AN EXPLORATION OF TEACHERS’ ADOPTION OF THE BRING YOUR OWN TECHNOLOGY PROGRAM

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The purpose of this study was to explore teachers’ concerns, use, and actual practices in their adoption of the bring your own technology (BYOT) initiative. Twelve secondary teachers in a private school setting participated in this study. The participants represented all content areas including reading, math, science, and electives. The private school was in its third year of implementing BYOT. This case study incorporated multiple methods to collect data to gain a better understanding of teachers’ adoption of an innovation, BYOT. The concerns-based adoption model (CBAM) was used as a theoretical framework. All three CBAM tools provided data: the Stages of Concern Questionnaire (SoCQ), levels of use interview protocol (LoUIP), and the innovation configuration (IC) map. Twelve of the participants completed the SoCQ across three different points in time. Six of the twelve teachers participated in three one-on-one interviews, including the LoUIP. Additionally, six teachers were observed in their classrooms during instruction.

After triangulating all pieces of data, the majority of teachers had highest concerns related to self. Teachers were concerned about their ability to implement the innovation and managing BYOT in their classroom. Four of the six teachers had a level of use (LoU) at mechanical, and two teachers had a LoU at routine. The teachers’ LoU indicated that they are using BYOT in the classroom; however, the majority of teachers observed had adoption practices mostly in the non-ideal variations of IC. The teachers’ LoU and IC indicated that teachers had implemented BYOT in their own way and not necessarily in alignment with the campus’ vision or expectations.
This case study had several limitations, including the small number of participants and the brevity of classroom observations. Additionally, this study was limited to one school setting. Recommendations for future research include exploring teachers’ adoption of BYOT in various school settings (i.e., both public and private schools) and teachers at the elementary, middle, and high school levels. Researchers should consider exploring the impact of specific interventions and support on teachers’ adoption.
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CHAPTER 1
INTRODUCTION

We are currently teaching digital native students, those born in the 1980s through the 21st century (Prensky, 2001). The newest generation of students has had the Internet readily available their entire lives. The Internet and other technological advances have allowed students to stay connected globally, with access to knowledge in the palms of their hands. In fact, almost 33% of toddlers today will have used laptops or digital cameras before they are old enough to start preschool (Basulto, 2011), and almost 25% of modern toddlers have used smartphones (Carmichael, 2011). Consequently, students entering modern classrooms want to learn with modern tools, work in collaborative groups, and lead their own learning. Students want to be able to connect with others on a global level, and they want their academic work to be engaging and relevant (Prensky, 2010; Robinson, 2010; Schlechty, 2009).

To facilitate learning that includes relevant technology, the International Society for Technology Education (ISTE; 2012b) has set standards and goals to measure technology proficiency for students, teachers, and administrators. ISTE (2012b) has laid the path for technology in education since 1998. Additionally, ISTE (2012b) created the national education technology standards (NETS) “for learning, teaching, and leading in the digital age, and [they]are widely recognized and adopted worldwide” (n.p.). The Texas Education Agency (TEA; 2011) uses NETS to guide state standards for students’ technology proficiency. Based on the information given by ISTE (2012a), the TEA (2011) bases its technology applications curriculum on six standards: (1) creativity and innovation; (2) communication and collaboration; (3) research and information fluency; (4) critical thinking, problem-solving, and decision-making; (5) digital citizenship; and (6) technology operations and concepts.
In an educational climate of shrinking budgets, school districts in Texas (e.g., Allen Independent School District, 2011-2012; Harlingen Consolidated Independent School District, n.d.; McKinney Independent School District, n.d.) have begun to allow and encourage students to bring their own technology to school as a way of bringing more technology into classrooms and easing school budgets. For example, bring your own technology (BYOT) programs expose students to various types of technologies that students might not otherwise explore. Students bring personal personal digital assistants (PDAs), cell phones, laptops, iPads, and iPods to school to complete instructional activities, both inside and outside of class. Incorporating mobile technologies in everyday student learning can positively influence students’ education in several ways. First, integrating technology into instructional activities may increase student engagement and academic achievement and may positively influence student motivation. Second, technology-enriched curricula may positively impact students’ collaboration and social interactions with other students and teachers. Finally, laptops, PDAs, cell phones, iPads, and iPods each may positively impact students’ learning experiences. The positive impacts of technology are evident across different age ranges. From elementary learners to adult learners, mobile technology has been a useful tool for learning and has helped students learn in new ways that were impossible with traditional paper-and-pencil methods (Enriquez, 2010; C. H. Lai, Yang, Chen, Ho, & Chan, 2007; Motiwalla, 2007; van ’T Hooft, 2004).

As with many innovations, BYOT initiatives will probably not be immune to some of the challenges that arise when new innovations are implemented in schools. Teachers must be prepared to work both with students who have access to a variety of technology and with students who have no access to any technology. Teachers will need not only to be comfortable and confident about technology and instruction with technology but also to know how to handle
various types of technology, even some they may never have experienced themselves. Campus administrators and district leaders will need to monitor teachers’ concerns and levels of use of technology as school districts continue to integrate the BYOT innovation in the classrooms.

School leaders who participated in this study tacitly supported BYOT by encouraging teachers to use and infuse technology in classroom instruction. BYOT initiatives are one way to increase the technology availability in classrooms. By having more technology and various types of devices in classrooms, students can increase their skills and levels of use of technology with the intent to better prepare them for modern workplaces. Therefore, this study was designed to assess teachers’ adoption of one technological innovation for classrooms: BYOT. The information gathered in this study enhanced understanding of teachers’ adoption of BYOT, provided information about how teachers felt about BYOT, and revealed teachers’ actual practices in classrooms with students’ mobile technology.

Statement of the Problem

For years, most schools had limited technology use in classrooms. For example, technology use in classrooms has been limited to computer labs or lab carts, with little or no use of mobile devices in spite of the fact that many students have been coming to school with their own handheld devices and are capable of using these devices in class to support learning. However, schools have recently attempted to take advantage of student-owned technology by planning instruction in ways that facilitate not only students’ use of technology owned by schools but also technology owned by the students.

BYOT is a school initiative that many schools are implementing as a way to bring more technology into classrooms. School leaders believe BYOT is a way to easily increase teachers’ access to various types of technology in classrooms and to better prepare students for the 21st
century. However, there is minimal to no research to inform school leaders about teachers’ beliefs and behaviors as they go through the process of adopting this initiative. The majority of the research concerning teachers’ adoption of technology deals with technology owned by the school. It is important to know how teachers experience change with an innovation that includes not only various types of technologies but also various models and capacities; teachers’ experience with BYOT is drastically different from teachers’ taking students to their schools’ computer labs or teachers’ using computer carts. The existing body of research about teachers’ adoption of technology that is based on the concerns-based adoption model (CBAM) often does not include all three components of CBAM: stages of concern (SoC), levels of use (LoU), and innovation configurations (IC); (Donovan, Hartley, & Strudler, 2007; Hope, 1997; James, Lamb, Bailey, & Householder, 2000; Y. Liu & Huang, 2005; Rakes & Casey, 2002). Therefore, this study was based on all three components of CBAM to provide insight into teachers’ beliefs, behaviors, and actual uses of technology following the BYOT initiative at a private school. By using all three components of CBAM for a more complete profile, I explored how teachers have adopted BYOT in their classrooms.

Purpose of the Study

The purpose of this study was to assess teachers’ adoption of one technological innovation for classrooms: BYOT.

Research Questions

1. What are teachers’ concerns as they implement BYOT?
2. What are teachers’ LoU regarding the implementation of BYOT?
3. What are teachers’ practices as they implement BYOT?
Theoretical and Philosophical Rationale

Concerns-Based Adoption Model

Educational change is a complex process that requires attention to teachers’ needs and concerns. In 1969, Fuller proposed a three-phase developmental model for understanding teachers’ concerns about change. Fuller’s three phases of concerns were as follows: (1) pre-teaching phase (i.e., non-concern), (2) early teaching phase (i.e., concerns with self), and (3) late concerns (i.e., concerns with pupils). In this three-phase model, Fuller (1969) suggested that these patterns of concern could be observed among teachers no matter their levels of preparation or experiences. In Fuller’s research, student teachers with no teaching experience often expressed no concerns related to teaching (i.e., the pre-teaching phase). Student teachers and teachers in the early stages of their careers expressed concerns about their selves and their adequacies and concerns about class management (i.e., the early teaching phase). In contrast, experienced teachers often expressed concerns related to their students’ progress (i.e., the late concerns phase). Fuller’s initial research about the three-phase model of concerns were later refined into four levels of concerns that teachers may experience in implementing a new innovation: unrelated concerns, self concerns, task concerns, and impact concerns (George, Hall, Stiegelbauer, & Abdullah, 2006).

Using Fuller’s (1969) model for teachers’ concerns, Hord, Rutherford, Huling, and Hall (2006) created CBAM. Hord, Rutherford, et al. began their research at the Research and Development Center for Teacher Education at the University of Texas at Austin in the 1970s. The goal of their research was to learn about “the school improvement process, what it is, who it involves, what are its effects, and how it might be managed” (Hord, Rutherford, et al., 2006, p. 4). The CBAM model is centered on teachers who are implementing an innovation or who are...
engaging in change. The model is used to identify the specific needs of individuals as they go through the process of adopting and implementing an innovation.

After studying change for over 40 years in educational settings, Hall and Hord (2006) derived twelve major principles characterizing change. The following is a brief list of the twelve principles:

1. The first describes change as a process. The CBAM authors stated “Change is a process, not an event” (Hall & Hord, 2006, p. 4).

