their role as educators is to the success of technology integration. Sixty-six percent of respondents agreed or strongly agreed that the effectiveness of integration was connected to educators' belief in their skills. That leaves one-third of respondents who did not see a connection between a belief in their own skill-sets and the success of technology integration. However, ninety-three percent agreed or strongly agreed that success of integration was connected to their knowledge about the use of devices, and 96% agreed or strongly agreed that success of integration was connected to the training they received.

Table 6: Individual Value of the Use of Devices in the Classroom

The use of digital devices (e.g., iPads, tablets, e-readers, laptops, etc.) in the classroom...					
Statements	Strongly Agree	Agree	Disagree	Strongly Disagree	Total
…is effective because I believe I can implement it successfully.	6 (14%)	22 (52%)	13 (31%)	1 (2%)	42 (100%)
…is successful only if I am knowledgeable about its use.	13 (31%)	26 (62%)	3 (7%)	0 (0%)	42 (100%)
… is successful only if there is adequate training for me in the use of technology for learning.	12 (29%)	27 (66%)	2 (5%)	0 (0%)	41 (100%)

Challenges. Responses to the statements in Table 7 demonstrated that respondents did not see the challenge statements listed as barriers to their integration. For example, 81% disagreed or strongly disagreed that use of digital devices required training that is too time consuming, and 83% disagreed or strongly disagreed that it is unnecessary because students would learn the skills on their own. These two statements demonstrate that respondents believed use of digital devices is an effective use of their classroom time and that they have a responsibility to support skill development for students. This spirit of responsibility was further supported by the 76% of respondents who disagreed or strongly disagreed that use of devices in the classroom is difficult because some students know more about digital devices than they do.

Slightly more than half of respondents (55%) agreed or strongly agreed that digital devices in the classroom make classroom management more difficult, and 52% agreed or strongly agreed that devices in the classroom require too much time with technical issues. These data revealed that about half of all respondents have concerns about classroom management and technology issues related to integration. Additional concerns came from the 55% of respondents who agreed or strongly agreed that use of devices decreases educators' ability to control sources of information in their classroom, the 38% who agreed or strongly agreed that use of digital devices was too costly in terms of resources, time and effort, and the 82% who agreed or strongly agreed that use of digital devices in the classroom required extra time to plan learning activities. A complete list of response breakdowns for each statement can be found in Table 7.

Table 7: Challenges of the Use of Devices in the Classroom

The use of digital devices (e.g., iPads, tablets, e-readers, laptops, etc.) in the classroom...					
Statements	Strongly Agree	Agree	Disagree	Strongly Disagree	Total
…is unnecessary because students will learn technology	3 (7%)	4 (10%)	16 (38%)	19 (45%)	42 (100%)

The use of digital devices (e.g., iPads, tablets, e-readers, laptops, etc.) in the classroom...					
skills on their own, outside of school.					
…is difficult because some students know more about digital devices than I do.	3 (7%)	7 (17%)	24 (57%)	8 (19%)	42 (100%)
…is too costly in terms of resources, time and effort.	6 (14%)	10 (24%)	22 (52%)	4 (10%)	42 (100%)
…requires training that is too time consuming.	1 (2%)	7 (17%)	29 (69%)	5 (12%)	42 (100%)
…requires extra time to plan learning activities.	9 (21%)	26 (62%)	7 (17%)	0 (0%)	42 (100%)
…requires too much time with technical problems.	8 (19%)	14 (33%)	18 (43%)	2 (5%)	42 (100%)
…decreases my ability to control sources of information in my classroom.	4 (10%)	19 (45%)	16 (38%)	3 (7%)	42 (100%)
…makes classroom management more difficult.	4 (10%)	19 (45%)	16 (38%)	3 (7%)	42 (100%)

Benefits. This final group of statements demonstrated the benefits of the use of digital devices in the classroom. Eighty-four percent of respondents agreed or strongly agreed that digital devices in the classroom allowed them to be facilitators of information rather than providers of information. The role of educators as facilitators is specifically a component of a learning-centered constructivist classroom. Sixty-two percent of respondents agreed or strongly agreed that devices in the classroom make them feel more competent as an educator. Lastly, 53% agreed or strongly agreed that devices in the classroom ease the pressure on them to have all the answers.

Table 8: Benefits of the Use of Devices in the Classroom

The use of digital devices (e.g., iPads, tablets, e-readers, laptops, etc.) in the classroom...					
Statements	Strongly Agree	Agree	Disagree	Strongly Disagree	Total
…gives me the opportunity to be a learning facilitator rather than an information provider.	7 (17%)	28 (67%)	7 (17%)	0 (0%)	42 (100%)
…makes me feel more competent as an educator.	4 (10%)	22 (52%)	14 (33%)	2 (5%)	42 (100%)
…eases the pressure on me to have all the answers.	4 (10%)	18 (43%)	19 (45%)	1 (2%)	42 (100%)

Educator Proficiency Level

To assess respondents' level of expertise with technology and how, if at all, that had changed as a result of the Connected Classrooms initiative, respondents were given a list of five different technology proficiency levels and asked to indicate their level of proficiency at the start of the initiative (March 2015) and their level of proficiency at the time of the survey (February 2016). This question was asked to assess whether the implementation activities helped to improve educators' proficiency. The different proficiency levels and corresponding descriptions can be found in Table 9.

Table 9: Levels of Technology Proficiency

Levels	Descriptions
Expert:	I am extremely proficient in using a wide variety of digital technologies.
Advanced:	I have acquired the ability to competently use a board spectrum of digital technologies.
Average:	I demonstrate a general competency in a number of software applications.

Beginner:	I am able to perform basic functions in a limited number of software applications.
Newcomer:	I have attempted to use digital technologies, but I still require help on a regular basis.
Unfamiliar:	I have no experience with digital technologies.

As evidence of the improvement to respondent proficiency, the percent of respondents who selected unfamiliar, newcomer, or beginner decreased between March 2015 and February 2016, while the percent of respondents who selected average, advanced, or expert increased between the same time period. In conducting the analysis to determine how respondents' perceived proficiency level had changed since the start of the pilot phase, and in what direction, individuals who reported not being present at the school during March 2015 were eliminated from the data set, resulting in a total of 37 respondents. Of those, 41% of respondents reported no change in their technology proficiency level, 46% reportedly improved in their technology proficiency by one level, 5% improved by two levels, 5% improved by three levels, and a final 3% reported a decrease in their technology proficiency level. Overall, 59% of respondents reported a positive change in their level of technology proficiency from March 2015 to February 2016, and no respondents reported a negative change.

Table 10: Educators' Levels of Technology Proficiency

Proficiency Level	March 2015		February 2016	
	Frequency	Percent	Frequency	Percent
Expert	6	14%	7	17%
Advanced	9	22%	13	31%
Average	15	36%	19	45%
Beginner	9	21%	2	5%
Newcomer	3	7%	1	2%

Unfamiliar	0	0%	0	0%
Total	42	100%	42	100%

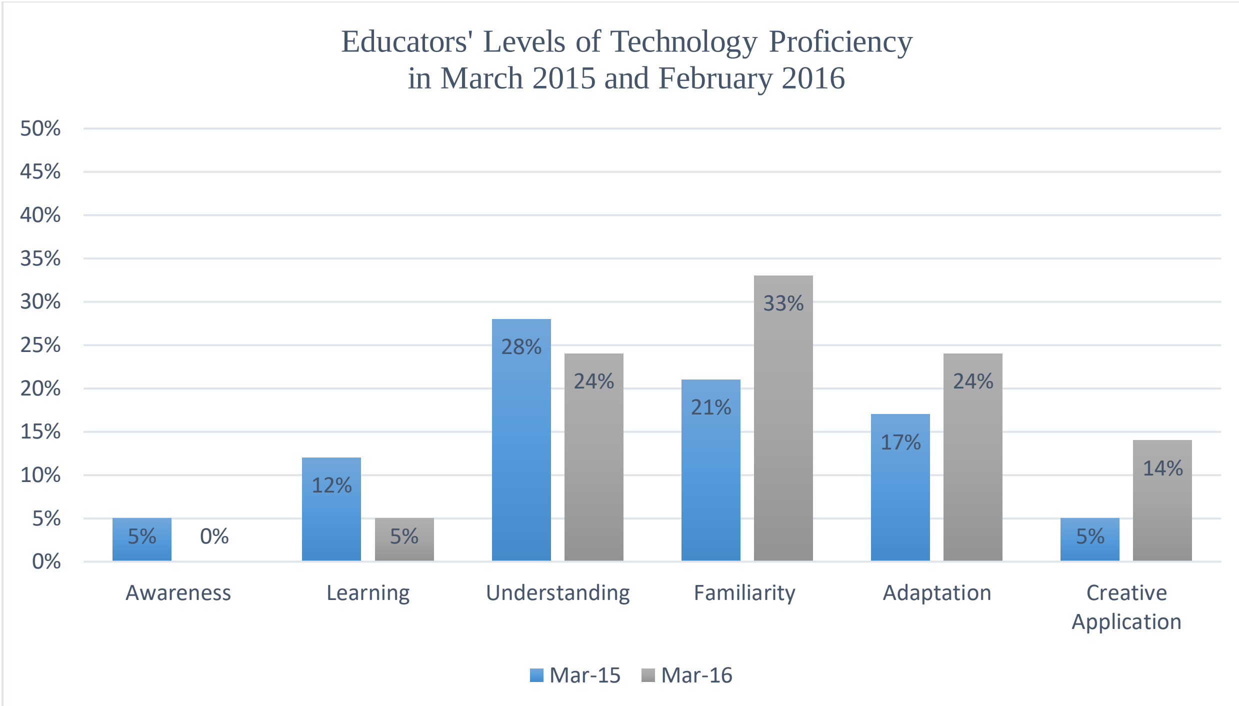

Figure 5. Educators' Levels of Technology Proficiency in March 2015 and February 2016

Educator Integration Stages

Respondents were presented with a question about digital integration of technology in their classroom. The purpose of this was to provide insight on the perceived success of implementation efforts, as effective implementation strategies would presumably improve integration stages. Respondents were asked to select the option that best represented their stage of integration at the start of Connected Classrooms and their current stage of integration when completing the survey. The different stages of integration and corresponding descriptions can be found in Table 11.

Table 11: Stages of Technology Integration

Stages	Descriptions

Awareness:	I am aware that technology exists, but have not used it – perhaps I'm even avoiding it. I am anxious about the prospect of using digital devices.
Learning:	I am currently trying to learn the basics. I am sometimes frustrated using digital technologies and I lack confidence when using them.
Understanding:	I am beginning to understand the process of using technology and can think of specific tasks in which it might be useful.
Familiarity:	I am gaining a sense of self -confidence in using digital technology for specific tasks and I am starting to feel comfortable using the technology.
Adaptation:	I think about digital technology as an instructional tool to help me and I can use many different software applications.
Creative Application:	I can apply what I know about technology in the classrooms. I am able to use it as an instructional aid and have integrated technology into the curriculum

In assessing the data about their stages of technology integration, there was evidence to support a general improvement in the respondents reported stage of integration between March 2015 and February 2016. As evidence of the improvement of respondent level of integration, the percent of respondents who selected familiarity, adaption, and creative application increased between March 2015 and February 2016, while the percent of respondents who selected understanding, learning, and awareness decreased between March 2015 and February 2016. Specifically broken down, from March 2015 to February 2016, the percent of respondents who described their stage of technology integration as awareness *decreased* by five percentage points, the percent who described their stage as learning *decreased* by seven percentage points, the percent who described their stage as understanding *decreased* by four percentage points, the percent who described their stage as familiarity *increased* by twelve percentage points, the percent who described their stage as adaption *increased* by seven percentage points, and the percent who described their stage as creative application *increased* by nine percentage points.

Specifically, 37% of respondents reported no change in their stage of integration, 29% increased their stage of integration by one level, 23% increased their stage of integration by two levels, and 5% increased their stage of integration by three levels. Overall, 57% of respondents reported a positive change, and 6% reported a negative change in their level of integration from March 2015 to February 2016. This is similar to the 56% who reported changes in their technology proficiency.

Table 12: Educators' Stages of Technology Integration

Stages of Integration	March 2015		February 2016	
	Frequency	Percent	Frequency	Percent
Awareness	2	5%	0	0%
Learning	5	12%	2	5%
Understanding	12	28%	10	24%
Familiarity	9	21%	14	33%
Adaptation	7	17%	10	24%
Creative Application	2	5%	6	14%
Not at THS	5	12%	0	0%
Total	42	100%	42	100%

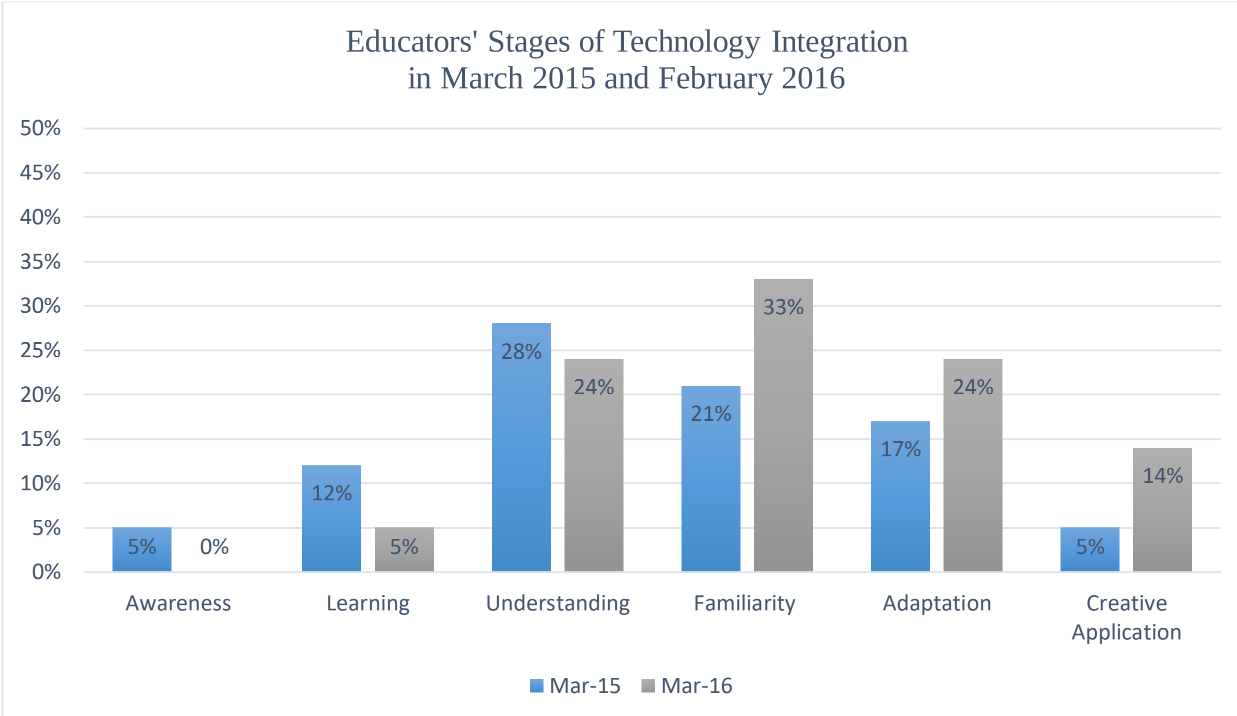

Figure 6. Educators' Stages of Technology Integration in March 2015 and February 2016

Use of Program and Software Devices

To further explore the ways in which educators were integrating technology into their classroom practice, a list of commonly used programs and types of software was obtained from staff in the building and used in the survey. The list was presented to staff to determine if specific programs or software were being utilized more frequently than others. Use of the Smartboard, Google Classroom, and Google documents surfaced as programs or software that respondents most commonly used. On the opposite end, Clickers, Kahoot, Zaption, Edu Puzzle, Document Cameras, Online Discussions, and YouTube surfaced as the least utilized programs and software for respondents. A breakdown of descriptive statistics can be found in Table 13.