2. Change requires balance between development and implementation of an innovation.

3. Change occurs only when the individuals within the organization change.

4. Innovations vary by the amount of time, resources, and amount required for implementation.

5. Interventions (e.g., professional development and support) are crucial for influencing change.

6. New outcomes result only when change in practice occurs.

7. Leadership from administrators can sustain change over time.

8. Mandates can influence the change process when followed up with training and communication.

9. Change is heavily dependent on the school. It is “the primary unit of change” (Hall & Hord, 2006, p. 12).

10. Change is a team effort influenced not only by administrative leaders but also by other individuals in the school and beyond.

11. Interventions aid the process of change and can help reduce resistance from individuals.

12. The physical features and the people in a school affect the change process.

As previously discussed, CBAM is composed of three components: SoC, LoU, and IC. The SoC component of CBAM is used to identify teachers concerns at a point in time of the adoption process. Teachers concerns about an innovation may change over time and can be different for
each teacher depending on the information the teachers have about the innovation and their experiences with it (A. A. George, Hall, & Stiegelbauer, 2006). In CBAM, there are seven SoCs: awareness/unconcerned, informational, personal, management, consequence, collaboration, and refocusing. The descriptions of the seven stages range from the individual lacking concern about the innovation in the awareness/unconcerned stage to the individual generating his or her own ideas for improving the innovation in the refocusing stage.

The second component of CBAM is LoU of the innovation. This component is used to describe teachers’ behaviors toward their use of an innovation. The eight LoU include the following: nonuse, orientation, preparation, mechanical use, routine, refinement, integration, and renewal. The descriptors of the eight levels begin with the individual not taking part in the innovation process in the nonuse level and end with the individual looking for alternative ways for improving the innovation that has been established in the renewal level (Loucks, 1983).

Finally, the third component of CBAM is IC, which is used to assess how an innovation is put into practice by individual users. An IC map can be described as a detailed rubric illustrating various components and variations of how an innovation can be implemented. An IC map can help assess the various degrees of fidelity with which an innovation is being implemented either by an individual or by a group of individuals (e.g., all teachers at one grade level, all teachers at one school, or all teachers at a set of schools).

The three components of CBAM—SoC, LoU, and IC—are used together to create not only a profile of each person involved in implementing an innovation but also a group profile in which all individual profiles are combined. Change leaders can use CBAM profiles to identify the needs of individuals or groups of implementers. Having this information allows change facilitators to know the needs of the adopters and to provide support or interventions to move the
team toward higher levels of fidelity to the innovation and toward a level of adoption that is
closer to the ideal envisioned when the innovation was adopted.

Technology in Education Proposals

Teachers are surrounded by passionate conversations regarding the need for educational
change. Many educational researchers—Robinson (2010), Prensky (2001), and Schlechty (2009,
2011)—have published their own arguments for the need for programmatic shifts. These voices
are strong, and their arguments are influencing decisions made in schools and school districts.

Robinson’s (2010) video, Changing Education Paradigms, had over seven million views
on YouTube since it was uploaded on October 4, 2010. The video has received much attention
because of Robinson’s argument for a paradigm shift in education. In this video, Robinson
posed two leading questions for teachers who plan to prepare citizens for the future:

- How do we educate our children to take their place in the economies of the 21st century?
- How do we educate our children so they have a sense of cultural identity and so that we
can pass on the cultural genes of our community? (n.p.)

Robinson argued that because the current educational system is structured on the educational
concepts of the 18th and 19th centuries, students are failing in this outdated system of
standardization. We have a new generation in our hands, one that does not fit the characteristics
of students from the past. The author argues for a change in our educational system by shifting
away from standardization and fostering instead divergent thinking and collaboration.

Similarly, Prensky (2001) argued that 21st-century students are different from students in
previous centuries. However, Prensky’s (2001) argument for educational reform centered on the
growth of a technology-dependent culture, in which he named the current generation digital
natives. Digital natives are people who were born in the 1980s or later and have grown up with
current technology, including “computer games, e-mail, the Internet, cell phones, and instant
messaging” (Prensky, 2001, p. 1). Prensky (2001) claimed that digital natives are further characterized by their native understanding of technology; in other words, they are “fluent in the digital language of computers, video games, and the Internet” (p. 9). After interviewing thousands of students around the world, Prensky (2010) found the following common themes in what students wanted as part of their academic experiences:

- They do not want to be lectured to.
- They want to be respected, to be trusted, and to have their opinions valued and count.
- They want to follow their own interests and passions.
- They want to create, using the tools of their time.
- They want to work with their peers on group work and projects.
- They want to make decisions and share controls.
- They want to connect with their peers to express and share their opinions, in class and around the world.
- They want to cooperate and compete with each other.
- They want an education that is not just relevant, but real. (Prensky, 2010, p. 2)

Prensky (2010) believed that modern curricular and instructional practices should include the following for educators to ensure the success of students: student engagement, collaboration, use of digital tools, and promotion of programming skills.

Schlechty’s (2009, 2011) work projected a message similar to that of Robinson (2010) and Prensky (2001, 2010). In Schlechty’s books titled Leading for Learning: How to Transform Schools into Learning Organizations (2009) and Engaging Students: The Next Level of Working on the Work (2011), Schlechty acknowledged a need to engage modern learners in different ways. Students should be in charge of navigating their own learning experiences while teachers facilitate this process rather than direct it through lectures and textbooks. Schlechty (2009) further argued that technology is a powerful tool that can help transform education so that students can take control of their own learning experiences. Schlechty (2009) wrote that “in the
digital world, the learner, not the instructor, is in charge of what will be learned as well as how and when that learning will occur” (p. 9). The messages presented by Robinson (2010), Prensky (2001, 2010), and Schlechty (2009, 2011) are very compelling. Many schools are embracing educational reform and are beginning to implement instructional practices that are engaging and motivating for students.

Many schools in Texas have recognized the need for change in education from lecture and textbooks to technology-based instruction. In 2006, 35 superintendents from public schools in the state developed the document Creating a New Vision for Public Education in Texas (2008). This group of superintendents recognized that the students who are reporting to school every day have changed and are highly dependent on technology, so schools need to change to “keep students fully engaged” (TASA, 2008, p. 2). Therefore, the superintendents proposed a “new digital learning environment” and included the following statement as a principle that must be included in educational reform: “We must embrace and seize technology’s potential to capture the hearts and minds of this, the first digital generation, so that the work designed for them is more engaging and respects their superior talents with digital devices and connections” (TASA, 2008. p. 13). Bringing old and new together requires change, and in all educational settings, change is difficult, challenging, and often fraught with resistance.

Definition of Key Terms

**BYOT**: An initiative that allows students to take to school their own personal mobile technology devices, including laptops, iPads, iTouch, and smartphones.

**Traditional technology**: This type of technology includes laptops, desktops, and projectors.

**Mobile technology**: This type of technology includes any technology that can easily be carried from place to place, such as iPads, iTouch, laptops, and cell phones.
Significance of the Study

Technology is a natural part of students’ lives. To better meet the needs of the current generation of digital natives, instructional practices need to be infused with technology. BYOT programs are one way that schools can begin to approach the technological needs of their students. Anytime an innovative change occurs, support is needed for its successful implementation. In this study, I explored teachers’ concerns, LoU, and practices in implementing BYOT. CBAM results offered insight into individuals’ SoC and LoU as they experienced the process of change. Results from this study provided insights into how a school going through a change by incorporating BYOT can be viewed through the lens of CBAM, which contributed to the body of learning on both change and change management while change is occurring.

Assumptions

It was assumed that teachers’ concerns about BYOT would align with their LoU and practices in their implementation of BYOT, particularly when their SoC, LoU, and IC were compared and aligned. It was also assumed that teachers’ concerns about, use of, and practices with BYOT are influenced by (a) their comfort levels in using various types of technology, (b) their peers, and (c) the types of technology brought in by their students.

Limitations

There were several limitations to this study. First, this study was based on a case study method to engage a small sample of teachers in one private school, so the results of this study are not generalizable to other populations or settings. Second, the research of this study may have been influenced by researcher bias due to personal experience and professional position as a campus administrator who has overseen the implementation of BYOT program, which could
have influenced both the research and the findings. Finally, Diefenbach (2009) discussed the effects of interviews on validity in qualitative research designs. Researchers in case studies often rely on interview data to draw conclusions or to identify thematic patterns. However, interviews can be a threat to validity when interviewees are not selected systematically, which can lead to a lack of representation of different perspectives.

The effects of these limitations were minimized by following three tests and recommendations for establishing quality in empirical research in the social sciences (Yin, 2003). According to Yin (2003), construct validity is often seen as a weakness in case studies. Yin recommended that researchers set operational measures before conducting their studies to strengthen construct validity. There are three ways for increasing construct validity during the research phases of data collection and report composition: (a) use multiple sources of evidence, (b) “establish a chain of evidence,” and (c) invite key informants from the study to review the case study reports (Yin, 2003, p. 36). External validity can be a major barrier for case studies because case studies are often based on a single case or a small number of cases. However, external validity can be increased through analytic generalizations and replication logic (Yin, 2003, p. 37). Finally, Yin discussed the reliability factor in case study research and recommended that researchers establish protocols for their case studies and maintain databases for their case studies with relevant data and documents.