Table 13: Programs and Software Use

Programs and Software	All the Time	Very Often	Occasionally	Rarely	Never	Total
Smart board	26 (62%)	7 (17%)	5 (12%)	3 (7%)	1 (2%)	42 (100%)
Google Classroom	14 (33%)	13 (31%)	5 (12%)	5 (12%)	5 (12%)	42 (100%)
Google docs	19 (45%)	11 (26%)	9 (22%)	3 (7%)	0 (0%)	42 (100%)
Clickers	0 (0%)	2 (5%)	3 (7%)	5 (12%)	32 (76%)	42 (100%)
Kahoot	3 (7%)	8 (19%)	10 (24%)	3 (7%)	18 (43%)	42 (100%)
Zaption	1 (2.5%)	0 (0%)	3 (7%)	1 (2.5%)	37 (88%)	42 (100%)
Edu Puzzle	0 (0%)	1 (2%)	2 (5%)	2 (5%)	36 (88%)	42 (100%)
YouTube	6 (14%)	12 (29%)	21 (50%)	1 (2%)	2 (5%)	42 (100%)
Doc Camera	1 (2%)	2 (5%)	14 (33%)	8 (19%)	17 (41%)	42 (100%)
Online Discussion	1 (2.5%)	1 (2.5%)	6 (14%)	11 (26%)	23 (55%)	42 (100%)

Number of Courses Taught

Respondents were asked to indicate the number of different courses they taught during the third trimester (pilot phase) of the 2014-2015 school year. With 42 total respondents, 14% reported teaching a single subject during that time period, 36% reported teaching two courses, 24% reported teaching three courses, and 9% reported teaching four (7%) or five (2%).

Table 14: Number of Courses Taught during Third Trimester

Number of Courses Taught	Frequency	Percent
One Subject	6	14%

Two Courses	15	36%
Three Courses	10	24%
Four Courses	3	7%
Five Courses	1	2%
Not Present	7	17%
Total	42	100%

The purpose of this question was to determine if there was a relationship between the number of different courses taught and the stage at which an educator reported integrating technology in his or her classroom. The literature would suggest that an educator who is tasked to integrate technology across multiple different courses (e.g., a math educator who is teaching Algebra I, Algebra II, and geometry within a single trimester) is more likely to integrate at lower level stages (awareness, learning, and understanding), rather than advanced stages (familiarity, adaptation, and creative application), whereas an educator who is teaching one or two different courses (e.g., Spanish I and Spanish II) is more likely to integrate at advanced stages than lower-level stages. However, survey responses did not confirm this assumption.

What Table 15 depicts is the relationship between the stages of implementation for March 2015 and the number of courses taught during the same time period. What the data illustrates is that, generally speaking, educators who were teaching one course integrated at the lower level stages of awareness, learning, and understanding, while educators who taught four courses often integrated at the higher-level stages of familiarity and adaptation. One potential explanation for this finding is that educators who teach multiple classes within a given trimester are more adept with technology integration.

Table 15: Number of Courses Taught by Stage of Technology Implementation

Stages of Implementation	Number of Courses Taught				
	One Subject	Two Courses	Three Courses	Four Courses	Five Courses
Awareness	17%	0%	10%	0%	0%
Learning	33%	7%	20%	0%	0%
Understanding	33%	33%	30%	33%	0%
Familiarity	0%	40%	10%	33%	0%
Adaptation	17%	13%	30%	33%	0%
Creative Application	0%	7%	0%	0%	100%
Total	100%	100%	100%	100%	100%

Frequency of Technology Integration

To assess the success of first-year implementation efforts, respondents were asked to report how often they integrated digital technologies in their classroom in March 2015 and how often they did so a year later in February 2016. This question was born from an assumption rooted in knowledge of the literature that the success of the implementation should lead to increased levels of integration across the school. In March 2015, of those who were present at the school, the majority of respondents reported integrating technology all of the time (10%), often (14.5%), or sometimes (27%). However, a total of one-third reported integrating technology occasionally (12%) or rarely (22%), and no respondent reported never integrating technology in their classroom. By February 2016, the percent of respondents who reported integrating technology all the time (34%), often (22%) or sometimes (24%) rose from 51.5% collectively in 2015 to 80% collectively.

Between March 2015 and February 2016, the percent of respondents who reported integrating technology in their classroom all the time *increased* by 26 percentage points. The percent who reported integrating often *increased* by seven percentage points, respondents who reported integrating sometimes *decreased* by four percentage points, respondents who reported integrating occasionally *stayed the same,* respondents who reported integrating rarely *decreased* by fifteen percentage points, and respondents who reported never integrating *stayed the same*.

Table 16: Frequency of Technology Integration

	March 2015		February 2016	
	Frequency	Percent	Frequency	Percent
All the time	4	10%	14	34%
Often	6	14.5%	9	22%
Sometimes	11	27%	10	25%
Occasionally	5	12%	5	12%
Rarely	9	22%	3	7%
Never	0	0%	0	0%
Not at THS	6	14.5%	0	0%
Total	41	100%	41	100%

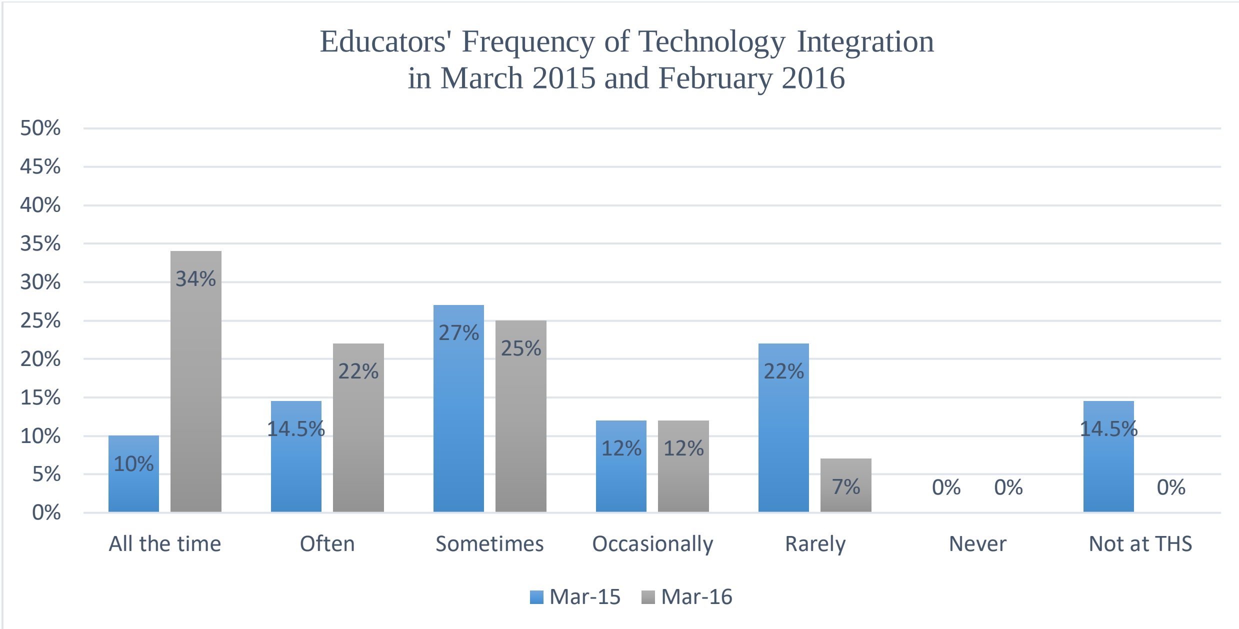

Figure 7. Educators' Frequency of Technology Integration in March 2015 and February 2016

Implementation Components

Leadership. The questions discussed below were asked in direct relation to learning technology strategies surfaced from the literature. The purpose was to assess respondents' perception of key aspects of the implementation, which was then used to make inferences about the strength of the implementation of Connected Classrooms.

This first section of data is related to respondent perceptions about leadership of the initiative. Sixty percent of respondents agreed that the school had a well-developed technology plan to guide the integration efforts, and 67% agreed that the principal was an effective leader for instructional technology in the school. Fifty-one percent of respondents agreed that the principal was willing to support—through funding or manpower—their efforts at technology integration. However, over a quarter (28%) of respondents disagreed with this statement. Similarly, about half (51%) of respondents agreed that they received adequate administrative support to integrate technology into classroom practice, while almost a third of respondents (31%) disagreed with this statement. At 49%, a near majority of respondents agreed that the principal consulted with staff before making decisions about instructional technology that affected them, with 31% expressing disagreement with the statement. This outcome was closely mirrored with 49% of respondents expressing agreement that there were clear expectations that technology would be used to enhance student learning, and 33% expressing disagreement. When it came to seeking administrative help, 47% of respondents agreed that they were comfortable reaching out to the principal for support because of his knowledge of the topic, while 32% disagreed. Lastly, the statement that elicited the strongest variation of responses was related to professional development. While 71% of respondents agreed or strongly agreed that the principal often participated in school-offered technology-focused professional development, 29% disagreed or strongly disagree with that statement.

Table 17: Attitudes about Leadership Implementation Components

Statements	Strongly Agree	Agree	Disagree	Strongly Disagree	Total
This school has a well-developed technology plan that guides all technology integration efforts.	2 (5%)	24 (60%)	11 (28%)	3 (7%)	40 (100%)
The principal is an effective leader for instructional technology in this school.	4 (10%)	26 (67%)	6 (15%)	3 (7%)	39 (100%)
The principal consults with staff before making decisions	5 (13%)	19 (49%)	12 (31%)	3 (7%)	39 (100%)

Statements	Strongly Agree	Agree	Disagree	Strongly Disagree	Total
about instructional technology that affect us.					
In this school there are clear expectations that technology will be used to enhance student learning.	5 (13%)	19 (49%)	13 (33%)	2 (5%)	39 (100%)
When this school has professional development focused on technology, the principal often participates.	9 (24%)	18 (47%)	9 (24%)	2 (5%)	38 (100%)
The principal is willing to support—through funding or manpower—teachers' efforts at technology integration.	6 (16%)	20 (51%)	11 (28%)	2 (5%)	39 (100%)
Teachers receive adequate administrative support to integrate technology into classroom practice.	5 (13%)	20 (51%)	12 (31%)	2 (5%)	39 (100%)
I feel comfortable going to the principal of this school for support because of his knowledge of the topic.	6 (16%)	18 (47%)	12 (32%)	2 (5%)	38 (100%)

School culture – educator support. For all the statements below, nearly three-fourths of respondents expressed general agreement, indicating a high degree of educator support and buy-in. Seventy percent of respondents agreed that teachers in their school shared an understanding about how technology will be used to enhance learning, with close to a quarter (23%) expressing disagreement with that statement. Seventy-three percent of respondents agreed that teachers in their school were continually learning and seeking new ideas about integrating technology in their classroom, and that teachers in their school were not afraid to learn about new technologies and use them with their class(es). Lastly, 78% of respondents agreed that teachers in their school were generally supportive of technology integration.

Table 18: Attitudes about School Culture – Educators Support Implementation Component

Statements	Strongly Agree	Agree	Disagree	Strongly Disagree	Total
Teachers in this school share an understanding about how technology will be used to enhance learning.	1 (2%)	28 (70%)	9 (23%)	2 (5%)	40 (100%)
Teachers in this school are generally supportive of technology integration.	5 (12%)	31 (78%)	4 (10%)	0 (0%)	40 (100%)
Teachers in this school are continually learning and seeking new ideas about how to integrate technology in their classroom.	6 (15%)	29 (73%)	5 (12%)	0 (0%)	40 (100%)
Teachers are not afraid to learn about new technologies and use them with their class(es).	3 (8%)	29 (72%)	8 (20%)	0 (0%)	40 (100%)

Parent and family support. Responses related to parent and family support were spread across the different response options. Although the majority of respondents (53%) agreed that parents were aware of the school's emphasis on technology, 37% disagreed with that statement. When asked about parents' support of the initiative, 2% of respondents strongly agreed, 50% agreed, and 38% disagreed that parents supported the school's use of technology. Lastly, 76% of respondents agreed or strongly agreed that parental support was necessary for successful use of technology in the classroom. This variation in responses calls to question the level of parent and family awareness and buy-in of the initiative.