Summary

National and state standards call for the integration of technology with instruction as a way to prepare modern students for workplaces in the 21st century. Many schools have implemented BYOT initiatives as a way to bring in more technology into classrooms without imposing extra costs on district budgets. BYOT is new to many schools, and minimal research
exists to inform campus and district leaders about the type of support and professional
development that teachers need to implement this innovation effectively. Therefore, this study
was designed to assess teachers’ adoption of BYOT based on the three components of CBAM.
The information gathered from this study provided insight into teachers’ feelings and behaviors
regarding the implementation of student mobile technology in classrooms and provided a
snapshot of teachers’ practices as they applied the initiative.
CHAPTER 2
LITERATURE REVIEW

Many school districts have adopted bring your own technology (BYOT) or bring your own device (BYOD) programs as a way to increase technological resources in classrooms without additional budgetary costs. BYOT programs particularly support mobile devices because they are small and easy to transport. Such programs could change how educators perceive mobile education in schools. Mobile education can be defined as “any service or facility that supplies a learner with general electronic information and educational content that aids in the acquisition of knowledge regardless of location and time” (Lehner & Nosekabel, 2002, p. 103). Mobile learning (a.k.a., m-learning) is learning that can begin in a face-to-face context and is then extended through e-learning environments (Macdonald & Chiu, 2011). M-learning offers students and teachers the flexibility of learning during any time of the day and from any location and facilitates a connection for learning through wireless mobile technology devices such as mobile phones, laptops, or personal digital assistants (DeWitt & Siraj, 2011).

This chapter includes a review of the concept of a digital native culture and issues regarding digital identities in the use of mobile technology in classrooms. Literature is examined regarding how laptops, personal digital assistants (PDAs), cell phones, and various Apple products (e.g., iPad, iPod, and iPod Touch) are used in learning environments and how these technologies can affect student learning. The use of short messaging service (SMS) in educational settings is also reviewed. Although SMS is not a mobile technology in itself, it has become a common means of communication for students. Finally, factors that influence teachers’ use of technology in classrooms are reviewed along with research about the use of the concerns-based adoption model (CBAM) in relation to teachers’ adoption of technology.
A Digital Native Culture

Based on the trends in technology use, there is an overwhelming amount of evidence supporting Prensky’s (2001) characterization of the digital native culture. Modern teens are dependent on their cell phones and often believe their cell phones to be part of their identities (Interactive, 2008). Teenagers between the ages of 13 and 19 years were surveyed in the United States about their use of cell phones. Results revealed that 85% of teens use cell phones to talk with others or to send or receive text messages. Teens ranked cell phones as the number two determinant of social status; jewelry and shoes ranked lower than did cell phones. Also, the majority of the teenagers surveyed reported using cell phones to connect to e-mail and social networking sites (Interactive, 2008).

Modern teenagers perceive technology as a way of being for them. McLean (2011) gave the example of LeeAnn, an immigrant teen from the Caribbean, who connects cross-culturally through her use of technology in her day-to-day experiences. The following is part of McLean’s field notes that illustrated LeeAnn’s connection to technology:

LeeAnn quickly records her latest track and field performance statistics and workout routine on her cell phone before returning to the open journal with her musings for a poem. . . . [She] docks her phone on her desktop computer while she downloads the SAT prep module online. . . . [S]he begins to Google chat with a friend in the Caribbean. The phone rings [with a call from] her classmate, Kristie. She responds in Standard English. (p. 160)

LeeAnn’s story is not only a snapshot looking into the lives of teenagers in the 21st century. It also illustrates her need to connect with others (Mclean, 2011). LeeAnn stays connected through sociocultural networks in both physical and virtual worlds. In the snapshot from LeeAnn’s life, she can be seen connecting with friends on the phone and the Internet. She reads and writes about poetry in her journal. She switches between her native language and English. She is connecting with others and identifying herself through multiple mediums.
In a second example of technology being a way of life for modern teens, Gasser (2008) discussed the trends of technology and Internet use at the college level for multiracial students. Gasser stated that “[s]tudents look to online portals for shared experience and supportive community” (p. 63). Multiracial students use social networking sites such as Facebook for opportunities to connect and build communities. These same students use wikis (online collaborative websites) to collaborate with others and to create information that reflects their beliefs and identities in society. Multiracial students blog to post commentaries, news, photos, and videos of themselves and the world around them to share their expressions and feedback about the world and to receive validation from their peers. YouTube and Podcasts allow a place for self-expression and connection through video and audio files (2008).

McLean’s (2011) and Gasser’s (2008) discussions of the use of technology in college settings are examples of how students already use technology to stay connected, to lead learning, and to collaborate with others. These discussions support Prensky’s (2001) idea of a digital native culture. LeeAnn represents a teenager who is overwhelmingly connecting with various digital tools. Her social and academic tasks are blurred through the channels of technology. Even college students use technology to collaborate with others, to create cultural communities, and to express themselves through virtual means.

Merging Student Identities

To better prepare students for the 21st century, teachers will need not only to be comfortable and confident about instruction and technology but also to know how to handle various types of technology, including some types of technology they may have never experienced themselves. Furthermore, teachers need to learn how to merge the technology that students use outside of school with instruction at school. Williams (2005) said that students
often “lead[] double lives” because of their out-of-school activities with technology (e.g., chat rooms, e-mails, online games, web pages, blogs, and text messaging), which contrast with heavily print-dependent in-class activities (p. 702). Such out-of-school activities immerse students in reading and writing, which leads them to feel as if they are “competent and confident writers and readers,” but when they come to school, these positive beliefs change to feeling like struggling students (Williams, 2005, p. 704). Williams (2005) described the dilemma that many students experience when they show up in our classrooms. Educators know that students are using technology in their personal lives as illustrated by LeeAnn. What can educators do to prepare students for the 21st century and merge the tools used in students’ personal lives with the tools used in their academic lives?

A study by Curwood and Cowell (2011) illustrated one way that technology can be integrated in classrooms. Curwood and Cowell (2011) worked with a group of high school sophomores on a digital poetry curriculum, called iPoetry. The focus of the project was to integrate new literacy practices to “enhance students’ critical engagement, increase their awareness of audience, and encourage their progressive use of multiple modalities” (Curwood & Cowell, 2011, p. 110). The authors defined new literacy practices as having two main components. The first component is the integration of technology media such as e-mailing, instant messaging, blogging, and podcasting. Students are already familiar with this first component because they regularly participate in social networking and gaming out of school. According to Lankshear and Knobel (2007), the second component is the integration of curriculum that is engaging, collaborative, and participatory (as cited in Curwood & Cowell, 2011). Teachers have not yet given students the opportunity to fully integrate both components. In their study, Curwood and Cowell (2011) aimed to incorporate new literacy practices like the
practices used in wiki spaces or YouTube videos in which collaboration and discussion can occur anywhere, inside or outside classrooms. The project required students first to read the poetry, understand it, and analyze it, then to write their own poetry in traditional printed text formats, and finally to move on to digital tools. Curwood and Cowell (2011) concluded that the iPoetry project allowed students to demonstrate their knowledge to wider audiences and to express their social identities. Furthermore, the iPoetry project allowed students to “acquire new literacy skills that are essential for knowledge acquisition, collaboration, and critical engagement in the 21st century” (Curwood & Cowell, 2011, p. 119). By using tools with which students are already familiar, educators demonstrate to students that they value their interests and can help them reach new heights in learning.

Using social networks and sites represents another way to merge the tools that students use in their personal lives into academic settings. Using social networks can also include teachers’ professional activities on social networks. Social networks have steadily crept into many people’s lives, and use of social networks has increased dramatically over the years. Davis (2010) cited that “73% of Americans, ages 12-17 years, use social-networking websites, up from 55.0% in 2006” (p. 15). Social networking is slowly changing the way professionals participate in professional development. Davis shared different ways in which staff has participated in staff development activities through Twitter, webinars, and other social sites. Social media are also changing how teachers provide support outside class for students. Teachers can now use interactive white boards, blogs, and webinars to provide support after class hours.

Social networking is a growing resource, and use of such sites is unlimited. For example, Davis (2010) used social networking to connect students across the globe. Students who had travelled to Europe had the opportunity to blog about their experiences online and received
feedback from people around the world. Other teachers have used Ning (a social networking site) to connect and collaborate with students in different continents and to learn what is like to live in those places. Davis also discussed schools in North Carolina where teachers used cell phones to answer questions and to discuss assignments with students via text message.

Barbour and Plough (2009) shared how using Ning has changed the way that teachers connect with their students online. Additionally, Barbour and Plough (2009) shared how their cyber charter school used Ning to connect 200 students and seven teachers. The social site allowed students to collaborate on projects, to give each other feedback, and to tutor each other. Students were also able to check with teachers when they had difficulty in completing assignments.

Social networking sites have many benefits for both teachers and students. By using modern technological tools like social networks, teachers can facilitate learning environments in which the technological practices that students are already engaging in after school are merged with technological practices that can be used at school. With the rapid development of technological capabilities, teachers can utilize and implement unlimited apps, tools, and resources in a way that fosters student learning.

**Digital Native Teachers**

Society has reached a point in which digital natives do not just include students in K–12 classrooms; digital natives now include students in college and even students who have graduated from college. Many of new teachers entering the field are also digital natives. These new teachers grew up in learning environments that reflected the traditional 19th century practices of lectures, textbooks, pens, and papers, yet their personal lives have revolved around the digital world. Teachers who are newly entering the field have technological experiences to
connect their personal selves with their new professional identities and roles as 21st-century educators. Casey (2011) argued that modern pre-service teachers “make meaning for their personal world through the multiple modes of [W]eb 2.0 tools (Facebook, instant messaging, video imagery, etc.)” and are challenged with “weaving” their personal and professional identities as they develop their own senses of self in their new careers (p. 175). Many newly graduated teachers are “negotiating” their new identities as they plan lessons with students to incorporate Web 2.0 tools with which they are well familiar but which they must now incorporate in a different context (i.e., the classroom; Casey, 2011, p. 175). For example, Casey (2011) described how one student used Web 2.0 tools in her academic studies:

Janet is also “plugged in” to these [W]eb 2.0 tools. She keeps her multiple textbooks in a single Kindle, regularly arrives to class with an iPod in her ears, text messaging as she walks, and would prefer to e-mail me her questions rather than stop by at office hours. (p. 177)

Janet is only beginning to merge her personal and professional identities with technological tools. Casey conducted a study with pre-service teachers in an English and language arts class. The participants were asked to create blogs to document their professional learning experiences in the 15-week course. Casey discovered that participants’ own reflections on their experiences helped them create professional identities and that the participants’ audiences also played a role. Audience members are allowed to provide feedback on the blogs, which leads to co-construction of identity for participants.

Many educators know that the educational system of K–12 is based on outdated teaching practices. As discussed previously, many schools are beginning to feel the need for change, and several schools have begun that journey. However, schools must not get too far into change before thinking about digital native teachers who are entering the field. Educational leaders and administrators need to consider the needs of these teachers and possibly tap into their knowledge.
As these new teachers come and begin to teach students in new settings, they will have a better understanding of how students feel when they are restricted in the use of technology. This new group of teachers will know the importance of learning in a way that is natural to students.

Technology in Student Learning Environments

The following section of this chapter will include a review of the literature about the use and the impact of technology on students when technology is integrated in various learning environments. Research about a variety of technological tools (e.g., laptops, PDAs, cell phones, iPad, iTouches, and text messaging) is explored.

Laptops

In general, people are probably most familiar with laptops in education. Laptop programs can have a positive influence on students’ use of technology and technology skills. In a study designed to help inform future decisions about investing in laptops, Larkin and Finger (2011) found that implementing a program that allowed for 1:1 or 1:2 netbook ratios in the classroom yielded positive results. The netbook program led to an increase in computer usage from 30 minutes weekly per student before the program to 60-90 minutes daily per student with the netbooks. Larkin and Finger did not report on statistical significance. Oliver and Corn (2008) evaluated the use of a 1:1 tablet program in a private middle school in the United States. At the end of the study, students in the program used technology in math and science more frequently and had greater technology skills. Significantly higher use of technology occurred in math across all grade levels as follows: $F(1, 103) = 513.00, p < .001, \eta^2 = .83$ in sixth grade; $F(1, 103) = 175.30, p < .001, \eta^2 = .63$ in seventh grade; and $F(1, 134) = 266.7, p < .001, \eta^2 = .67$ in eighth grade. Additionally, significantly higher use of technology occurred in science across all grade levels as follows: $F(1, 103) = 397.40, p < .001, \eta^2 = .79$ in sixth grade; $F(1, 103) = 136.30,$
The results of the students’ self-report on technology skills were also statistically significant: $F(22, 69) = 12.30, p < .001, \eta^2 = .80$ in sixth grade; $F(22, 74) = 8.20, p < .001, \eta^2 = .71$ in seventh grade; and $F(22, 103) = 2.60, p < .05, \eta^2 = .35$ in eighth grade. Lei and Zhao (2008) researched how a group of middle school students used laptops in school when provided with a 1:1 laptop ratio. Results revealed that students used the laptops every day at home and at school, most students used the laptops for school-related tasks, and students thought the laptops were a useful tool and helped them stay organized. Students who used the laptops had increased their GPA at a marginally significant level; $t(176) = 1.97, p = .051$. Students also increased their use of technology and showed statistically significant gains in their technology proficiency; $t(176) = 2.26, p < .05$.

One-to-one laptop programs can also have an impact on student achievement, engagement, and motivation. Dunleavy and Heinecke (2007) investigated the effect of 1:1 laptop ratios on math and science achievement in an at-risk middle school. Students were able to use the laptops every day and could take them home on weekdays. Posttests from the laptop program indicated an increase in science scores that were statistically significant. Suhr, Hernandez, Grimes, and Warschauer (2010) evaluated the effects of a 1:1 laptop program with students in third through fifth grade. The researchers placed students in classrooms either with 1:1 laptop ratios or in classrooms without any laptops. After a 2-year period of using the laptops, data showed that students used the laptops most often to write and to look up information on the Internet. Teachers reported high levels of student engagement in the classrooms with laptops, with 83.8% of students reporting that they preferred learning with laptops, and 79.9% stating that they had become more interested in schoolwork when they used laptops. In the end, students
with laptops performed significantly higher in literacy response and analysis, \( p < .01 \), and writing strategies, \( p < .05 \), than students without laptops in the program. Mei-Chuen Lin and Yi-Jiun (2010) investigated how use of netbooks in a sixth-grade classroom could influence the types of learning activities, student learning, student behavior, and student attitudes towards learning English. Results indicated that the instructor used more innovative learning activities, which was associated with greater student engagement. In addition, students who used netbooks were more attentive in class, more confident in learning English, and outscored students who did not use netbooks. Test scores for the experimental group were significantly higher; \( t (87) = 2.22, p < .05 \). Russell, Bebell, and Higgins (2004) found that when students worked in an environment in which they had their own laptops in the classroom, technology use occurred more frequently and students displayed higher levels of engagement and motivation as well. The researchers also noticed that students who used laptops as their primary tool for writing wrote with better quality and had a significantly higher level of engagement and motivation than students in the classes that shared laptops; \( t (257) = 4.72, p < .0001 \). Additionally, Mouza (2008) implemented a laptop program with third through fourth grade students in a New York City school that primarily served Hispanic students on free lunch. After a full year of implementation, results from the study indicated that laptops facilitated student engagement, created better motivation and influenced student interactions in the classroom. Students in the laptop program also had higher gains in writing and math. The fourth graders with laptops exhibited significantly higher positive attitudes about school; \( t (51) = 2.06, p < .05 \).

Teachers and students can use laptops and tablet PCs in innovative ways to create an interactive learning environment (ILE) between students and the teacher. For example, C.-C. Liu and Kao (2007) created a workspace in which students could use mobile technology along
with community workspace through a shared-display area. C.-C. Liu and Kao observed that creating the opportunity for students to use mobile devices enhanced collaboration. The shared-display was effective in supporting collaborative learning activities, which resulted in higher participation rates. Results from the student questionnaire revealed that shared-displays were considered more effective for collaborative learning. Enriquez (2010) conducted two studies that showed how using tablet PCs and wireless technology during classroom instruction creates an ILE with positive effects on student learning and interactions. The set up allowed the instructor to solicit active participation from all students during lectures and provide immediate feedback through survey responses. The instructor could view students’ work on their tablet PCs from the computer station, facilitate group chats, and exchange files. Students who attended classes with the ILE were more engaged and performed better in class. In the first study, which involved Spring 2005 and 2006 circuits, the quiz average and homework average were significantly higher for the experimental group; $t(1, 33) = 8.06, p < .001$ and $t(1, 42) = 2.61, p < .01$. In the second study, which involved the Spring 2007 circuits of San Francisco and Canada College, the quiz, test, and final exam averages of the experimental group were significantly higher; $t(1,20) = 2.56, p < .05$, $t(1,35) = 2.11, p < .05$, and $t(1, 25) = 2.17, p < .05$. These students also exhibited positive attitudes about the ILE model and the use of tablet PCs in the classroom. Students believed that using the tablet PCs helped to improve their note-taking and organization.

Implementing laptop programs with 1:1 access ratios can increase computer usage and technology skills (Larkin & Finger, 2011; Lei & Zhao, 2008; Oliver & Corn, 2008). Such programs have revealed an increase in student achievement, engagement, and motivation (Dunleavy & Heinecke, 2007; Mei-Chuen Lin & Yi-Jiun, 2010; Mouza, 2008; Russell et al., 2004; Suhr et al., 2010). Additionally, the use of laptops with learning activities that involve
students working together can help support student collaboration, participation, and interaction (Enriquez, 2010; C. C. Liu & Kao, 2007).

**Personal Digital Assistants**

A PDA is a small computer device that usually fits in the palm of one’s hand. It can be used to store and access documents just like on a computer. Often referred to as a handheld, PDAs allow individuals to store information such as notes, to-do lists, Word documents, and spreadsheets. People can use them to read electronic books, check e-mail, and access the internet. PDAs are relatively inexpensive, with the cheapest selling price set at less than $100, but costs can reach as high as $600 (Hewlett-Packard, 2000).