Table 19: Attitudes about Parent/Family Support Implementation Component

Statements	Strongly Agree	Agree	Disagree	Strongly Disagree	Total
Parents are aware of our school's emphasis on technology.	2 (5%)	21 (53%)	15 (37%)	2 (5%)	40 (100%)
Parents support our school's use of technology.	1 (2%)	20 (50%)	15 (38%)	4 (10%)	40 (100%)
Use of technology in the classroom is successful only if there is the support of parents.	11 (28%)	19 (48%)	9 (22%)	1 (2%)	40 (100%)

Technical support. Responses related to questions about technical support were varied among response options, leaving only small majorities across many of the response options. When asked about the speed of Internet connection, 28% of respondents strongly agreed, 38% agreed, and 34% disagreed or strongly disagreed that the Internet in their class was too slow. Additionally, 51% of respondents agreed or strongly agreed that the Internet connection in their class was often not working. This was countered by 49% of respondents who disagreed or strongly disagreed with the statement. Thirty-six percent of respondents strongly agreed, 33% agreed, and 31% disagreed that problems such as device freeze or an inability to access the Internet made it difficult for them to use technology in their classroom. No respondent reported strong disagreement with that statement.

As cited in the literature, it is important for schools to be mindful of district-blocked websites and the effect that can have on school technology initiatives. While 33% of respondents indicated blocked sites were not an issue for them, 67% agreed or strongly agreed that there were times when specific sites they needed for teaching were blocked from viewing. The highlight in respondents' attitudes about technical assistance was the support staff. A total of 54% strongly agreed and 41% agreed (95% collectively) that their requests for technical assistance were addressed in a timely manner. Overall the variation in responses in this section demonstrates that some respondents were having positive experiences with connectivity while others were not. This may be a result of where the respondent's classroom was located within the school. As a general rule, if connectivity is not of equal quality in all, if not most, areas of the school, that serves as an indicator of poor technical infrastructure.

Table 20: Attitudes about Technical Support Implementation Component

Statements	Strongly Agree	Agree	Disagree	Strongly Disagree	Total
Internet connection in my class is often too slow.	11 (28%)	15 (38%)	12 (31%)	1 (3%)	39 (100%)
Internet connection in my class is often not working.	7 (18%)	13 (33%)	14 (36%)	5 (13%)	39 (100%)
My requests for technical assistance are addressed in a timely manner.	21 (54%)	16 (41%)	1 (2.5%)	1 (2.5%)	39 (100%)
Problems such as devices freezing or an inability to	14 (36%)	13 (33%)	12 (31%)	0 (0%)	39 (100%)

access the Internet make it difficult for me to use technology.					
There are times when specific sites I need for teaching are blocked from viewing.	5 (13%)	21 (54%)	12 (31%)	1 (2%)	39 (100%)

Professional development. Professional development is a key aspect of schooling and teaching and a strong component to the success of any technology-related initiative. In responses to the survey questions, 50% of respondents agreed and 40% disagreed that the school or district had provided adequate professional development to prepare them for Connected Classrooms. Additionally, 60% agreed and 5% strongly agreed that technology-related professional development from their school or district often met their specific level of proficiency. While half of respondents felt they had access to an adequate amount of professional development, close to all respondents believed the professional development they received met their specific proficiency levels. Lastly, an overwhelming majority of respondents (72.5%) agreed that the technology-related professional development from their school or district was provided in a variety of different formats (lecture/presentation, small group work, collaborative activities, etc.) to meet their needs.

Table 21: Attitudes about Professional Development Implementation Component

Statements	Strongly Agree	Agree	Disagree	Strongly Disagree	Total
My school or district has provided me with an adequate amount of professional development to prepare me for the Connected Classrooms program.	1 (2%)	20 (50%)	16 (40%)	3 (8%)	40 (100%)

Technology-related professional development at our school or district is provided in a variety of different formats (lecture/presentation, small group work, collaborative activities, etc.).	4 (10%)	29 (72.5%)	7 (17.5%)	0 (0%)	40 (100%)
Technology-related professional development at our school or district often meets my specific level of technology proficiency.	2 (5%)	24 (60%)	13 (33%)	1 (2%)	40 (100%)

Coaching. The responses related to statements about coaching indicated that some coaching was happening at the school, but it was reportedly not widespread. When asked about how often they received coaching or mentoring from an internal source, 32.5% of educators reported very often, 42.5% reported occasionally, and 20% reported rarely receiving that type of support. When asked about coaching and mentoring from an external, non-school staff source, 35% reported rarely, and 45% reported never receiving that type of support.

Table 22: Attitudes about Coaching Implementation Component

Statements	All the time	Very often	Occasionally	Rarely	Never	Total
I receive coaching or mentoring from an internal source, such as another teacher or technology coordinator.	0 (0%)	13 (32.5%)	17 (42.5%)	8 (20%)	2 (5%)	40 (100%)
I receive coaching or mentoring about technology integration from an external (non-	0 (0%)	1 (2%)	7 (18%)	14 (35%)	18 (45%)	40 (100%)

staff) source such as a curriculum specialist.	

Student Survey Results

Demographic Data

Of the approximately 1,600 total students enrolled during the 2015-2016 school year, a total of 577 students completed the survey. Based on the number of homeroom educators who opted to have their students participate in the survey, the response rate for the survey was 87%. Respondents were asked demographic questions about their gender, race and ethnic background, and grade level. Of the total respondents, 50% identified as male, 45% identified as female, and 5% identified as other. When asked about ethnicity, 15% of respondents identified as Hispanic, while 85% identified as non-Hispanic. In regards to race, 40% of respondents identified as White/Caucasian with the remaining 60% identified as Other or persons of color. Students of color are largely overrepresented in the sample because they only make up 33% of the school-wide population. The breakdown of this group was as follows: 21% Asian/ Pacific Islander, 17% African-American/Black, 12% Hispanic/Latino, 5% Native American or American Indian, and the remaining 5% identified as Other. Lastly, when asked about grade level, the majority of respondents (34%) identified themselves as sophomores, 33% identified at freshman, 20% as juniors, and 13% as seniors. Tables for each of the demographics can be found below.

Table 23: Students' Gender Demographics

Demographics	Frequency	Percent
Gender		
Male	268	50%
Female	246	45%

Other	25	5%
Total	539	100%

Table 24: Students' Ethnicity Demographics

Demographics	Frequency	Percent
Hispanic/Latino		
Yes	82	15%
No	452	85%
Total	534	100%

Table 25: Students' Race Demographics

Demographics	Frequency	Percent
Race and Ethnicity		
African American	86	17%
Asian/ Pacific Islander	110	21%
Hispanic or Latino	61	12%
Native American or American Indian	28	5%
White/ Caucasian (Non-Hispanic)	205	40%
Other	25	5%
Total	515	100%

Table 26: Students' Grade Levels

Demographics	Frequency	Percent
Grade Level		
Freshman	180	33%
Sophomore	185	34%
Junior	106	20%
Senior	68	13%
Total	539	100%

Access to Devices

Ownership of personal devices. The first question survey respondents were asked was whether they personally owned a digital device. This question was asked as a proxy to predict expected saturation of device levels within the school. Of the 576 students who responded to this question, 97% of students reported having a personally-owned device. Three percent reported not having a personally-owned device.

Table 27: Students' Ownership of Personal Devices

Device ownership	Frequency	Percent
Yes	561	97%
No	15	3%
Total	576	100%

Of the 561 students who reported personally owning a digital device, 530 (94%) provided details about the type(s) of devices they owned. After eliminating responses that were not useful to the analysis (ex: "N/A" or "Yes") and responses in which respondents only provided a brand name without mention of the type of device they owned (e.g., "Apple" or "Galaxy"), 511 (91%) responses were utilized in the analysis. Of those, 87% listed a type of cellular phone as a digital device they personally-owned, 44% listed a type of laptop as a device they owned, 17% listed a type of tablet, and 3% listed another type of device that they owned. The majority of "other" devices were Apple iPods.

Table 28: Types of Devices Students Personally Owned

Types of Device Ownership	Frequency	Percent
Phone	443	87%
Laptop	225	44%
Tablet	85	17%
Other	37	3%
Total	511	100%

Students were asked to list ALL digital devices they personally-owned, thus the percent will not add up to 100%.

Respondents who indicated having a personally-owned device were also asked if they brought a personally-owned digital device to school for academic uses. Sixty-nine percent of those who reported owning a digital device reported bringing a device to school for academic purposes, while 31% reported that they did not.

Table 29: Students Bringing Devices to School

Devices to School	Frequency	Percent
Yes	387	69%
No	173	31%
Total	560	100%

Of the 387 students who reported bringing a personally-owned digital device to school for academic use, all provided details about the type(s) of devices they brought. After eliminating responses in which respondents only provided a brand name without mention of the type of device they bring (e.g., "Windows") and responses where students only provided a description of what they used their device for (e.g., "Grade checks and researches"), 368 (95%) respondents were used in the analysis. Of those, the majority (63%) of devices respondents reported bringing to school for academic purposes was laptops. This was followed by 51% of respondents who reported bringing and using cell phones for academic purposes, 14% who brought tablets, and 1% who brought "other" devices.

Table 30: Types of Devices Students Brought to School

Types of Device Ownership	Frequency	Percent
Phone	195	51%
Laptop	243	63%
Tablet	55	14%
Other	5	1%
Total	386	100%

Students were asked to list ALL digital devices they personally owned, thus the percent will not add up to 100%.

Respondents who reported that they brought a personally-owned device to school were also asked how many days each week they brought a device to school for academic purposes. The majority of respondents (62%) reported that they brought their device to school 5 days a week. This was followed by 12% who reportedly brought a device one day a week, 11% who brought a device two days a week, 8% who brought a device three days a week, and 7% who brought a device four days a week. It should be noted that in many cases the devices students brought was a smart phone, a device they regularly carried with them everywhere.

Table 31: Number of Days Students Brought a Device to School

Number of Days Per Week	Frequency	Percent
One day	45	12%
Two days	40	11%
Three days	32	8%
Four days	27	7%
Five Days	238	62%
Total	382	100%

Reasons for not bringing a device. The 31% of respondents who reported owning a device but not bringing it to school for academic purposes were asked to shed light on why they chose not to bring their devices. Responses were thematically analyzed into six key topics. The largest theme focused on a lack of need or use of the device. Responses within this theme included "*It is not needed most times*" and "*Because it is not implemented into our daily classwork.*" The next major theme was students who mentioned a lack of ownership. Responses shared included "*I don't have the money to buy a device," "I do not have any other device but my phone,*" and "*The computer is used* *by the whole family and I don't feel comfortable bringing it.*" The next theme was related to fear of theft or loss of device. Responses included "*I don't want to lose it*" and "*It's too expensive and I don't want it to get stolen*." Other themes included use of only phones ("*I don't bring a laptop or anything, only my phone*"); a preference for traditional learning ("*Because I don't like working on devices at school, I like using pencils and pens and paper 'cause I just feel like I learn better*"); and a lack of personal initiative ("*Because I didn't pass the BYOD*[10] *and was too lazy to take it again*").

School-owned device. Students who reported using a school-owned device during the school day for academic purposes were asked how often they took the device home with them. This question was asked with the purpose of determining how many students are utilizing school-owned devices they have checked out for the year and how many are utilizing school-owned devices from technology carts during the day. Of the 156 students who responded to this question, 51% reported that they took their device home every night. Another 40% of students reported that they never took the device home with them. This group is presumed to represent students who used netbooks from technology carts during class time. A final 9% of students reported taking their device home between one and four nights each week.

Table 32: Number of Nights Students Brought School-Owned Devices Home

Nights Per Week	Frequency	Percent
Every Night	80	51%
3-4 Nights	4	3%
1-2 Nights	9	6%
0 Nights	63	40%

[10] A user agreement test students were required to pass before obtaining permission to use their devices at school.

Total	156	100%

A final question related to student access to devices included whether students had access to a device when they needed one to participate in class. An overwhelming majority (83%) responded that they had access to a device when they needed one, while 17% reported not having access to a device when they needed one during the school day.

Table 33: Students' Access to Devices During the School Day

Access to Devices in Class	Frequency	Percent
Yes	477	83%
No	96	17%
Total	573	100%

Perceived Skill Level

To assess students' perceived skill level with technology, respondents were given a list of five different technology skill levels and were asked to indicate which level best described their skill of using technology. The different skill levels and corresponding descriptions can be found in Table 34. Of the 569 total respondents, 21% described their skill level as expert, 34% described their skill level as advanced, 40% as average, 4% as beginner, and 1% as newcomer.

Table 34: Technology Skill Levels

Skill	Description
Expert	I am extremely proficient in using a wide variety of digital technologies.
Advanced	I have acquired the ability to competently use a broad spectrum of digital technologies.
Average	I demonstrate a general competency in a number of software applications.

Beginner	I am able to perform basic functions in a limited number of software applications.
Newcomer	I have attempted to use digital technologies, but I still require help on a regular basis.

Table 35: Students' Technology Skill Levels

	Frequency	Percent
Expert	118	21%
Advanced	195	34%
Average	231	40%
Beginner	22	4%
Newcomer	3	1%
Total	569	100%

Student Perception and Support

Given the relationship between support and buy-in, four statements were used to assess students' perceptions and support of the initiative. From the findings below, respondents indicated high levels of support for the initiative and reported positive academic benefits as a result of the initiative. Sixty-six percent of respondents agreed, and 28% of respondents strongly agreed with the statement, "I am pleased my school implemented the Connected Classrooms initiative." Nearly three-fourth of respondents (73%) agreed or strongly agreed that since the start of Connected Classrooms, their use of a digital device had improved their learning. A similar percent of students (78%) agreed or strongly agreed that the skills they were learning through Connected Classrooms would provide them benefits after graduation. In regard to educators' use of devices, 76% agreed or strongly agreed that they were pleased with the way most of their teachers incorporated the use of devices in their classroom. Lastly, the majority of respondents (83%) reported that having access to technology during the school day was very or somewhat important to them. The remaining 17% believed access to technology during the school was not very or not important to them.