PDAs can be useful tools for learning. Motiwalla (2007) explored e-learning with handheld devices in a college setting. Students and instructors were able to interact, access course materials, and have discussions online from their devices. Participants claimed that the tool was very useful and a good compliment for classroom interaction. They believed the wireless connection provided by the handheld was convenient, offered flexibility, and was an efficient device for learning; statistical significance was not reported. van `T Hooft (2004) studied how students in Grades 1-12 used handhelds. Results from the study of 300 students revealed that students used the handhelds everywhere including the classrooms, on field trips, at home, on the bus, and at restaurants. The majority of students used them at least three times a week, if not every day. Students said that they “liked using the handhelds, and believed the devices made them better students” whereas other students found them “easy to use, fun, and a useful tool for learning” (p. 300). The researcher did not report on values of statistical significance.
PDAs can be used in many different ways to help students interact with daily tasks and learning activities. For example, Gentry, Wallace, Kvarfordt, and Lynch (2010) worked with a group of 22 high school students with autism to evaluate the use of PDAs for task management. All participating students were diagnosed with autism, attended a public high school, and had difficulties in performing everyday tasks because of their cognitive and behavioral issues. At the end of the study, students showed improvement on the Canadian Occupational Performance Measure (COPM). When reviewing the PDAs for data entry, the researchers saw calendars with alarms and reminders that were set by the students. Eight weeks later, 82% of the students exhibited retention of learned skills and used the PDAs on a regular basis. All participants expressed that PDAs had helped their independence in completing everyday activities. Improvements observed in their performance of daily tasks were statistically significant; \( t (21) = 10.312, p < .001 \). Clarke and Besnoy (2010) used PDAs to study how students would interact with the technology and examine how such technology facilitated the growth of student literacy. Participating students accessed text through their PDAs rather than through traditional textbooks. Clarke and Besnoy observed that the PDAs motivated students. The digital text allowed students to engage with the reading in different ways such as highlighting and writing notes on the text. Rogers and Price (2008) investigated how mobile technology can help scientific collaborative inquiry in the field. Students used PDAs to take formal measurements and assessments and to share information with each other. Through observations, the researchers found that PDAs supported collaborative learning, social interactions, and were highly engaging for the students. PDAs also enabled students to enhance their reasoning skills, and students used information from the PDAs to initiate formulating their own inquiries. This case study did not report on statistical significance. Hung, Lin, and Hwang (2010) study exemplified how PDAs can facilitate field
observations with fifth- and sixth-grade students. While visiting three mangrove wetlands, students used PDAs to guide their observation targets, access information, search facts through an e-library, and take notes. The PDA-interactive worksheets posted questions for students and provided them with live feedback. At the end of the trips, students showed progress in their learning as well as in their observations and records of their field experience, although statistical significance was not reported.

PDAs can also affect students’ engagement, motivation, and cooperation with other students. Facer, Joiner, Stanton, Reid, Hull, and Kirk (2004) conducted a study to explore the use of mobile technologies in an outdoor space in which seventh-grade students role-played as lions in an attempt to better understand their habitat and survival in a savannah. Students used GPS linked to PDAs as they explored and experienced the outdoor environment. With the PDAs, students could access sounds, images, and descriptions of smells from an actual savannah. Results from the study revealed that students felt as though they were in a real savannah and found the assignment highly engaging and motivating; statistical significance was not reported.

Lai and Wu (2006) found that students who used handheld technology within a jigsaw cooperative learning activity exhibited greater levels of engagement and motivation than students who used no technology. Students who participated in the PDA activities expressed positive perceptions about cooperative learning activities; \( t (89) = 2.99, p < .001 \), greater concern about completing their tasks, and better interactions with group members. Roschelle et al. (2010) found that the integration of the TechPALS program with handhelds resulted in increased engagement, significantly more feedback from students, and a greater number of students working together when compared with results from students who used desktops. In reviewing the pre and posttests, the researchers found a significant main effect for the experimental group;
$F(1, 155) = 4.08, p < 0.05$, Cohen’s $d = 0.22$. Furthermore, the TechPALS students learned more ($M = 6.38, SD = 4.17$) than the control condition ($M = 5.24, SD = 3.92$). Additionally, Lai et al. (2007) hypothesized that mobile technologies could increase “the level of knowledge creation through experiential learning beyond that which is achieved with traditional methods (paper and pencil)” (p. 330). When the researchers gave one group of students PDAs to use on a field trip to collect data, take pictures, and make notes, the students with PDAs retained more knowledge and were more motivated than the group that only used pencil and paper. The PDA group scored significantly higher on the posttests.

Students have found PDAs to be a very useful and helpful tool for learning. PDAs offer flexibility, convenience, and portability (Motiwalla, 2007; van `T Hooft, 2004). This handheld technology can be used to help students with special needs in completing everyday tasks (Gentry et al., 2010) and allow students to interact with texts and other learning activities, such as field trips, in innovative ways (Clarke & Besnoy, 2010; Hung et al., 2010; C. H. Lai et al., 2007; Rogers & Price, 2008). Instructional activities that integrate PDAs have shown potential for increased student achievement, collaboration, motivation, and peer interaction (Clarke & Besnoy, 2010; Zurita & Nussbaum, 2004, 2007). PDA use has also resulted in an increase in student cooperation and engagement when integrated with lessons that involve students working together (Facer et al., 2004; C. Y. Lai & Wu, 2006; Roschelle et al., 2010).

**Cell Phones**

Today’s teens are dependent on their cell phones, often believing them to be a part of their identities (Interactive, 2008). Students are already familiar with their cell phones and agree that they can learn, both inside and outside of class, with them. When Humble-Thaden (2011) asked college freshman about their perceptions of cell phone use as a learning tool in high
school, they responded positively to the idea. College freshman felt that cell phones would be a good tool for collaborating with other students. Male students responded significantly higher than female students regarding cell phone use when initiated by teachers and students to foster collaboration; $t(140) = 2.90, p < .05$ and $t(140) = 3.13, p < .05$. Also, when Daher (2009) evaluated the perceptions of ninth-grade students regarding learning algebra and geometry via cell phones, the students had favorable opinions. Ninth-grade students felt that using cell phones helped them collaborate with others in solving math problems; and they could learn anytime, anywhere, even outside of the classroom (statistical significance was not reported). Furthermore, a group of college students received the opportunity to access their class’ online forum with their cell phones. Students were able to access the online discussion forums with their cell phones in addition to record face-to-face discussions, access information anytime and from any location, and read textbooks with voice support. Seventy-four percent of students liked the system and benefitted significantly from sharing voice knowledge and information (Wei, Chen, Wang, & Li, 2007).

Educators can take advantage of students’ high dependence on cell phones by using them as a means for communicating via text messaging in addition to facilitating learning through other cell phone features. For example, Daher (2010) conducted a study that required pre-service teachers to create lessons in which middle school students would use cell phones to build mathematical knowledge. At the end of the lessons, students showed that they had gained knowledge in math and were able to collaborate with other students using cell phones in the lesson activities (statistical significance was not reported). In science, Looi et al. (2011) created and implemented a mobilized science curriculum for third-grade students over a 21-week period. Students used their cell phones to video record class experiments, to conduct online research, and
to share their findings and recordings with others. Students who received science instruction that integrated smart phone usage were more engaged in learning, were able to reflect on their understanding of the science concepts, and were able to recall what they had learned better than students who did not experience technology-enriched lessons. Scores of the end-of-year science exam were significantly higher in the mixed-ability classes with mobilized lessons; $F (5345) = 31.62, p < .01$. Students’ attitudes about the use of the mobile devices in the learning process significantly increased; $t (38) = -2.77, p < .01$. In addition, McConatha, Praul, and Lynch (2008) worked with students who were able to access course materials through their cell phones in order to prepare for exams. These students exhibited a significantly higher level of knowledge of class material than students who accessed class material with traditional methods, such as class handouts; $t (110) = -2.50, p < .01$. Cell phones can also provide an easy way for after-class support for students who are hearing-impaired. C.-C. Liu and Hong (2007) created a way for students and teachers to use smart phones to connect to the Internet in order to communicate with each other after class. Teachers also used the system to remind students about assignments, provide feedback on in-class progress, and praise students. Both students and parents liked that they could use smart phones to have after-class interactions with the teacher. They thought the use of smart phones was effective in helping students learn while at home, and students had higher homework completions rates. The researchers did not report on statistical significance.

Students can also use cell phones as a tool for learning language. Cell phones can easily facilitate the use of multimedia outlets to present instructional material. For example, students exhibited a significantly stronger ability to learn a second language when utilizing learning materials via a cell phone, which included use of pictures, text, sounds, and videos (Taki & Khazaei, 2011). Thornton and Houser (2005) also reported significantly positive results in
learning language when Japanese students received English mini-lessons via cell phone messages that used text and videos. Demouy and Kukulska-Hulme (2010) found that cell phones helped students learn language by allowing them to access features and software in which they could practice listening to and speaking the new language and receive feedback. Using cell phones to practice a new language allows students to access materials anytime and anywhere, such as during commuting time and even when exercising (statistical significance was not reported).

Students already are accustomed to using cell phones and are open to the idea of utilizing them as a learning tool, to collaborate with other students, and to access online forums (Daher, 2009; Humble-Thaden, 2011; Wei et al., 2007). When teachers have used cell phones as a way to learn content, positive results in learning outcomes have occurred (Daher, 2010; C.-C. Liu & Hong, 2007; Looi et al., 2010; McConatha et al., 2008). Cell phones allow teachers to present materials through multimedia methods, which also results in increased learning (Taki & Khazaei, 2011). Several studies have indicated that cell phones can be used to help students learn a second language (Demouy & Kukulska-Hulme, 2010; Fallahkhair, Pemberton, & Griffiths, 2007; Taki & Khazaei, 2011; Thornton & Houser, 2005). Finally, cell phones can help students to access instructional materials anytime and anywhere and have been described as a useful tool (Macdonald & Chiu, 2011; McConatha et al., 2008).

iPad, iPod, iPod Touch

The iPad, iPod, and iPod Touch represent one of the latest forms of mobile technology on the market. They include similar features except that the iPad has a much larger screen. These Apple products have touch screens with Wi-Fi or 3G wireless data connection, built-in GPS, and cameras. They can be used to listen to music, watch movies and videos, play games, and access
The iPad, iPod, and iPod Touch are very popular with people of all ages. Apple sold two million iPods in the first 90 days after its release in 2001 (Blaisdell, 2006). Sales reports show that 300,000 iPads were sold on its first day on the market, and 15 million were sold within its first 9 months of existence (Bradford, 2012). These Apple products have the potential to impact education.