Table 36: Attitudes about Connected Classrooms

Statements	Strongly Agree	Agree	Disagree	Strongly Disagree	Total
I am pleased my school implemented the Connected Classrooms initiative.	142 (28%)	333 (65%)	9 (2%)	24 (5%)	508 (100%)
Since the start of the Connected Classrooms initiative, the use of my (personal or school-owned) digital device has improved my learning.	96 (17%)	315 (55%)	124 (22%)	32 (6%)	567 (100%)
The skills I am learning through the Connected Classrooms initiative will provide benefits for me after graduation.	91 (16%)	352 (62%)	103 (18%)	20 (4%)	566 (100%)
I am pleased with the way most of my teachers incorporate the use of my device (personal or school-owned) in their classroom.	96 (17%)	337 (59%)	99 (18%)	36 (6%)	568 (100%)

Table 37: Attitudes about access to technology in school

Statements	Very Important	Somewhat Important	Not Very Important	Not Important	Total
How important is having access to technology during the school day to you?	178 (31%)	298 (52%)	81 (14%)	15 (3%)	572 (100%)

Use of Technology

Frequency of device use for in-class academic purposes. Students were asked to report how often they used digital devices in class for academic purposes at the start of Connected Classrooms (March 2015) and how often they used them at the time of data collection (April 2016). The percent of respondents who reported often, frequently, or always using digital devices doubled between March 2015 (16%) and April 2016 (33%), while the percent of respondents who reported sometimes, occasionally, rarely, or never using a digital device decreased between March 2015 (73%) and April 2016 (67%).

When broken down, the percent of respondents who reported never using a device for academic purposes *decreased* by five percentage points between March 2015 and April 2016. The percent of respondents who rarely used a device *decreased* by seven percentage, respondents who occasionally used a device *decreased* by two percentage points, respondents who sometimes used a device *increased* by eight percentage points, respondents who often used a device *increased* by twelve percentage points, respondents who frequently used a device *increased* by three percentage points, and respondents reported always using a device for academic purposes *increased* by two percentage points between March 2015 and April 2016.

After eliminating individuals who reported not being present at the school in March 2015, non-respondents, and incomplete responses, a total of 473 responses remained for further analysis. Of those, 24% reportedly increased their frequency of use by one level, 15% increased by two levels, 8% increased by three levels, 2% increased by four levels, and 1% increased frequency of use by five levels. Conversely, 7% decreased their frequency of use one level, 3% decreased by two levels, 2% decreased by three levels, and 2% decreased their frequency of use by four levels. Overall 50% of respondents reported a positive change, 36% reported no change, and 14% reported a negative change in their frequency of use of devices for in-class academic purposes between Mach 2015 and April 2016.

Table 38: Students' Use of Devices for Classwork

Response Options	March 2015		April 2016	
	Frequency	Percent	Frequency	Percent
Always	20	4%	32	6%
Frequently	21	4%	41	7%
Often	43	8%	105	20%
Sometimes	107	19%	143	27%
Occasionally	135	24%	121	22%
Rarely	109	19%	63	12%
Never	62	11%	31	6%
I was not there	63	11%	1	0%
Total	560	100%	537	100%

Frequency of device use to complete homework outside of school. The percent of respondents who reported often, frequently, or always using digital devices for homework increased between March 2015 (34%) and April 2016 (41%), while the percent of respondents who reported sometimes, occasionally, rarely, or never using a digital device for homework decreased between March 2015 (56%) and April 2016 (41%).

Specifically broken down, the percent of respondents who reported never using a device for homework purposes *decreased* by four percentage points between March 2015 and April 2016. Respondents who rarely used a device for homework purposes *decreased* by four percentage points, respondents who occasionally used a device for homework purposes *decreased* by seven percentage points, respondents who sometimes used a device for homework purposes *stayed constant*, respondents who often used a device for homework purposes *increased* by four percentage points, respondents who frequently used a device for homework purposes *increased* by twelve percentage points, and respondents who always used a device for homework purposes *increased* by nine percentage points between March 2015 and April 2016.

After eliminating individuals who reported not being present at the school in March 2015, non-respondents, and incomplete responses, a total of 480 respondents remained for further analysis. Of those, 21% increased their frequency of use by one, 14% increased by two, 7% increased by three, 4% increased by four, and 1% increased their frequency of use by five. Conversely, 5% decreased their frequency of use one, 1% decreased by two, and 2% decreased by three. Overall 47% of respondents reported a positive change, 45% reported no change, and 7% reported a negative change in their frequency of use of devices for homework between Mach 2015 and April 2016.

Table 39: Students' Use of Devices for Homework

Response Options	March 2015		April 2016	
	Frequency	Percent	Frequency	Percent
Always	39	7%	88	16%
Frequently	69	13%	131	24%
Often	85	15%	100	19%
Sometimes	107	19%	104	19%
Occasionally	97	18%	59	11%
Rarely	61	21%	37	7%
Never	44	8%	19	3%
I was not there	52	9%	1	1%
Total	554	100%	539	100%

Wi-Fi Connectivity

To assess students' perceptions of the Internet connectivity in the school, respondents were asked about the adequacy of the wi-fi connection across the school. Fifty-six percent of respondents agreed or strongly agreed that the wireless network in their school was adequate to support the use of their device. Forty-four percent disagreed or strongly disagreed with that statement.

Table 40: Students' Perceptions of Wi-Fi Connectivity

Statements	Strongly Agree	Agree	Disagree	Strongly Disagree	Total
The wireless network in my school is adequate to support the use of my personal or school-owned digital device.	48 (9%)	265 (47%)	163 (29%)	82 (15%)	558 (100%)

Perception of Parents' Knowledge

In lieu of surveying parents and families about their knowledge and support of Connected Classrooms, students were asked to describe their parents' awareness of the initiative. Thirty-six percent of students reported that their parents knew a little about the initiative. This was followed by 28% of students who reported that their parents knew somewhat about the initiative. However, only 5% of students indicated their parents knew a lot about the initiative, and 13% indicated their parents knew nothing about the initiative. Lastly, 18% of students were unsure of how much their parents knew about the initiative.

Table 41: Students' Perceptions of Parents' Knowledge

Statements	Frequency	Percent
They know a lot about the initiative.	30	5%
They know somewhat about the initiative.	153	28%
They know a little about the initiative.	206	36%
They know nothing about the initiative.	71	13%
I am not sure how much my parents/guardians knows about the initiative.	97	18%
Total	557	100%

Conclusion

This chapter reviewed the findings from the educator and student surveys. From the data, a large majority of educators held strong positive views about the potential impact of digital devices in the classroom, including 93% of respondents who agreed that success of integration was connected to their knowledge about the use of devices and 96% who agreed that success was connected to the training they received. However, respondents remained highly aware of the challenges of technology integration as well. The survey revealed positive change between March 2015 and Mach 2016 in the areas of educator technology proficiency, educator level of integration, and educator frequency of integration. Additionally, respondents were largely in support of their principal as an effective leader for instructional technology in the school and believed that educators in their school were in support of technology integration. Seventy-six percent of respondents believed support of parents and families was necessary for success of the initiative, but only half believed parents and families were currently in support of the initiative. Lastly, although 96% believed success of the initiative was dependent on the training they received, only half (52%) of respondents believed they had been offered adequate professional development to prepare them for that initiative.

From the student survey, an overwhelming majority of students reported that they had a personally-owned digital device, the majority of which were smart phones (87%), followed by laptops (44%) and tablets (17%). However, only 69% of students with devices brought devices to school to support their academic work. Those who chose not to bring a device reported a lack of need or requirement by the educators, fear of theft or loss of device, preference of phone use over other devices, and a lack of personal initiative as a reason for not bringing a device. Respondents were pleased that their school implemented the initiative, with 83% reporting that having access to technology during the school day was very or somewhat important to them. Fifty-five percent of student respondents described their skill level as expert or advanced. The surveys revealed that 50% reported a positive change in their frequency of use of devices for in-class academic purposes, and 47% reported a positive change in their frequency of use of devices for homework between March 2015 and April 2016. The final chapter will discuss how the findings presented in this chapter verify or contradict the literature on implementing learning technologies, implications for practice and scholarship, and conclude with recommendations for future research.

Chapter Six: Discussion of Findings and Conclusion

Introduction

By examining the process of implementing a Bring Your Own Device approach in a high school context, the triple aims of this study were to (1) expand the context-specific knowledge of implementing a BYOD approach by providing a narrative-based example of the process, (2) determine the degree of similarity between one-to-one implementation strategies and BYOD implementation strategies, and (3) surface potential new strategies to support the implementation of a BYOD initiative. This study was conducted with the goal to identify new practices to assist schools in strengthening their implementation efforts. To facilitate this purpose, the following questions guided the research:

1. What happens when a school implements a BYOD program?
    a. What initial processes does the school employ when launching a BYOD program?
    b. How are the strategies for implementing a BYOD initiative similar or different from implementation of a one-to-one initiative?
2. What, if anything, is unique about the implementation of a BYOD program?

This final chapter will discuss the qualitative and quantitative findings, highlighting how they support or refute current strategies stated in the literature. The chapter will conclude with implications and recommendations for practitioners dedicated to improving BYOD implementation and for researchers in the field of education and instructional technology. Table 42 below presents a simplified summary of the responses to each of the research questions for this study.

Table 42: Research Questions and Answers

Research Question	Findings
1. What happens when a school implements a BYOD program?	The plan to launch the initiative in the spring was determined to be the most efficient course of action. However, a less than perfect pilot phase served to quell the excitement and enthusiasm for some educators and the principal. During the first full implementation year, competing priorities, coupled with a tension between students' access to devices and educators' demand for the use of devices, resulted in low and varied saturation rates across the school. As the challenges of implementation mounted, leadership support of the initiative dwindled, creating a widespread sense of apathy among many stakeholders in the school. Towards the end of the first full implementation year, absent a plan to move forward, the future of the initiative remained uncertain.
a. What initial processes does the school employ during the first year of its BYOD initiative?	Specific activities and processes this school employed in the implementation of its BYOD program included: 1. Observation of other BYOD implementation sites 2. Development of a 12-week implementation plan for educators 3. Technology device vendor fair 4. Professional development offerings
b. What, if anything, is unique about the implementation of a BYOD program?	**Equal importance:** Of the seven strategies presented from the literature, those listed below held equal importance when implementing a one-to-one or BYOD learning technology initiative: • Empowered leader • Professional development • Assessment and evaluation • Expanded network **BYOD-emphasized importance:** The following strategies from the literature appear to have an increased degree of importance when implementing a BYOD learning technology initiative:

Research Question	Findings
	• **Access and equity:** Given the reality that not all students would be able to bring a device to school, there was an increased emphasis on this strategy to ensure that the initiative did not exacerbate issues of access and equity. • **Engaged stakeholder community:** When properly secured, this strategy appeared to hold equal importance for one-to-one and BYOD contexts; however, when absent, this strategy could have greater repercussions in a BYOD context. • **Shared school vision:** BYOD required a heightened emphasis on this strategy because so much of the success of the approach was dependent on articulating the vision of the initiative in order to secure buy-in. **New Strategies for a BYOD context:** Below are strategies that surfaced from the analysis as having supported or would have supported the implementation of a BYOD approach. • Needs assessment • Pilot phase
2. How do educators and students perceive the program and its implementation, and how does that influence their support and buy-in?	**Educators:** Educator participants were generally supportive of the initiative and held strong positive perceptions about the potential impact of integrating technology into their classrooms. However, their strong degree of support for the initiative was often muted by their perceptions of the implementation and its apparent challenges with access to devices, device saturation, and appropriate professional development. Thus the barriers and issues educators were facing with the implementation negatively affected their full buy-in of the initiative. **Students:** The vast majority of student respondents were strongly in favor of the initiative and were pleased with the decision of the school to allow the use of digital devices during the school day. The greatest criticism students expressed was the lack of requirement of devices by their educators. Students might have

Research Question	Findings
	demonstrated increased support and engagement with the initiative, by way of increased device use, if more educators integrated technology into their lessons in a way that required students to bring and use devices.

Findings: Strategies for Technology Implementation

Empowered Leaders

The literature is clear about the need for an experienced and supportive leader to guide the implementation of a learning technology initiative. The role of said leader should be played by a member of the school administrative team, but, by and large, that position should be inhabited by the principal. The findings from this study demonstrated that while the principal did serve as the leader of the initiative, his level of support and degree of enthusiasm began to decline as the implementation moved forward and when the initiative was most in need of a leader. This was noted and shared by the majority of interview participants. While many expressed disappointment with the diminished level of support, that disappointment was often expressed in combination with sentiments of understanding for the multitude of competing priorities the principal was charged to address. It was evident that participants had a genuine fondness for principal, which made it difficult to negatively characterize his efforts. Despite the feelings of disappointment, it is assumed that the understanding of the staff was what contributed to the 77% of survey respondents who agreed or strongly agreed that the principal was an active leader for instructional technology at their school. This percentage was higher than expected given the sentiments expressed in the qualitative data.

Between the conclusion of the pilot phase and the time in which data were collected, planned activities for Connected Classrooms declined, conversations grew quiet, and meetings with the TIT ended. Staff perception was that the principal was no longer an active champion of the initiative, leaving some feeling that the excitement was short lived. The principal was aware of his lessened support and attributed that in part to a sense of hopelessness about the future success of the initiative. This hopelessness was a result of many factors, including budget cuts, personnel cuts, low saturation, and higher priority issues. Another potential activator of his diminished support may have been his decision to leave the school. During the interview with the principal in May, he revealed that he was leaving the district to pursue a plan to manage an educational consulting firm. This served to confirm his disengagement as it can be assumed that his attention was split and thus was no longer fully directed in the on goings of the school. As theorized in the literature, had the principal been able to maintain an adequate level of support to encourage activities, conversations, and meetings related to the initiative, that sentiment might have trickled down to staff and students, leading to sustained enthusiasm and support for the initiative and implementation activities. Absent this degree of sustained support and interest, the initiative struggled during the first year and faced an uncertain future.

The literature sets high expectations for leaders implementing learning technology initiatives, and the necessity for the role of the leader was evident in the BYOD context as well. Although the school struggled to meet those expectations, it is fair to conclude that empowered and engaged leadership is a strategy that holds equal necessity for one-to-one and BYOD contexts.

Shared School Vision and Planning

The second key implementation feature as stated in the literature is the development of a unified vision about the outcomes of the initiative, allowing everyone to conceptualize what the school is striving towards. This is assessed by the degree to which key stakeholders can accurately articulate the long-term vision of the initiative, often obtained through the development of a planning and implementation guide. The findings detailed that the principal spoke of a well thought out implementation plan, developed through observation and research by the TIT that was used to guide their process. However, details or a copy of this plan was not shared with the researcher. In the quantitative data, 65% of educators agreed or strongly agreed that the school had a well-developed technology plan to guide integration efforts, but few, if any, staff members made specific mention of the planning guide during individual interviews or the group interview.

If successful and of quality, a planning guide might have ensured a unified vision of the school's efforts with the initiative. The quantitative data revealed that 73% of respondents agreed or strongly agreed that educators in their school held a shared understanding about how technology would be used to enhance learning. However, that understanding appeared slightly varied in the qualitative data. Specifically, some staff members who participated in interviews and members of the TIT described the goal of the initiative as student-focused, aimed at improving student access to devices and improving student proficiency in the use of software and hardware to prepare them for post-secondary opportunities. Others highlighted a more educator-focused goal of increasing the degree to which educators meaningfully integrated technology in their classroom. While it can be assumed that the purpose of the initiative was a combination of student- and educator-focused outcomes, staff members should have been able to uniformly articulate those specific outcomes. Given the lack of consistency in how interview participants described the long-term goals of the initiative, it can be deduced that, while not of poor quality, improvements could have been made to the planning guide and more could have been done to ensure that all stakeholders held a unified long-term vision for Connected Classrooms.

A unified vision and concrete blueprint for the implementation would serve multiple purposes, including securing and sustaining buy-in and as an indicator of progress in the process. Without access to the document, it is not possible to assess the quality of the plan and how well it covered topics necessary to support the implementation. However, it can be stated with confidence that the need for a shared school vision and plan is essential for both one-to-one and BYOD contexts. Additionally, it can be said that BYOD requires a more heightened emphasis on this strategy than one-to-one contexts, specifically because so much of the success of BYOD is dependent on articulating the vision to secure buy-in, so students and families will purchase devices and change their behavior towards education and learning.

Engaged Community as a Resource

As essential parts of the school community, the buy-in and support of parents, students, and educators should be fostered to utilize their strengths for the implementation process. According to the principal, not a lot was done on the front end with parents and students. Thus, it was expected that the buy-in and support from these two groups would be limited. This was due in part to a challenges the school faced in communicating face-to-face with families. Much of what was done to foster parent and family buy-in was either through student conferences or from individual educators who took it upon themselves to speak with parents and families of their students. Students were used as a proxy and asked to describe their parents' awareness of the initiative. As expected, given the lack of intentional effort, a near majority, 49%, of students reported that their parents knew nothing or a little about the initiative. Surprisingly, a total of 33% of students said that their parents knew a lot (5%) or somewhat (28%) about the initiative. The qualitative data revealed that parents expressed concerns related to not wanting to be financially responsible for a school-issued device, how their student could remain actively engaged in the learning process without a device, and lack of clarity about why students needed a device. This led one educator to conclude that parents were largely unaware of what was happening with Connected Classrooms.

For students, despite the lack of intentional strategies used to foster their buy-in, an overwhelming 93% of those who completed the survey agreed or strongly agreed that they were pleased their school implemented the initiative. Further support for the initiative included the 72% of students who agreed or strongly agreed that the use of a digital device had improved their learning and the 83% who reported that having access to technology during the school day was very or somewhat important to them. This high level of support was further evidenced by findings from the principal and staff interviews where participants shared that they believed students were largely in favor of and on board with the initiative.

Across the three stakeholder groups from this school, the expectation was that educators would have the highest level of buy-in. Survey data revealed that 91% of educators agreed or strongly agreed that teachers in their school were generally supportive of technology integration. Interviews with staff revealed that there were a small number of individuals who expressed having positive perspectives or support for the initiative from the beginning. Others could either be described as hesitant or supporters with concerns. Some of the hesitations that hindered full support from staff members included logistical concerns about what the initiative would look like on a school-wide scale, accessibility of devices and connectivity of the wireless Internet, how to effectively get educators on board, how to implement the initiative, and what the initiative would look like. Not surprisingly, there remained a group of educators who had chosen to opt out of the initiative, seeing it as another trend they could wait out until something new was attempted.

It is assumed that the lack of continued leadership support may have led to shifts in the support and buy-in from educators. Some shared that there were high levels of excitement at the start of the initiative when everything was new, but that excitement dissipated as their efforts were frequently met with challenges and setbacks. These concerns heightened the continued need for strong leadership and a champion of the implementation, exactly as the principal's priorities shifted.

The buy-in and support from the key stakeholder groups varied. Parents and families remained the group with the reported least level of knowledge and thereby the least level of support for the initiative (as gathered from students and educators). While this group may appear to be an understandable afterthought, schools should be mindful of the fact that despite the assumed autonomy of high school students, their parents and families hold considerable influences over their lives, education, and purchases. Thus, to address the issue of low saturation as reported in the previous chapters, schools should develop intentional strategies to increase parent and family awareness and buy-in. Part of securing buy-in would require helping parents visualize how devices are used in the classroom to address the philosophical hesitation and lack of understanding parents had with technology in the classroom.

With respect to students' support, while survey respondents reported high levels of support and while the principal and educators expressed a belief that students were on-board with the initiative, the low levels of device saturation painted a different picture. There remained a disconnect between students' overall level of support and students' decision to bring and use devices in class for academic purposes. Based on the findings and responses reported in the student survey, it can be assumed that a number of factors contributed to the disconnect between ownership of a device, bringing said device, and using that device. These factors include, but are not limited to, lack of expressed need by educators, fear of theft and loss, lack of personal initiative to complete the required assessments, and a preference for traditional methods of teaching and learning. However, a limitation of this study was an inability to state, with data-supported confidence, which variables influenced or had the most effect on the relationship between support for the initiative with assumed devices ownership and a decision to bring and use a device.

Finally, after the pilot phase, educators were reported not to have returned to the new school year with the same degree of energy and enthusiasm for Connected Classrooms. The combination of these attitudes and the limited activity and conversation about the initiative in the fall further shifted their levels of support. It is possible, although not clear, that these shifts and apparent declines in support might have been mitigated or avoided through effective leadership practices.

Engaging the stakeholder community as a resource in the implementation cannot be underscored enough. When properly secured, this strategy appears to hold equal weight in one-to-one and BYOD contexts. However, when absent, this strategy has greater repercussions for BYOD contexts for many of the reasons detailed above. Specifically, because so many of the key ingredients of success for the BYOD approach, i.e., parents purchasing devices, students bringing devices, and educators teaching with devices, rests on the buy-in of these stakeholders; if they are not properly engaged, the initiative will fall apart.

Expanded Network

Without adequate Wi-Fi connectivity, the devices students were allowed to bring would be as valuable as an outdated textbook. Depending on a school's recent advancement, most schools will require significant technical upgrades to support a BYOD implementation. Additionally, a school with a large population and a variety of devices would require additional measures to ensure proper connectivity. Student and educator survey participants were both asked about the technical infrastructure of their school. It should be noted that almost two-thirds (66%) of educators agreed or strongly agreed that the Internet connection was often too slow, and over half (56%) agreed or strongly agreed that the Internet connection was often not working. By contrast, the same percentage of students (56%) agreed or strongly agreed that the wireless network was adequate to support the use of their digital devices. Since the majority of student and educator survey respondents reported concerns with the speed, reliability, and adequacy of the Wi-Fi connectivity, it is assumed that efforts made to improve the technical infrastructure and Wi-Fi connectivity were not substantial enough to meet the needs of the school.

There was an overwhelming degree of appreciation for technical support staff in the school. Ninety-five percent of educator survey respondents agreed or strongly agreed that their requests for technical assistance were addressed in a timely manner. Additionally, interview participants shared exuberant praise of the two staff members charged with addressing issues of technical support.

Moving forward, it will be important for the school to conduct a full-scale assessment of its technical infrastructure, paying close attention to areas of poor connectivity and detailing opportunities for improvement. This will go a long way to improve stakeholder confidence for the initiative and increase educators' likelihood of integration. Unsurprisingly, this strategy holds equal weight for both one-to-one and BYOD contexts. Both approaches are highly dependent on student's ability to connect to the Wi-Fi network with ease and speed. But it should be noted that the BYOD approach holds the potential for greater emphasis as the variety of devices adds complexity to the strategy.

Focus on Access and Equity

The concern for equal access to digital devices becomes sharply elevated for schools that opt to implement a BYOD initiative. Schools should not expect that every student will own or chose to bring a device to school, and measures should be put in place to address the shortage. At this site, school-owned Chromebooks were made available for students to check out for the school year. Additionally, carts filled with

Netbooks were available for educators to check-out for specific tech-heavy lesson plans. Given that only about one-third of the student population completed the survey, the findings cannot be extrapolated to the larger population to fully under the access to devices and needs of the student body. However, of the 577 students who completed the survey, 97% reported owning some type of digital device, and 83% reported always having access to a device when they needed one during the school day. It can then be assumed that among the combination of student-owned devices, Chromebooks, and Netbooks, the vast majority of survey respondents had access to a device when they needed one. Still short of a 1:1 ratio, a presumed 83% saturation rate leaves room for improvement in the following implementation years. It should also be noted that an 83% potential saturation rate is of limited value if it consists of smart phones, which can only perform a fraction of what educators aim to do in classrooms.

This school was fortunate to have school-owned devices to support students who were unable to provide their own. Without that supply of devices, the rate of potential saturation would likely have been much lower than it was. Given this knowledge, it should be said that schools cannot reasonably rely on students and families alone to provide all devices necessary to reach a 1:1 ratio for a BYOD initiative. If a school aims to reach a point where 100% of students have access to devices when they need one, the school should be prepared to provide a percentage of the devices to support those who cannot provide their own. If not, the school will inadvertently foster a system where potential academic outcomes are differentiated between students who have devices and those who do not, leading the initiative to be relegated to the closet of failed educational innovations.

Again, it comes as no surprise that the strategies of access and equity proved to be of heightened importance in this BYOD context than in the general one-to-one literature. The challenge of ensuring that all students have a device of adequate quality and that the devices are brought to school every day is a challenge that undoubtedly requires more attention in a BYOD context than one-to-one where every student is given a device.

Professional Development

The literature makes it clear that professional development is the single component that if absent or inadequate can quickly collapse the implementation of any learning technology initiative. This is because learning technologies and all related devices used for the purpose of academic goals are merely tools that require the adeptness of educators to help achieve those goals. According to the literature, professional development should (a) utilize a variety of delivery modes to address the needs of all educators, (b) be tailored to the specific proficiency level of the educators, and (c) be blended with pedagogy and focus on effective teaching practice *through* the use of technology.

The quantitative data from the educator survey revealed that slightly more than half (53%) of respondents agreed or strongly agreed that an adequate amount of professional development had been offered to prepare them for Connected Classrooms and integration of technology. This left 47% of respondents—slightly less than half—whose professional development needs were reportedly not being met and thus would be limited in their integration of technology. It is reasonable to assume that only those who felt they received adequate professional development would integrate technology into their classroom. This would leave 47% of educators not integrating technology, thereby resulting in a number of students who found no academic use for their devices because their educators were not integrating technology. When asked about the specifics of the professional development that had been offered, 65% of respondents agreed or strongly agreed that the technology-related professional development did meet their specific level of proficiency, and 83% agreed or strongly agreed that the technology-related professional development was delivered in a variety of formats. While there was room for improvement, the professional development that was offered was reportedly meeting the proficiency and format delivery needs of educators.

Despite the quantitative data indicating strong support for the proficiency levels of professional development, interview participants expressed frustration about the proficiency levels of the professional development and their desire for more advanced offerings. This spoke to the challenge of providing professional development that meets the needs of a staff that is spread across all proficiency levels. Either some groups are left feeling that the trainings are far too advanced, or others are left feeling as though the trainings are a waste of their time. There was also expressed frustration about the lack of feedback being solicited about educators' professional development needs. Ongoing communication to ensure that what was being offered was what educators needed most is important if educators are to get the most out of the offerings.

Moving forward, what educators wanted was focused time, specific content, and motivation to integrate. Data revealed that educators wanted week-long technology camps that would allow them to focus on learning software and developing content. The biggest roadblocks to this, not surprisingly, were time and resources, further highlighting the interconnectedness of implementation strategies, where success with one and not another makes the process futile.

Similar to the expanded network strategy, professional development is another strategy that is requisite to the intention of learning technology initiatives. Acknowledging the need for changed behavior on the part of educators for the initiatives to be successful, this strategy is essential in both BYOD and one-to-one. It may be debatable as to whether BYOD contexts require a more intentional need for professional development, but in the opinion of the researcher, many of the impacts and mentioned challenges would be present regardless of the approach being implemented.

Assessment and Evaluation

Ongoing assessment of the implementation process was necessary for identifying strengths and weaknesses for improvement. Because the process of implementation is rarely perfect, but necessary for the success of an initiative, it is important to assess and document the process. In lieu of a full-scale formal evaluation, schools should aim to gather information about (1) feedback all important stakeholder groups, (2) educators' skills and proficiency, (3) student access to devices and school saturation level, and (4) stage and frequency of integration of technology by educators in order to understand the effects and success of their implementation.

As one of the least discussed implementation components in the literature, it comes as little surprise that assessment and evaluation were not key foci during the implementation of Connected Classrooms. Conversations with the principal about effects and impacts of the implementation were answered with anecdotal, rather than data-driven information. Because no specific benchmarks were put in place at the front end of the implementation, many participants had a difficult time assessing the progress or success of the implementation. Without knowing where the school expected to be with respect to different implementation measures, participants could not informatively provide an opinion on the progress and success of the implementation.

Time should be spent gathering a pre- first-year baseline to be used to set future benchmarks for key measures of implementation success. If the school had identified benchmarks to measure, they could have been assessed at the end of the first year to determine implementation progress. Finally, assessment and evaluation appear to be of equal value in both the BYOD narrative of this study and the one-to-one general literature. Implementation of both approaches benefit equally from the addition of an evaluation and assessment plan.

Findings: Emergent Strategies

Pilot Phase

The use of a pilot phase to help transition into the full implementation year appears to be a valuable strategy that could be adopted in the BYOD literature for learning technology implementation. The idea of starting the implementation during the second half of the year, with the plan to use the summer months for assessment and revision of the implementation plan could greatly benefit many schools. While the site of this study failed with specific parts of its pilot phase, it provided many lessons to support the development of a theory around the BYOD approach. The benefit of utilizing a pilot is that it allows stakeholders to slowly ease into the initiative. It gives educators time to wrap their minds around what is expected of them, where they are currently situated concerning new expectations, and what they can do to meet those expectations at the start of the full implementation year. The pilot allows stakeholders, especially educators who may require more coaxing, the feeling of a voluntary buy-in. This time could also be spent preparing students for new school and classroom expectations, developing basic technology skills, and completing requirements to access devices for the full implementation year. The pilot phase would provide the necessary time to educate parents and families about why their students need a device, the value it affords, and purchasing options.