Parson, Reddy, Wood, and Senior (2009) investigated student opinions about audio podcasts and video vodcasts by examining how well podcasts and vodcasts helped students to meet class requirements and aided in the learning process. The researchers divided students into three groups: One group accessed class materials through PowerPoint, the second group used podcasts to hear audio lectures through either their iPod or cell phone, and the third group used vodcasts to observe actual lecture recordings. Students who used podcasts and vodcasts saw them as beneficial resources for learning when used in conjunction with other course materials. Students considered all of the vodcasts helpful; $\chi^2(2) = 10.19, p < 0.01$; and useful; $\chi^2(2) = 9.42, p < 0.01$. Podcasts were also considered as useful; $\chi^2(2) = 23.21, p < 0.0001$. Stav, Nielsen, Hansen-Nygard, and Thorseth (2010) piloted the use of the iPod Touch and iPhone with a student response system (SRS) with a group of engineering students. The researchers used the system to pose questions with yes-or-no, true-or-false, and multiple choice answers to students. After students selected and submitted their answers to the SRS with their iPod Touches, the teacher instantly projected the results for immediate feedback. Results of a survey indicated that the system encouraged students to be more active and engaged during class lectures and helped them to learn the topics in their class syllabus (the researchers did not report on statistical significance). Dale and Pymm (2009) study allowed performing arts students to incorporate the iPod as a way to supplement class lessons and to create collaborative projects. Several common
themes emerged from student responses to the research project. Students felt that the iPod offered flexibility in learning by facilitating access to information and learning at any location, even outside of class. It allowed the students to reflect on their work. The iPod fostered creativity in the students because they had to think differently about their subject matter. The iPod projects allowed students to engage in multisensory learning through utilization of creative movements and recorded images. In addition, students felt the iPod projects generated learning experiences that were motivating and enabled collaboration with their peers (statistical significance was not reported). Kelly and Kennedy-Shaffer (2011) incorporated the iPod Touch as part of a physics enrichment program for eighth-grade, Latino students from the Bronx in New York City. At the end of the 3-week course, students exhibited an increase in understanding of Newton’s law, and students expressed that the technology integration, which included the iPod Touch, was very engaging. The gains resulting from the pre and posttests were statistically significant; \( t (19) = 3.10, p < .01 \). Finally, O'Reilly, Lancioni, Lang, and Rispoli (2011) explored the use of an iPod-based communication device with two students and one adult with development disabilities. The three participants learned how to request stimuli, such as snacks, social interaction, or toys, through an iPod Touch using the Proloquo2Go software. Two of the three participants were successful in using the iPod Touch to communicate their requests (the research group did not report on statistical significance).

Investigators of several research projects in Australia have evaluated the effects of iPods and iTouch on teaching and learning. One study, titled the iPodagogy Project, was conducted to investigate students’ attitudes about emerging technologies and examine the use of iPods and video podcasts for learning (Murray and Sloan, 2007). Students received iPods and Apple MacBook laptops to use in the classroom. At the end of the study, the six teachers who had
participated believed that student behavior had improved, students engaged in higher-order thinking activities more often, students were more engaged in learning, and students better remembered the content over time (statistical significance was not reported; (Murray and Sloan, 2007). State Government Victoria (2008) in Australia conducted a study that implemented the iPod Touch Project. Conducted at three primary schools, the researchers investigated students’ attitudes about handheld technologies and examined how the iPod Touch affected student learning, teacher pedagogy, and curriculum and assessment. Collected data revealed that students found the iPod Touch easy to use, and many students believed the iPod Touch had helped their learning. Data also indicated an improvement in student numeracy, literacy skills, and technology skills. Additionally, the researchers observed teachers using more innovative and creative teaching strategies while integrating technology into their lessons (the researchers did not report on statistical significance (Victoria State Government, 2008). The third study, which involved Victoria, Australia, was a collaborative project between three schools in Singapore, the United States, and Australia called the Global Mobile Learning Project. The focus of the study was to identify factors that could help improve learning and teaching with students in a virtual learning environment, called Studywiz. Students in the project represented primary through secondary grades. Students used an iPod Touch to demonstrate their cultural identities, upload information onto Studywiz, and communicate with each other across the three countries. Data from the study indicated that the iPod Touch motivated and engaged students, who participated more in class and enjoyed learning (statistical significance was not reported; (Etechgroup, 2009).

iPads, one of the newest forms of mobile technology, were recently released in 2010. Several articles have been published on the potential positive effects of the iPad on student
learning (Malala, 2011; Manuguerra & Petocz, 2011; Sandars, 2010); however, not very many empirical research articles regarding the effects of iPads have been published yet. In 2011, Price conducted a study to examine how the iPad interactive eBook could affect the comprehension level of students with autism. Price (2011) had the students read a traditional, printed book and then answer a set of comprehension questions. Later, students read an interactive e-book with their iPads and answered a set of comprehension questions. Results of the comprehension test showed that every student with autism except for one significantly improved in comprehension when they used the iPad with the interactive e-book over reading the traditional, printed books. Teachers thought that the students were motivated and that off-task behavior decreased when students used the iPads. The researcher did not report the statistical values in this study.

Although teachers and students are exploring the capabilities of the iPad, iPod, and iPod Touch in the educational setting, their effects seem promising and show potential for positively influencing student learning and communication. The iPod can provide a way for students with disabilities to communicate their needs or requests (O'Reilly et al., 2011). The iPod also can be a means for providing students with instruction through multimedia outlets, such as podcasts and vodcasts (Dale & Pymm, 2009; Parson et al., 2009). The iPod Touch can provide an innovative way for teachers to integrate their lessons with the SRS so that students are more engaged in class lectures. When students use the iPod Touch with the SRS, they are using a technology that is already familiar to them and can lead to increased immediate feedback on their learning (Stav et al., 2010). The iPad also shows promise for influencing student learning, as Price had demonstrated in a 2011 study in which students increased their reading comprehension by using the iPad as an electronic reading device.
SMS is a way of communicating through a cell phone by using a feature on the phone to send and receive plain text messages. People also refer to SMS as text messaging, texting, mobile messaging, wireless messaging, and short mail (CTIA, 2011). CTIA-The Wireless Association (2011) reported that the number of text messages sent in the United States increased by 16% in 2011; 982.9 billion text messages were sent in 2010, and 1.138 trillion texts were sent by mid-year 2011.

In addition to frequently using text messaging in personal or work-related settings, people can also use text messaging in the school setting. Divitini, Haugalokken, and Norevik (2002) investigated students’ use of mobile technology and their interest in integrating communication through text messages with education. The researchers found that most students (a) already used text messaging to communicate with each other and (b) were interested in receiving text messages from the university regarding class information, sharing information with classmates, and receiving important notices from the university. The researchers did not report on statistical significance because of a small number of survey responses. Thomas and Orthober (2011) worked in the United States with a group of high school students, who expressed that receiving text messages about tests, homework, and other matters regarding class assignments was very useful. Students viewed text messages as good reminders for assignments, dates, and tests; values of statistical significance were not reported (Thomas & Orthober, 2011). Students have also shown an interest in using text messages during class to post questions and contribute to class discussions, citing it as a good way of interacting with other students and continuing discussions even after class ends (Markett, Sanchez, Weber, & Tangney, 2006). For example, a group of 14-year-olds in Malaysia regularly used cell phones for discussions about science.
assignments and regularly used text messaging to communicate with each other (significance not reported; (DeWitt & Siraj, 2011).

Students can also use text messaging as a resource for learning. Some students have conveyed that use of text messaging is helpful in learning actual academic content. Lu (2008) evaluated the efficacy of using cell phones to teach English to a group of 10th-grade students. In this study, one group of students received targeted vocabulary words through text messaging on their phones while another group received the words on paper. Lu found that students who received the words via text messages exhibited greater gains in vocabulary than the other group of students. Results of the vocabulary scores are especially significant in the first week; $t (28) = 2.62, p < 0.05$. Students’ attitudes were significantly more positive about learning vocabulary via their cell phones, noting convenience as one reason for this preference. A second example of research that incorporated using text to learn language is Kert’s 2011 study in which college students received text messages containing course material. Students who received text messages had higher posttest scores than students who only received all course materials entirely on paper. The posttest scores of the experimental group were significantly higher than control group; $t (38) = 3.07; p < .05$ (Kert, 2011).

The use of text messaging for personal communication will continue to increase. The average teenager sent over 3,000 text messages per month in 2010, and 43% of teenagers said that texting is the primary reason why they acquire a cell phone (Parr, 2010). Students enjoy when educators conveniently communicate with text messaging, citing the practice as favorable and useful (DeWitt & Siraj, 2011; Divitini et al., 2002; Markett et al., 2006; Thomas & Orthober, 2011). In addition, students who use text messaging as a strategy for learning have seen positive
Factors that Influence Technology Integration

BYOT programs have only recently become part of school practices. Research is very limited on how such programs influence teachers’ integration of technology in the classroom. Researchers who have studied traditional technology programs have identified several factors that influence teachers’ use of technology with students and possibly prevent successful integration in the classroom. Teachers’ access to and use of technology are part of those factors. For example, Norris and Soloway (2004) administered the Snapshot Survey to over 4,000 K–12 classroom teachers in the United States and collected information about teachers’ demographics, educator attitudes, classroom practices, and access to technology. The purpose of the survey was to help identify factors that have the greatest influence on technology integration in classroom instruction. Researchers found that the main reason why technology has not fully been integrated into classroom instruction was related to access and actual usage of the technology. They suggested that although the United States has spent billions of dollars on technology in the classroom, few teachers actually use it.