Another aim of the pilot phase is to provide the opportunity during the summer months, when there is more time, for key members of the implementation planning team to assess the pilot. The findings can be used to revise and develop new implementation practices for the following school year when full implementation is rolled out. The planning team needs to remain committed to meeting during the summer and preparing for an enthusiastic full-year kick-off. As part of the pilot phase, students and staff should be given directives to work towards during the summer months. Students should be urged to acquire a suitable device while educators should be expected to focus on activities to support their integration in the fall.

Echoing the sentiments shared by the principal is the fallacy that school-based initiatives need to start at the beginning of the year. On the contrary, such an implementation timetable may very well be detrimental to the success of the initiative. Schools should not feel obligated to operate on a nine-month schedule, as that mindset can lead to wasted time for three months of the year. Rather, they should provide paid opportunities during the summer months for educators to acquire new skills to support progressing of implementation.

Needs Assessment

Another strategy that should be included in the literature for BYOD implementation is the use of a needs assessment to determine organizational readiness for the initiative. While some attempts were made towards this aim, a more formal needs assessment process should be included in BYOD implementation frameworks. There are four specific areas that should be included in this type of needs assessment. These include, but are not limited to, student skills and proficiencies, educator skills and proficiencies, student access to devices, and organizational culture:

- Student skills and proficiencies will provide an indicator of how well students use technology beyond social networking, allowing the staff to determine which skills need to be taught and what students can be reasonably expected to learn during the initial implementation of the initiative.
- Similarly, the assessment of educator skills and proficiencies will measure how well educators can use technology, integrate it into their classrooms, and determine the types of professional development that are needed for staff to acquire the necessary skills.
- Measuring student access to devices is of particular importance for BYOD initiatives that rely heavily on student procurement of devices. If schools can accurately determine the percentage of students who own and can bring devices, they can then estimate the number of devices needed to fill the gap to 100% saturation. For some schools, this gap may be the factor that determines the feasibility of their entire initiative. Hypothetically speaking, if a school recognizes that they need to fill a 20% gap, they may be impassioned to move forward with

their implementation with the confidence that they can easily fund the additional devices. However, if a school recognizes that they need to fill a 50% gap, they may opt out of the initiative or make significant changes to their plan if the approach will not be successful with only a 50% expected saturation level. There are two additional factors to consider:

  - Another factor to measure related to student access to devices is the types of devices students will bring to school. Smartphones, laptops, and tablets were commonly listed devices in the survey, each with a different set of pros and cons. Depending on the needs of students and expectations of the school, the types of devices students can bring will matter a great deal.
  - Lastly, further assessment should be completed with students who report, through initial assessment, an inability to bring devices to determine why they are unable to bring devices. If the reason is financial in nature, the options for a solution may be limited. However, if the reasons are similar to what was expressed in the current study (fear of theft or loss, preference for traditional learning, or lack of personal initiative) strategies can be developed to address those barriers.

- A final area in the needs assessment is <u>organizational and contextual culture</u>. A review of the culture of this current study revealed funding cuts as a result of a failed levy, layoffs in support staff positions, changing demographics, decreased morale, and student conduct incidents. Independent of the initiative, these realities put the school in a mode of survival, where the primary goal was to stay afloat. In hindsight, had a contextual needs assessment been conducted, the school may have forgone the initiative. The combination of these organizational and contextual occurrences and their expected impacts should be taken into consideration when determining whether the timing is best for implementing a major, school-wide initiative, although the reality of operating a public high school for 1,600 students is that rarely will conditions be perfect for implementation. So rather than waiting for that impossible window of opportunity, schools should consider making the best of what they have to work with, which first requires a complete understanding of their context. Schools should conduct a complete assessment of the culture of their school, district, and community. This will help to understand the opportunities and threats to the implementation and to develop plans to capitalize on those opportunities and mitigate those threats.

The four areas of the needs assessment should be combined with planning of the pilot phase and structured as a process of organizational readiness. This concept will be described in detail in the following section related to recommendations and implications for practitioners.

Significance of Findings

The findings detailed above contribute to the literature in three ways. As mentioned in the problem statement, prevalent frameworks are oversimplified and lack contextual knowledge. Additionally, the implementation components in the literature were developed from the perspective of the one-to-one model. This has led to questions about whether those frameworks are appropriate for BYOD implementation. This study and the findings discussed above confirm that the strategies present in the literature are sufficient for implementing a BYOD initiative in a high school context, with some requiring greater emphasis in the BYOD context. This supports the notion that BYOD and other learning technology approaches share a sufficient degree of commonalities to warrant to use of similar implementation frameworks, so long as the strategies that warrant emphasis are clearly identified.

The second contribution of the study is in identifying the value of a pilot phase. As a practice that is largely absent from the literature and the context of K-12 initiatives, this study shed light on how an implementation pilot phase can support schools by slowly preparing and easing stakeholders into the norms and new responsibilities of an initiative. The opportunity to avoid a nine-month long implementation catastrophe by using an end of the year pilot that utilizes the summer to assess, revise, and reset the implementation for the first full year is a potential benefit that school leaders should consider for the implementation of all major initiatives.

The final contribution of this study is the importance of a needs assessment to precede and support implementation efforts. Such a practice, which once again is largely absent from the literature and the context of K-12 technology initiatives, was also absent from the current study site. It is the very absence of a proper needs assessment, coupled with the theoretical knowledge about the relationship between a needs assessment and implementation, that advances the belief that (1) not only would this site have strongly benefitted from a needs assessment, but (2) organizational readiness activities should be combined with implementation strategies to form a more comprehensive framework for how to implement learning technologies in K-12 contexts.

Implications and Recommendations

The use of a qualitative case study gave way for detailed findings to surface. There are key implications from the findings that may be beneficial in implementing BYOD in K-12 contexts. The implications for practice shared below are primarily intended for school-level administrative leaders and other school staff leading implementation efforts. The implications for scholarship are primarily intended for academics and all those interested in the theory and research to further the quality of implementation practice.

Implications for Practice

Based on the findings shared above, there are specific implications this study has for school leaders interested in improving the practice of implementing BYOD in their schools. The implications have been framed into four recommendations that are described below.

The first recommendation is for school leaders and all those charged with planning a BYOD initiative to properly detail the plans of a pilot phase. While a pilot phase should be flexible, it should not be informal and should be as well planned as the full implementation phase, with strategic activities and intentional and ongoing monitoring for areas of improvement. The benefits of the pilot phase include (1) allowing stakeholders to gradually buy in to the initiative, (2) creating space for trial and error of implementation activities, and (3) providing the opportunity for an assessment and revision period soon after the initiative kicks-off.

The second recommendation is to create a school culture that facilitates a demand for the use of devices. At its foundation, the implementation of a BYOD initiative requires a change of behavior, something that much of literature recognizes is difficult for individuals—specifically educators—to achieve. It is important for leaders to understand that the majority of educators and students will not independently change their behavior, but will need to be encouraged and motivated to do so. Motivating educators towards changed behavior may be achieved through formal accountability measures or through demonstrating the efficiencies of a technology integrated classroom. Students may be motivated through the use of a curriculum that requires the use of technology for success and by demonstrating to them the limitations of their technology proficiency. By cultivating a culture where both groups can clearly see the added value in using devices and slowly start to recognize the limitations of their old practices, school leaders will be better positioned to increase support and buy-in for their initiative.

The third recommendation is to enhance strategies to improve the awareness and support of parents and families for a BYOD initiative. Although there are many associated challenges with parent engagement at the school level, leaders should not allow these challenges to hinder their efforts towards making parents and families an integral part of their initiative and implementation. Potential strategies include hosting educator-led skills trainings for parents and families, integrating initiative-related information at non-academic events including athletic games and extracurricular activities, and providing information through public community spaces (grocery stores, libraries, coffee shops, etc.). The goal is to meet parents and families where they are in the community. These efforts should start as early as possible and should be ongoing throughout the years of implementation until the initiative becomes so intertwined with academic expectations that the families of incoming freshmen and new students do not see the initiative as separate from day-to-day schooling.

The final recommendation is for the creation and administration of an assessment and evaluation plan. This should be a key priority in the development process and should be created in connection with the planning for both the pilot and full implementation phases. The evaluation should include benchmarks for the pilot phase and yearly bench marks for the full implementation. It should include measurable outputs related to the school's specified outcomes and should be monitored regularly for change.

Implications for Scholarship

The findings from this case study have implications for the literature. While adequate information for the implementation process exists in various forms for BYOD and other learning technology approaches, what was missing from this specific case and appears scant, if not nonexistent in the literature, is a focus on pre-implementation activities. As a result of the emergent strategies from this study, I propose an explicit addition of organizational readiness activities to be formally married to the practice of implementing learning technology initiatives. As more schools and districts continue down the path of adopting and implementing learning technology initiatives, it is critical that school staff understand the complete journey upon which they are embarking. Complete understanding of that journey will require knowledge about both implementation *and* organizational readiness. Organizational readiness for change is necessary for any organization that hopes to successfully implement an initiative, and schools aiming to provide students with access to technology and reach their intended outcomes are not exempt from this critical process (Ruedel, Brann, Gray, & Zorfass, 2013). The next section will briefly review organizational readiness, how it is connected to implementation, and the value it can provide for schools working towards successful implementation.

Organization readiness and technology implementation. Similar to the practices put forth by this site, schools that have successfully navigated the complexity of implementing a school-wide BYOD intervention can attest to the fact that months of planning and preparing occur long before the first device is in the hands of students. However, readiness is the often unmentioned, but necessary precondition for the implementation of a program or initiative. Is it defined in the literature as the degree to which an organization is willing and able to implement an intervention (Drzensky, Egold, & Van Dick, 2012; Rafferty, Jimmieson, & Armenakis, 2013; Weiner, Amick, & Lee, 2008; Weiner, 2009). The value of executing readiness practices prior to implementation is that it allows schools to determine if this is the right time to implement (whether the initiative will be met with failure or sustainability) (Dymnicki, Wandersman, Osher, Grigorescu, & Huang, 2014), and, specifically, if the time, energy, and money to be spent are the best use of resources (Dymnicki et al., 2014).

Readiness theories have overwhelmingly been disproportionately applied to the healthcare sector, with few references in a K-12 technology context. This may be due in part to the fact that readiness is typically embedded within larger implementation frameworks that are used in schools (Aarons, Hurlburt, & Horwitz, 2011; Damschroder et al., 2009; Greenhalgh, Robert, MacFarlane, Bate, & Kyriakidou, 2004; Powell et al., 2012). This inclusion of readiness into larger frameworks may be beneficial in simplifying the complex process of implementation, but it may inadvertently diminish or eliminate the contribution of the readiness process. A thorough understanding of readiness practices and its benefit to the implementation process are important knowledge for all those who plan to lead change efforts. By working to establish or strengthen a schools' readiness, leaders can avoid plunging into an implementation journey they may not be prepared for. Strengthening readiness change efforts and working to avoid implementation pitfalls are major incentives for urging the explicit and formal addition of organizational readiness practices to the process of implementing learning technology initiatives.

Although readiness has been discussed as a process that precedes implementation of an initiative, that should not be the only time when it takes places. Readiness is an ongoing, dynamic, and flexible process; thus, it would be unwise to only assess readiness at the start of the implementation process (Scaccia, 2014). To fully exhibit the value of readiness fully on the implementation of an initiative, readiness can and should be assessed throughout the implementation process, all the way through the sustainability of the intervention. Measures of readiness, such as the examples listed previously (student skills, educator proficiency, student access to devices, and organizational culture), should be assessed at regular intervals as changes to the measures may impact the progress and sustainability of the initiative. For example, if the incoming freshman class is expected to have a lower saturation rate than previous years, plans will need to be made to increase the school's stockpile of available devices. Additionally, contextual changes in the school or district, financial, or otherwise, may reduce in priority the focus of the initiative.

The literature on education and instructional technology would strongly benefit from a formal and explicit inclusion of readiness practices to implementation frameworks. This addition would take the literature one step forward in addressing all stages of the implementation process, from start to finish. While the benefit of this cannot be overstated, it is important to note that organizational readiness alone will not guarantee the success and effectiveness of the initiative. Organizational readiness is a necessary requirement for implementation effectiveness, but by itself is not a sufficient condition for successful outcomes of an initiative (Weiner, 2009). If the program theory itself is flawed, no level of readiness or implementation can lead to successful outcomes (Lehman et al., 2012).

Recommendations for Future Research

Relative to many other K-12 instructional models and initiatives, BYOD remains in its relative infancy both in practice and in the literature. There exists a lot of information about BYOD, but so much more remains to be learned about this approach. This case study may set the foundation for additional studies to further expand the knowledge and information about implementing BYOD initiatives. Below are three proposed research studies that would build on the research here.

This study discusses, in Chapter Four, the importance of device saturation levels. It is important for schools to know what percentage of students own and will bring devices to school, so they can then assess the gap size they need to fill. How future research may improve this process is to investigate what the tipping point of saturation levels is. Specifically speaking, is there a minimum percent or a specific range where school staff may need to slow down, pause, or indefinitely halt their implementation because expected saturation levels are too low for success? Conversely, future research could also shed light on the saturation levels that indicate a strong likelihood of success.

Another proposed study that might prove useful would be to explore the relationship between organizational readiness and the success of a BYOD implementation. This would help to measure the added value of affixing organizational readiness practices to implementation frameworks. Given the scant evidence of the benefits of organization readiness in K-12 contexts, a study of this sort would help to not only improve the quality of BYOD implementation but serve to advance the literature for organizational readiness by providing evidence for its value in new contexts.

Lastly, the findings shared in Chapter Four and discussed in this current chapter reveal what can best be described as misalignment between students' degree of support for the initiative and their decisions to bring and use a digital device at school. Further research on this topic should explore correlations between various factors that influence the relationship between support and action of bringing and using a device. This research would help to explain the disconnect between the two factors.