Pierson (2001), as well as Sandholtz and Reilly (2004), identified that knowledge of instruction and technology can play a large part in the use of technology within the classroom. Pierson (2001) evaluated the relationship between teachers’ levels of technology knowledge and teaching abilities to investigate how this related to their use of technology integration. Pierson worked with 16 self-contained, elementary teachers who were previously identified as exemplary technology users. Results revealed that the relationship between pedagogical knowledge, content knowledge, and technological knowledge affects the successful integration of technology
in the classroom. Teachers who are lacking in technology or content knowledge have difficulty in successfully integrating technology in their classrooms (the researcher did not report statistically significance values). Sandholtz and Reilly (2004) conducted a study that reinforced the importance of teachers’ instructional knowledge and its impact on technology integration. Sandholtz and Reilly worked with a group of teachers in a California school district that provided all teachers with technology and professional training that focused on instruction rather than simply technical skills. The researchers found that teachers in this program integrated technology much more quickly when compared to teachers in other programs that solely focused on technical skills (statistical values were not reported).

Wozney, Venkatesh, and Abrami (2006) and van Braak, Tondeur, and Valcke (2004) found that computer access and knowledge of direct applications of technology were not the only factors affecting teacher use of technology in the classroom. The researchers also reported that teachers’ attitudes had a great effect. Wozney et al. (2006) administered the Technology Implementation Questionnaire to a group of 799 teachers in elementary and secondary schools to study teacher attitudes and personal and professional use of technology. Survey results revealed that participating teachers needed training on the actual application of technology in the classroom rather than training on technical skills. Student access to computers was identified as a barrier to technology integration. Results from the questionnaire were statistically significant. In addition, teacher attitudes and beliefs towards technology integration influenced use of it in the classroom. van Braak et al. (2004) surveyed 468 elementary school teachers to evaluate the effect of demographics, computer related experience, and attitude constructs on teachers’ computer use. Results indicated that teachers’ attitudes towards computers in education and
technological innovativeness significantly affected their use of computers in class. Additionally, teacher attitude was a significant predictor of supportive computer use; $\beta = .15$.

Researchers have identified several factors that could affect teachers’ successful integration of technology in the classroom. Student access to computers and teachers actually using the technology were one factor (Norris, Sullivan, Poirot, & Soloway, 2003). However, two of the most influential factors were teachers’ knowledge of instruction and technology (Pierson, 2001; Sandholtz & Reilly, 2004) and attitudes about technology use in the classroom (van Braak et al., 2004; Wozney et al., 2006).

Review of the Research Using the Concerns-Based Adoption Model

Researchers have used tools from the CBAM to examine teachers’ adoption or integration of technology in the classroom. Many of the studies used the Stages of Concern Questionnaire (SoCQ) to investigate teachers’ concerns, specifically, across various grade levels. Y. Liu and Huang (2005) examined in-service teachers’ concerns about technology integration in the classroom. The researchers used the SoCQ to identify a pattern in scores with teachers’ concerns and to examine whether a difference in scores existed when teachers’ levels of concern were considered. Results indicated that when teachers’ concerns were examined as a whole group, the stages of informational, personal, and refocusing were the strongest. Donovan et al. (2007) researched concerns of teachers who were working at a school that provided all students and teachers with a laptop as an initiative. The purpose of this initiative was to provide training for teachers, to raise parental involvement, and to increase student-centered instruction with the integration of technology. The 17 seventh-grade teachers who participated in the study were asked to complete the SoCQ and participate in brief one-on-one interviews. The majority of the teachers, 52%, had self concerns that fell mostly in Stage 2 (i.e., personal). Additionally, when
examining the group, group concerns peaked at Stage 2 (i.e., personal) as well. In this study, the researchers found that teachers’ concerns related to the impact that the laptop initiative would have on them in terms of the time it would take up, the planning it would require, and the type of instructional practices they would need to implement. Yang and Huang (2008) investigated the relationship between teachers’ concerns and behaviors with technology integration in their high school English courses. Participants included 332 junior and senior high school English teachers in Taiwan. The researchers used the SoCQ and reported that the highest stage of concern for participants was Stage 2 (i.e., personal). The second highest concern was at Stage 1, (i.e., informational). Rakes and Casey (2002) evaluated the concerns of PK–12 teachers across the United States. Their study included 659 teachers with access to the Internet and a wide range of teaching experience in years. The researchers used the SoCQ to identify teachers’ concerns about use of instructional technology. Results of the survey indicated that the highest level of concern was at Stage 2 (i.e., personal). This stage of concern includes a teacher who is primarily concerned with “status, reward, and potential or real effects of technology” (p. 9). The second highest concern was at Stage 5 (i.e., collaboration). This stage often includes a teacher who is concerned about “working with colleagues in coordinating the use of technology” (p. 9).

Additionally, Al-Rawajfih, Fong, and Idros (2010) evaluated teachers’ stages of concern (SoC) in secondary, Jordan Discovery schools, where teachers integrated e-learning with their daily teaching practices. The 350 participating teachers took the SoCQ. Statistical analysis of the questionnaire responses revealed the following: The most dominant concern was in Stage 2 (i.e., personal) for the group, male and female teachers, and teachers who had taught for more than 5 years. Teachers who had taught between 1 and 5 years showed concern mostly at the collaboration stage.
Other researchers, including James et al. (2000) and Hope (1997), utilized the SoCQ to assess teachers’ concerns and used this information to improve professional development for teachers. James et al. (2000) adopted a technology project to implement technology and an integrated curriculum. The researchers evaluated teachers’ concerns and provided professional development over a 2-year period. The project involved three teachers and one administrator from schools in Texas. One teacher taught math, another taught science, and the third taught technology courses. Questionnaire results from the first year of implementation indicated that concerns were highest in Stages 1, 2, and 3 (i.e., personal, informational, and management, respectively). The results from the SoCQ were typical of new users. Often, new users want to find information about the innovation so that they are able to manage it in their classrooms. Participants took the questionnaire again in the spring of the second year of implementation. Results of this second questionnaire remained indicative of new users and showed high concerns in Stages 1 and 2 (i.e., informational and personal, respectively); however, some changes occurred over time in that the concerns in these stages slightly decreased from the first year.

Hope (1997) administered the SoCQ twice over a 1-year period to 16 teachers in Grades 3 through 5. The innovation in this study was the use of a technology workstation for teachers, which included a computer, printer, and software for lesson plans and grade book tracking. Results of the first questionnaire appeared typical for a new innovation with high concerns in Stages 0, 1, and 2 (i.e., awareness, informational, and personal, respectively). Similar to the previous study, this information was used to cultivate professional development and teacher support. Towards the end of the school year, the researchers administered the SoCQ again. These results indicated that no teachers had high concerns in Stage 0 (i.e., awareness). At the
end of the school year, more teachers had advanced to Stages 5 and 6 (i.e., collaboration and refocusing, respectively).

Swain (2006) used a version of CBAM’s levels of use interview protocol (LoUIP) to explore student teachers’ “perceived use of educational technology” and their “perceived growth” (p. 30). Student teachers received the survey in the fall and spring semesters of 2002-2003 both before and after completing the course, Integrating Technology into the Curriculum. The researcher noted that student teachers became more comfortable with integrating technology over the course of the school year, and student teachers’ LoU moved from Level III (i.e., mechanical) to Level IVB (i.e., refinement). This indicated that student teachers became more concerned about how technology affected student learning.

Several researchers have developed innovative configuration (IC) maps to evaluate and identify levels of implementation or integration of technology by college faculty. Javeri and Persichitte (2007) developed an IC map following the guidelines of Heck, Steigelbauer, Hall, and Loucks (1981). The researchers found that 56.7% of participants were integrating technology at a high level of fidelity, 38% at a moderate level of fidelity, and 5.3% at a low level of fidelity. Mills and Tillman (2000) created their own IC map, the Integrated Learning System Configuration Matrix (ILSCM), by using the guidelines of CBAM. They used the map to explore teachers’ implementation of an integrated learning system (ILS). The researchers focused on a way to identify (a) how teachers were implementing the ILS and (b) which teachers were implementing the ILS as campus leaders intended. By interviewing elementary teachers, transcribing the interviews, and analyzing the transcripts, a panel of three experts plotted the teachers on the ILSCM. The researchers identified the most important components of the program and which teachers were implementing the ILS with fidelity. Mills and Tincher (2003)
developed a second IC map, the Technology Integration Standards Configuration Matrix (TISCM), as a tool to evaluate teachers’ integration of technology at the district level. The TISCM contains 18 components with four variations each. Forty-six teachers across the school district completed the TISCM checklist both at the beginning and at the end of the school year. Results from the study supported the researchers’ hypothesis of “technology integration is a developmental process” (p. 40). The researchers observed the following trend: At the beginning stages of implementation, novice teachers’ use of technology was mostly for productivity. Later, after professional development and support, teachers used technology in more student-centered and innovative ways.

Summary

BYOT is one economical way for schools to incorporate more technology in the classroom. Such programs can expose students to various types of technologies that students might not otherwise explore. Students can bring their own PDAs, cell phones, laptops, iPads, and iPods to school to use along with instructional activities. Mobile technology can have a positive influence on learning, motivation, and collaboration, regardless of the type of technology used. Laptops, PDAs, cell phones, iPads, and iPods all have a positive impact on students’ learning experiences regardless of age or grade level.