Recommendations for Continued Implementation

With the transition of leadership at the site of this study, the incoming principal had a lot on her plate beyond determining how best to move forward with the struggling implementation of a school-wide initiative. Below is advice I would share with the principal about how best to stabilize the implementation and regain control of the initiative. For starters, I would suggest a pause on any new implementation activities. The whole initiative needed to be refocused and energy should not be expended without a clear direction forward. Educators and students who were already comfortable with use and integration of technology should be allowed to continue using devices so as to not disrupt their teaching or learning process. But those who were not yet using devices should not be asked to make any immediate changes. Next I would suggest that administrators and members of the technology integration team reconvene to conduct a full needs assessment and detail the specific purpose of the initiative, explicitly stating what the aim of technology integration is for educators and teachers. This could then be followed by the development of a strategic plan for buy-in from all stakeholders – educators, students, families.

Once these necessary strategies were in place, I would recommend the school move forward with a phased implementation plan focusing on each incoming freshman class. The school should begin by communicating with eighth grade students and their parents in the summer months before their ninth-grade year. The school should communicate to them the expected academic and instruction practices as it relates to the initiative, and help students secure suitable devices to support their learning. Resources and strategies would then be targeted towards the freshman class and all educators who teach freshman level courses. The focus of this first year would be to support use and integration with this group of students and educators, developing skills and proficiencies, and normalizing a culture of learning done through technology. In the summer following this first year of implementation, educators who demonstrated great comfort and skill in technology integration could lead trainings and professional development offerings for other staff. All interested staff would be invited to attend, and educators who teach sophomore-level courses would be required to attend to prepare them for their students in the fall. This process would repeat itself for the next three years until a normed culture around use and integration of technology existed across all grades. By targeting a sample of students and educators each year, limited resources could be properly focused to maximize impact, rather than dispersed across the entire school in a way that leads to limited effects.

My recommendations to help the incoming principal progress the implementation and support the teaching and learning towards 21st-century goals would first be to make clear the purpose and desired outcomes of the initiative. This could then be followed by a strategy to encourage engagement by student and educator champions. Lastly, a four-year phased process could be used to systematically roll out the implementation with each incoming freshman class for gradual adoption by students and educators. This would ease the challenges of a school-wide implementation and makes the process more manageable.

Limitations

One of the major limitations of this study was the issue of recall. When data collection began in January of 2016, Connected Classrooms had been underway for close to nine months, and planning and preparation had been ongoing for nearly two years. Therefore, participants were asked to think back to recall how implementation unfolded and to remember the perceptions they had from months prior. Those whose opinions may have changed may have faced difficulty in remembering older feelings, attitudes, and beliefs, and may falsely report changed perceptions.

Another limitation specific to research done in schools is the concern for honesty in responses, specifically from educators. To fully assess educators' perceptions of the BYOD implementation process, they were asked questions about their opinions of different implementation activities and strategies. Educators may have felt compelled to provide responses that were more positive than their true feelings out of fear that their opinions would be made public. This could significantly have influenced the validity of the data and hold the potential to bias the findings.

A third limitation is the limited representation of the student survey. The challenges associated with surveying the entire student population at a single time period resulted in students having to be invited to complete the survey by proxy of their homeroom educators. This indirect method of inviting students meant that homeroom educators played the role of gatekeeper and some students who may have been interested in completing the survey were not given the opportunity. This resulted in a sample of students completing the survey that was not representative of the entire student population. As such, the findings from the survey cannot be expected to reflect the opinions and attitudes of the larger student body.

The final limitation is the bias of being a single researcher. The individual process of conducting a dissertation eliminated the opportunity for a collaborative analysis and meaning-making process. As a result of having only a single researcher, the data were filtered and interpreted through a single lens. As described in Chapter Three, the researcher has positionality and a background, and those personal traits have inevitably influenced the way the data were gathered, interpreted and understood.

Conclusion

The trend of technology integration in schools shows no signs of declining, thereby requiring schools and districts to strategize a plan to provide students with the skills they need most to succeed in our tech-driven world. To that aim, this study was designed to explore and examine the journey of one school's implementation of its BYOD initiative. The process of documenting this journey served to (1) expand the context-specific knowledge of implementing a BYOD approach by providing a narrative example of the process, (2) determine the degree of similarity between one-to-one implementation strategies and BYOD implementation strategies, and (3) surface potential new strategies to support the implementation of BYOD initiative.

Finding from this study illustrated that there are overlapping implementation strategies that are of equal importance for the BYOD or one-to-one approach (empowered leader, professional development, assessment and evaluation, and expanded network), and other strategies that require increased emphasis for the BYOD approach (access and equity, engaged stakeholder community, and shared school vision). Additionally, the case that was studied revealed the addition of new implementation strategies (needs assessment and pilot phase), which may be of added value if formally and explicitly integrated into BYOD implementation frameworks. These findings will support those working through their own implementation journey by providing a framework to guide their process and drawing their attention to strategies within those frameworks that require additional attention. Lastly, by demonstrating an authentic implementation process fraught with challenges and barriers, this study contributed to the literature on current implementation examples a candid example of the blemished and flawed processes of how real implementation unfolded.

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Appendices

Appendix A: Sweeney (2012) Models for BYOD

1. **Bring Your Own Standard Device:** "Students have to procure a device from a limited selection of standardized devices dictated by the school. Fully funded and owned by the student, but managed by the school" (Sweeney, 2012, p. 23)

2. **Bring Your Own Device:** "the student procures and owns a device of their own choosing. The school does not manage the device, but may provide a managed educational environment using VDI (virtual desktop infrastructure) or remote access, or provide a web-based learning management system. In many cases the school demands a specific operating system or software solution to be installed on the device (eg. Windows 7 and the Microsoft Office suite)" (Sweeney, 2012, p. 23).

3. **Bring Your Own Stuff:** "the student procures and owns not only their own device, but also has complete control over the software and services they use within the educational environment. While this approach may appear similar to BYOD, it does away with any attempt by the school to provide a baseline education environment. The school's only activities are to provide network connectivity, content through a standard (web-based) Learning Management Environment, and administrative services" (Sweeney, 2012, p. 23).

4. **Education as a Service:** "At this point, the school is acting purely as an Internet based resource for learning. The student selects and owns their device(s), makes a decision on the software they will use, and also provides their own network infrastructure (using 3G or 4G wireless networking)" (Sweeney, 2012, p. 23).

Appendix B: Dixon and Tierney (2012) Models for BYOD

1. **School-defined single platform laptop:** In this model the school defines the required minimum specifications for student laptops. The benefits of this model include: student computers all have the same capabilities, so no student is working with an inferior tool and teachers can plan learning activities around these capabilities; the specification of a single model and brand offers the best volume buying power, simplifies servicing arrangements significantly, and lowers costs accordingly; and the devices are fully functional laptops, which can be used for the full range of learning activities (Dixon & Tierney, 2012, p. 7). This is similar to Sweeney's Bring your own standard device model.

2. **School-defined single platform laptop, plus another device:** This is the same as the above plus students are allowed to use smartphones etc. It can be used to 'legalise' smartphones in schools and allow for school policy to more effectively guide appropriate use. When used as supplementary devices, this format allows for flexibility and personal choice, while ensuring there is a common standard across a class. Considerations include: smartphones, as with 3G or 4G enabled modem sticks, are unfiltered; additional devices can be seen as distracting; and maintenance of any additional device is entirely the responsibility of families. (Dixon & Tierney, 2012, p. 8).

3. **School-defined multi-platform laptops:** Similar to Model One, but, while the laptop must adhere to minimum specifications it several platforms or manufacturers are acceptable. Benefits: Parents or students who prefer one platform or manufacturer over another have a choice. Considerations: more work for the network manager to manage a variety of laptops; buying power and bulk discount purchasing options are diminished, for both hardware and service accountability; teachers and tech support staff need to be familiar with several platforms; and some programs are either not available across platforms or exhibit some differences (Dixon & Tierney, 2012, p. 8).

4. **Student-choice of laptop or tablet:** The students can bring a laptop (no matter what form, including netbook) with full PC functionality, or a Tablet. 100% - parent funded. Benefits: parents and students who prefer one platform or device over another have a choice. Considerations: student devices do not all have the same capabilities; some devices aren't suitable for consumption and production/ creative tasks or cannot even input full sentences easily; teachers and tech support staff need to be familiar with several platforms and many devices; buying power and bulk discount purchasing and licensing options are diminished; most programs/applications are not available across all platforms and devices or function very differently across various devices (Dixon & Tierney, 2012, p. 9).

5. **Bring your own whatever connects to the Internet:** When people speak broadly of BYOD, this is the option they are usually referring to. This model allows students to bring any device that connects to the Internet – smartphone, e-book or 5-year-old laptop from their parents. There are no minimum specifications for screen size, keyboard, storage, ports and so on. 100 % parent funded. Considerations – same as for model 4 plus the" wide variety of devices and device functionality engenders considerable complexity in the classroom" (Dixon & Tierney, 2012, p. 9).

Appendix C: Educator Survey

SECTION I- Professional Views on Technology in Schools

Please rate the extent to which you agree or disagree with the following statements regarding the use of technology in the classroom.

The use of digital devices (e.g. iPads, Tablets, E-readers, Laptops, etc.) in the classroom...

	Strongly Agree	Moderately Agree	Moderately Disagree	Strongly Disagree
increases academic achievement.				
is an effective tool for students of all abilities.				
helps accommodate students' personal learning styles.				
motivates students to get more involved in learning activities.				
is unnecessary because students will learn technology skills on their own, outside of school.				
gives teachers the opportunity to be learning facilitators instead of information providers.				
is effective because I believe I can implement it successfully.				
is successful only if a teacher is knowledgeable about its use.				
makes teachers feel more competent as educators.				
is difficult because some students know more about digital devices than many				

teachers do.				
is too costly in terms of resources, time and effort.				
requires training that is too time consuming.				
is effective only when extensive technical resources are available.				
requires extra time to plan learning activities.				
eases the pressure on teachers.				
requires too much time with technical problems.				
is successful only if there is adequate teacher training in the uses of technology for learning.				
is successful only if there is the support of parents.				
makes classroom management more difficult.				

SECTION II –Experience with Digital Technology

Please read the descriptions of the proficiency levels related to digital technology and choose the level that best describes where you were at the start of the Connected Classrooms initiative (March 9th 2015) and where you are today.

Descriptor	March 2015	(Month) 2015
Unfamiliar - I have no experience with digital technologies.		
Newcomer - I have attempted to use digital technologies,		

but I still require help on a regular basis.		
Beginner - I am able to perform basic functions in a limited number of software applications.		
Average - I demonstrate a general competency in a number of software applications.		
Advanced - I have acquired the ability to competently use a broad spectrum of digital technologies.		
Expert - I am extremely proficient in using a wide variety of digital technologies.		

Please indicate how often you integrated digital technologies (software and hardware) in your classes at the start of the Connected Classroom initiative and how often you are using technologies in your classroom today.

	March 2015	Nov 2015
All the time (5 class period)		
Often (4 class period)		
Sometimes (3 class period)		
Occasionally (2 class period)		
Rarely (1 class period)		
Never		

SECTION III - Level of Integration

Please read the descriptions of the six stages related to the process of integrating digital technologies in your classroom and choose the stage that best describes where you were at the start of the Connected Classrooms initiative (March 9th 2015) and where you are today.

Descriptor	March 2015	Oct 2015
Awareness: I am aware that technology exists, but have not used it – perhaps I'm even avoiding it. I am anxious about the prospect of using digital devices.		
Learning: I am currently trying to learn the basics. I am sometimes frustrated using digital technologies and I lack confidence when using them.		
Understanding: I am beginning to understand the process of using technology and can think of specific tasks in which it might be useful.		
Familiarity: I am gaining a sense of self -confidence in using digital technology for specific tasks and I am starting to feel comfortable using the technology.		
Adaptation: I think about digital technology as an instructional tool to help me and I can use many different software applications.		
Creative Application: I can apply what I know about technology in the classrooms. I am able to use it as an instructional aid and have integrated technology into the curriculum.		

SECTION IV – Implementation Components

Please rate the extent to which you agree or disagree with the following statements regarding the implementation of Connected Classrooms in your school.

Leadership:	Strongly Agree	Moderately Agree	Moderately Disagree	Strongly Disagree
My school has a well-developed technology plan that guides all technology integration efforts.				
The principal is an effective leader for instructional				

technology in this school.				
The principal consults with staff before making decisions about instructional technology that affect us.				
In this school there are clear expectations that technology will be used to enhance student learning.				
When our school has professional development focused on technology, the principal often participates.				
The principal is willing to support—through funding or manpower—teachers' efforts at technology integration.				
Teachers receive adequate administrative support to integrate technology into classroom practice.				

School Culture -Teacher Support:	Strongly Agree	Moderately Agree	Moderately Disagree	Strongly Disagree
Teachers in this school share an understanding about how technology will be used to enhance learning.				
Teachers in this school are generally supportive of technology integration efforts.				
Teachers in this school are continually learning and seeking new ideas about how to integrate technology in their				

classroom.				
Teachers are not afraid to learn about new technologies and use them with their class(es).				

Perception of Family Support:	Strongly Agree	Moderately Agree	Moderately Disagree	Strongly Disagree
Parents are aware of our school's emphasis on technology.				
Parents support our school's use of technology.				

<u>Technical Support:</u>	Strongly Agree	Moderately Agree	Moderately Disagree	Strongly Disagree
Internet connections in my class is often too slow.				
Internet connection in my class is often not working.				
My requests for technical assistance are addressed in a timely manner.				
Problems such as devices freezing or an inability to access the Internet make it difficult for me to use technology.				

Professional Development:	Strongly Agree	Moderately Agree	Moderately Disagree	Strongly Disagree
My school or district has provided me with an adequate				

amount of professional development to prepare me for the Connected Classroom program.				
Technology-related professional development at our school or district is provided in a variety of different formats (lecture/presentation, small group work, collaborative activities, etc.).				
Technology-related professional development at our school or district often meets my specific level of technology proficiency.				

Please describe how often you receive coaching regarding the implementation of technology in your classroom.

Coaching:	All the time	Very often	Occasionally	Rarely	Never
Receive coaching or mentoring from an <u>internal source</u>, such as another teacher or technology coordinator					
Receive coaching or mentoring about technology integration from an <u>external (non-school) source</u> such as a curriculum specialist.					

SECTION V - Your Background

1. How many years have you been teaching/an educator?

a. This is my first year of teaching
b. 2-3 years
c. 4-7 years
d. 8-15 years
e. More than 15 years

2. Are you Hispanic or Latino?
    a. Yes
    b. No

3. Which category best describes your race? (*Check all that apply*)
    a. African American/Black
    b. Asian / Pacific Islander
    c. Hispanic or Latino
    d. Native American or American Indian
    e. White/Caucasian
    f. Other

4. Which category best describes your gender?
    a. Female
    b. Male
    c. Transgender
    d. Gender Fluid
    e. Other: ______________

Appendix D: Educator Interview

Thank you for agreeing to participate in this interview to assess the implementation of the Connected Classrooms initiative!

I am conducting this study in partial fulfillment of my Ph.D. in Evaluation Studies at the University of Minnesota – Twin Cities. The purpose of this study is to assess the implementation of the Connected Classrooms initiative as a way to examine the process of implementing a Bring Your Own Device (BYOD) approach in a high school context. The BYOD approach requires unique strategies that are necessary for successful implementation. BYOD initiatives can prove to be challenging for schools due to the constantly changing ecosystem of devices students may choose to use, the lack of descriptive narrative supporting implementation frameworks and a focus on the technological rather than the human elements of the implementation process. The opportunity to gain insights about your school's implementation activities and the perceptions of staff and students will help contribute to the body of knowledge in the field around implementation of learning technology programs in K-12 contexts.

This study is completely voluntary, and the decision to participate or to abstain from participation is yours. This decision will not affect your relationship or standing with your school or the University of Minnesota. You may choose to abstain, for any reason, from responding to any of the questions in the survey that you do not wish to answer.

Your responses to this survey will be kept private and anonymous, and responses will not be tied directly back to you. In any published material that uses this data, participants will not be personally identifiable. Only the researchers in this study will have access to the research data and records. Aggregate findings from your school will be compiled and shared with school staff interested in reviewing the data.

There are no known risks involved in participating in this study. The benefit of your participation is feedback on the implementation of Bring Your Own Device (BYOD) program in K-12 contexts, and the contribution to the body of knowledge around unique implementation strategies and needs for BYOD programs.

Do you have any questions before we get started?

Would it be alright if I audio-recorded our conversation today? This will allow me to better engage during our conversation, while ensuring that I am accurately capturing the accuracy of your responses.

Interview Questions

1. In your own words, how would you describe the Connected Classrooms initiative?

    a. What do you believe is the motivation for implementing this initiative?
    b. What do you believe is the expected outcome of this initiative? (At the student level)

2. Take me back to when you first learned about the Connected Classrooms initiative; what were your initial thoughts and attitudes?
    a. 9 months later, how, if at all, have those attitudes changed?

3. What role do you believe technology can and should play in the classroom?
    a. What outcomes do you believe technology can bring when used in the classroom by students and teachers?

4. How, if at all, are you currently using technology in your classroom?
    a. Which classes/device/software/program do you use?

5. What limitations do you perceive as obstacles to integrating technology into your classroom?
    a. What additional support would you need to increase/improve the use of technology in your classroom?

6. On a scale of one to five, with one being the lowest score and five being the highest score, how would you describe the effectiveness of your school's efforts of implementing the Connected Classrooms initiative? Please explain your response.
    a. What was your role in the implementation process?

7. The initiative officially kicked off in March; in your opinion what effects (positive or negative) did the pilot phase have on the implementation process?

8. What professional development opportunities have you been offered and what professional development opportunities related to developing skills for Connect Classrooms have you taken part in?
    a. What skills did you learn and use from those opportunities?
    b. Are there specific offerings that have been instrumental in your initial or continued use of technology in the classroom?

9. Since the start of the Connected Classrooms initiative, have you connected (sharing resources, learning from one another, etc.) with another educator in the building about using technology in your classroom? How so?

10. In your opinion, since the start of the Connected Classrooms initiative last March, have there been any noticeable changes in the culture (interaction between educators and students) of the school?

Appendix E: Student Survey

ACCESS TO DEVICES

Do you bring a personally owned digital device to use during the school day for academic purposes?

- Yes
- No
    a) [Skip Logic] If you answered yes to the previous question, what device(s) do you bring?
        a. Other: ______________________________

    b) [Skip Logic] If you answered no to the previous question, why do you choose not to bring a device to use during the school day?
        a. Other: ______________________________
        b. Prefer not to answer

Do you use a school-owned Chromebook or other school-owned digital device during the school day for academic purposes??

- Yes
- No

How often do you take a school-owned Chromebook or other school-owned digital device home with you?

- Every night
- 3-4 Nights
- 1-2 Nights
- I don't take the device home with me.

TECHNOLOGY SKILLS

For greater clarity, digital technologies includes computers, Internet resources, or other comparable software or hardware devices used for social or academic purposes.

Descriptor	Please Select Only One
Unfamiliar - I have no experience with digital technologies.	
Newcomer - I have attempted to use digital technologies, but I still require help on a regular basis.	

Beginner - I am able to perform basic functions in a limited number of software applications.	
Average - I demonstrate a general competency in a number of software applications.	
Advanced - I have acquired the ability to competently use a broad spectrum of digital technologies.	
Expert - I am extremely proficient in using a wide variety of digital technologies.	

PERCEPTION OF CONNECTED CLASSROOMS INITIATIVE

How important is having access to technology during the school day to your academic goals?

- Very important
- Pretty important
- Not very important
- Not important at all

Please rate the extent to which you agree or disagree with the following statements*:*

	Strongly Agree	Moderately Agree	Moderately Disagree	Strongly Disagree
I am pleased my school implemented the Connected Classrooms initiative.				
Since the start of the Connected Classrooms initiative, the use of my (personal or school-owned) digital device has improved my learning.				
I believe the Connected Classrooms initiative will provide benefits for me after graduation.				
I am pleased with the way most of my teachers incorporate the use of my device (personal or				

school-owned) during the school day.				

USE OF DEVICES

Please choose a response that best reflects how frequently you used your digital device (personal or school-owned) **to complete homework** at the start of the Connected Classrooms initiative (March 9th 2015), and how frequently you currently use it today.

Frequency	March 2015	Nov 2015
Not at all		
Rarely (1 class)		
Occasionally (2 classes)		
Frequently (3 classes)		
Almost Always (4 classes)		
All the Time (5 classes)		
I don't have access to a device to use for my homework		

Please choose a response that best reflects how frequently you used your digital device (personal or school-owned) **in class for academic purposes** at the start of the Connected Classrooms initiative (March 9th 2015) and how frequently you currently use it today.

Frequency	March 2015	Nov 2015
Not at all		
Rarely (1 class)		
Occasionally (1 classes)		
Frequently (3 classes)		
Almost Always (4 classes)		
All the Time (5 classes)		
I don't have access to a device during the school day.		

PERCEPTION OF TECHNICAL INFRASTRUCTURE

Please rate the extent to which you agree or disagree with the following statements*:*

	Strongly Agree	Moderately Agree	Moderately Disagree	Strongly Disagree

The wireless network in my school is adequate to support the use of my personal or school-owned digital device.				
The software available on my digital device (personal or school-owned) meets my educational needs.				

PARENT PERCEPTION OF CONNECTED CLASSROOMS INITIATIVE

How much do your parents or guardians know about the Connected Classrooms initiative?

- They know **a lot** about the initiative.
- They know **somewhat** about the initiative.
- They know **a little** about the initiative.
- They know **nothing** about the initiative.
- I am **not sure** how much my parents/guardians knows about the initiative.

DEMOGRAPHIC INFORMATION

1. What grade are you in currently?
    a) Freshman
    b) Sophomore
    c) Junior
    d) Senior

2. Are you Hispanic or Latino?
    a) Yes
    b) No

3. Which category best describes your race (*Check all that apply)*
    a) African American/Black
    b) Asian / Pacific Islander
    c) Hispanic or Latino
    d) Native American or American Indian
    e) White/Caucasian
    f) Other

4. Which category best describes your gender?
    f. Female
    g. Male
    h. Transgender

i. Gender Fluid
j. Other

Appendix F: Principal Interview

BACKGROUND:

1. How many years have you worked within this district/at this school?
    a. How many years have you been an administrator at this school?

2. In your own words how would you describe the Connected Classrooms initiative?
    a. How does the mission of this initiative align with the school/district mission?

3. What was the motivation for adopting and implementing the Connected Classrooms initiative?
    a. Why did the school not adopt a one-to-one initiative or another model?

CONNECTED CLASSROOM -- IMPLEMENTATION

4. Walk me through the planning and implementation of this initiative --How did you get from the decision to move forward to where we are today?
    a. How would you describe the school's implementation efforts thus far?

5. What specific responsibilities do you have with the implementation process? (In the school? and Outside of the school?)

6. The initiative officially kicked off in March; why did you choose not to wait until the start of the next school year?
    a. In your opinion what effects (positive or negative) did the pilot phase have on the implementation process?

7. What work has been done this summer to strengthen implementation of the Connected Classrooms?

STAKEHOLDER PERCEPTIONS

8. <u>TEACHERS</u>
    a. What is the expected role for teachers in the initiative?
        i. Are teachers required to use technology in their classroom? Why or why not?
    b. In your opinion, what are teacher's perceptions of the initiative?
    c. In your opinion, what are the greatest challenge educators are facing related to the Connected Classrooms Initiative?

9. <u>STUDENTS</u>
    a. What is the expected role for students in the initiative?
    b. What is the role of student technology interns?
    c. In your opinion, what are student's perceptions of the initiative?
    d. In your opinion, what are the greatest challenge students are facing related

to the Connected Classrooms Initiative?

10. PARENTS
    a. What has the response from parents been? (Positive response? Negative response?)

EVALUATION

11. What successes have you experienced during the implementation of Connected Classrooms?

12. What challenges have you experienced during the implementation of Connected Classrooms?

13. What short-term would you like to make to strengthen this implementation?
    a. Any long-term changes you'd like to make to strengthen this implementation

14. Although you have only just begun your implementation efforts, what changes have you noticed as a result of the initiative so far?
    a. What are your expected outcomes (5 years; 10 years) for the Connected Classrooms initiative? What impacts do you expect to see?

15. How do you plan to evaluate the outcomes stated above?
    a. What measures do you currently have in place to support evaluation of the program?

Appendix G: Tech Integration Group Interview

BACKGROUND

1. In your opinion, what was the motivation for this initiative? Why did Principal Favreau decide to do this? Why BYOD? --were there other options?

2. How did this team come together? – Walk me through the process of how you were each invited to help support the implementation/integration process of connected classroom?
   a. Why did you each agree to join?

3. Were any of you already using technology in your classrooms prior to the start of Connected Classrooms? – How so?

4. What was the purpose behind starting the initiative towards the end of the year (March 9^{th}) instead of waiting until the beginning of the following school year?
   a. In your opinion, what effects (positive or negative) did the pilot phase have on the implementation process?

IMPLEMENTATION

5. Describe the implementation activities that have occurred since the planning of Connected Classrooms began.

6. What type of professional development has been offered for staff to prepare them for Connected Classrooms?
   a. What other types of professional development do you see as necessary for proper technology implementation?
   b. Are there currently plans in place for future professional development?

7. What is currently being done to encourage and promote technology use by teachers?

ASSESSMENT AND FUTURE OUTLOOK

8. If you were asked to describe the greatest success of your implementation thus far, what would they be?

9. If you were asked to describe the greatest challenges of your implementation thus far, what would it be?

10. What are the expected student-level impacts/effects of Connected Classrooms?
    a. How activities are currently in place to help lead to those impacts?

11. What do you envision as the future of Connected Classrooms (i.e. Five years from now describe what this school/a classroom will look like)?

Appendix H: Classroom Observation Protocol

Classroom Background

Date:	Start Time:	End time:
Educator:	Grade level:	Subject:
Number of students:	Number of devices:	

Types of Devices:

- Educator: ____
- Students: ____

  ____

Do all students have access to a device (please explain):

Room descriptions and student characteristics:

Student groupings:

- Individual student work
- Student Pairs
- Small group
- Whole Class
- Other _________

Teacher roles

- Lecturing
- Interactive direction/Modeling
- Discussion
- Facilitating/coaching
- Other ________

Describe how students are using devices and what they are using them for?

Classroom Management of Technology

None: No technology related management problems or 1-2 small problems that are dealt with smoothly and without disruption to classroom activities.	**Few:** Technology management problems are somewhat distracting but these are dealt with reasonably quickly.	**Repeated:** Repeated technology related problems that exist are not dealt with effectively; management issues are distracting or substantially occupy teacher.

How does the educator monitor students' use of technology (classroom management)?

Did you observe any issues related to the technical infrastructure, connectivity, log in, challenges with devices, etc.? – How were those issues resolved?

Student Engagement

How would you describe student engagement during activities with integrated technology use:

	First 10Min	Second 10Min
High: Nearly all of the students are focused on the learning tasks. Most of the activity in the classroom is relevant to the tasks.		
Mixed: At least half of the students are focused on the learning tasks, but some are easily distracted or confused and a minority may not be on task.		
Low: Less than half of the students are focused on the learning tasks. They may be doing things unrelated to the learning or confused about what they should do.		
COMMENTS:		

Assessment of Classroom Integration

	Observed for LESS than half of observation	Observed for half of observation	Observed for MORE than half of observation	Not observed
Technology is used as a tool to learn with (i.e., communication, publication or research)				
Technology is used as a tool to learn from (i.e., drill and practice, tutorials)				
Technology use is optional and not necessary to meet lesson objectives				
Technology use is simplistic and all				

students are assigned the same activity				
Technology is used with little or no management problems				
COMMENTS:				

How would you describe student engagement during activities with integrated technology use:

	First 10Min	Second 10Min
Simple: Limited tech use, simplistic, not well integrated into lesson, low learning impact. The use of the technology does not always support learning in a meaningful way.		
Moderately Complex: Moderate tech use, partially integrated, used in a single way to support learning. Technology is used in a single way for productivity, communications, research or problem-solving/decision making to support learning.		
Advanced: Extensive tech use, fully integrated in multiple, complex ways that promote learning. Technology use promotes deep learning through productivity, communications, research or problem-solving/decision making.		
COMMENTS:		