Teenagers are highly dependent on cell phones and other mobile technology. Many students’ social and academic lives conflict because of differences between home and school. Lack of technology integration in schools along with a dependence on textbooks and paper pencil materials is common. However, while at home, students stay in constant contact with friends and family through text messaging, e-mail, blogs, and even gaming. Disconnect between students’ academic and social lives occurs when students arrive at school and are asked to put
away all technology. Additionally, as we move into the future, the need for supporting digitally
native students in the classroom in preparation for the workforce is increasing. This is especially
important for newly graduating teachers who have grown up as digital natives. Many new
teachers grew up in learning environments that reflected traditional 20th-century practices of
lectures, textbooks, pen and paper; however, their personal lives have revolved around the digital
world. New teachers must find ways to merge or transform learning to reflect the needs of the
21st century.

Finally, factors that influence the successful integration of technology include students’
and teachers’ access to computers, teachers’ knowledge of instruction and technology, and
teachers’ attitudes towards the use of technology in the classroom. Research supports that
although many classrooms have technology, teachers have issues with actually using it.
Teachers who lack knowledge either in content or in application of technology often have
difficulty with the integration of classroom technology. Also, research has shown that teachers
will hesitate to integrate technology into their instruction if they do not see the value in it.
Furthermore, the tools from the CBAM can be used to evaluate teachers’ adoption of technology
by assessing their concerns, levels of use, and practices.
CHAPTER 3

METHODOLOGY

In this case study, classroom teachers’ behaviors and concerns related to the adoption of the bring your own technology (BYOT) program were evaluated by using tools from the concerns-based adoption model (CBAM): Survey of Concern Questionnaire (SoCQ), levels of use interview protocol (LoUIP), and the innovation configuration (IC) map (Hall & Hord, 2006). The research also included interviews with six of the 12 participating teachers using a modified version of Seidman’s (2006) three-interview series. Additionally, each classroom teacher was observed once in the classroom to see his or her actual practices with BYOT. This study has provided insight on teachers’ feelings and behaviors regarding implementation and a snapshot of teachers’ practices as they applied the initiative to their instructional practices.

Purpose of the Study

The purpose of this study was to assess teachers’ adoption of an innovation, the BYOT initiative. Information was gathered through this study to explore teachers’ concerns, use, and practices in the adoption of the BYOT initiative.

Research Questions

The research questions that guided this study were the following:

1. What are teachers’ concerns as they implement BYOT?
2. What are teachers’ LoU regarding the implementation of BYOT?
3. What are teachers’ practices as they implement BYOT?

Setting

BYOT initiatives are emerging in Texas schools as a way for school districts to address the need for more technology in classrooms. School leaders that initiate BYOT claim that
BYOT programs encourage and support a learner-centered, engaging, and motivating learning environment. The school in which this study was conducted embraced the BYOT principles. School leaders in this study believed that by incorporating students’ mobile technology in the classroom, teachers could create a learning environment conducive to student-driven learning, create more collaborative student groupings, and reach the goals set by the International Society for Technology Education (ISTE; 2012a) standards. Leaders also encouraged teachers to use technology as a tool for publishing student work, promoting digital citizenship, and connecting with other learning communities outside of the local school.

The school in this study was a private school in a suburb in Texas, hereafter referred to as Private School to preserve anonymity. Beginning in fall of 2009, the school began to adopt e-textbooks for students in some content areas. Students accessed e-texts either through school-issued iPods or through students’ personal iPods. At this time, only a small number of students in select content areas had access to the e-textbooks. Later, the school adopted BYOT and used e-textbooks in all classes in 2010. Administrators asked all students to bring their own laptop or mobile technology devices as part of their enrollment agreements. Administration allowed students to bring any mobile technology device that was compatible with the schools adopted e-textbooks; however, the majority of the students brought laptops. If a student could not purchase a laptop, the school offered financial support. Additionally, the school had an extra set of laptops to lend to students if their laptops were not working properly.

The school serves an estimated 600 students in 6th through 12th grade, primarily from families with a low socio-economic status. A low-income neighborhood surrounds the school, but students from all economic backgrounds attend the school from other neighborhoods. Private School is different from many other private schools in that its enrollment includes a large
number of low-income students, which occurs as a result of several different factors. First, many students can pay tuition costs because their families, which include aunts, uncles, and grandparents, work together to pay the bills. Second, some parents value a private education enough to work two or three jobs to afford for their child to attend Private School. Some students may even work themselves to help pay for their tuition. Finally, a small number of students receive financial support for their tuition from local churches.

Students at the school must wear uniforms and are held to high behavior and academic standards. Teachers and campus administrators invest many hours ensuring that they support every student academically and do not accept student failure. Private School follows a blocked schedule. All student textbooks are electronic. Teachers can check out document cameras, writing pads, and e-readers to use along with technology already available in the classrooms. Teachers are also able to check out cameras for video recording and photography. Students from all economic backgrounds have access to the technology. Depending on each teacher’s instructional plans, students use the technology in different ways. Students can use the e-readers for reading books of personal interest or texts assigned by the teacher. Students can use cameras to take pictures to illustrate concepts learned in class or video record skits or plays for class. Additionally, students bring their own laptops to school on a daily basis and access course and reading materials through their personal laptops.

Population

In 2012, the ethnic distribution of students attending the school was as follows: 23% White, 36% Black, 32% Hispanic, 2% Asian, and 6% bi-racial. The ethnic breakdown is 64% Non-Hispanic and 36% Hispanic; 47% of students reported that they were from low socioeconomic families. The teacher-to-student ratio is 13:1 with an average class size of 15.
Design

The research design was a case study that incorporated multiple methods for data collection. A case study research design is defined as “an empirical inquiry that: investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident” (Yin, 2003, p. 13). This case study took place at one private school in Texas serving middle and high school students. Teachers’ experiences as they adopted students’ own technology in context were studied using the CBAM tools, interviews, and class observations. Data from these sources were triangulated for a deeper understanding of teachers’ concerns, uses, and practices in implementing the BYOT initiative.

Twelve teachers participated in the study; however, they did so in different ways. All twelve teachers completed the questionnaires at three different intervals. After collection of the initial questionnaire results, only six of the twelve teachers participated in interviews and classroom observations. The six teachers were invited to take part in interviews and observations based on the results of the questionnaire so that teachers from various points of the SoCQ were represented for further insight into their adoption of BYOT. This design allowed (a) for a bigger pool of participants when collecting questionnaire data and (b) for comparisons across more groups of teachers for a greater understanding of how campus teachers felt about the innovation.

Participants

Study participants included teachers from middle and early high school grade levels, representing each content area (English language arts, math, science, social studies, and electives). Twelve teachers participated; six teachers participated fully by completing
questionnaires, interviews, and observations, and the remaining six teachers completed questionnaires only.

All participating teachers were welcoming and excited to offer insight on their feelings, concerns, and actual use of BYOT. My relationship with the participants began in the fall of 2012 when they were first informed of the research and granted their informed consent. After receiving consent to participate in the study, six of the twelve teachers were individually interviewed on three separate occasions. The six teachers were selected based on their responses to the first questionnaire, and they were subsequently observed in their respective classrooms for 45 minutes each to gain insight into a typical day with BYOT. The following is a brief description of each teacher, whose privacy is protected by using a pseudonym.

The English language arts teachers were Mr. Lane and Ms. Ponce. This was Mr. Lane’s first year as a teacher, teaching English language arts to seventh- and ninth-grade students and coaching boys’ soccer. Originally from Massachusetts, he graduated from Notre Dame in 2012 and came to Private School as part of the Alliance for Catholic Education (ACE) program. He felt confident in his personal use of technology because he has an iPhone and laptop that he uses often. In his classroom, he regularly utilizes students’ laptops and the SMART Board. Ms. Ponce has been teaching for 10 years; however, this was her first year to teach at Private School, teaching ninth-grade English language arts. Before coming to the school, she taught in several different countries including England, Korea, and Canada. She felt that she used technology for everything; she said she was “addicted” to her iPhone because she often checked her e-mail, feeling connected with parents and students because of this technology. In her classroom, she shared that she utilized students’ laptops, the SMART Board, e-readers, and students’ cell phones.
Ms. Manning and Ms. Alvin were both science teachers. Ms. Manning was a first-year teacher who, like Mr. Lane, came to Private School as part of the ACE program from Notre Dame. At the time of this study, she shared a home with six others participating in the program, including Mr. Lane. Ms. Manning grew up in the Bahamas. She graduated from college in New York with a pre-med degree. After spending some time overseas, she decided to continue to serve in the U.S. through the ACE program. At the time of the current study, she taught sixth- and eighth-grade science. She felt good about her personal use of technology and was in the process of transitioning from a PC to a Mac. She shared that in her class, she mostly utilized students’ laptops and the SMART Board. Ms. Alvin taught at another private school in the area for 4 years before coming to Private School. She has worked at Private School for 4 years as a middle and high school science teacher. Regarding her personal use of technology, she used her phone a lot for e-mail and staying connected with others through social media. She enjoys the students and likes all the technology available at Private School. She shared that she utilized students’ laptops and her SMART Board in class.

Ms. Casey and Mr. Belagio were both middle school math teachers. Ms. Casey had taught for 21-30 years before moving in 2001 to a city in Texas where she worked at a Catholic church and school. Her principal there recommended her for a math position at Private School. She has taught middle school math for 10 years at Private School. This was her third year with BYOT at Private School. She explained that she mostly used the class SMART Board and Airliner along with students’ laptops in her class. Mr. Belagio began his time at Private School by volunteering as a track coach and later decided that he liked working with students. He changed careers from working in the auto industry to teaching middle school students. At the time of the current study, he had been at Private School for 7 years and was teaching eighth- and
ninth-grade math, although he has also taught science in the past. He shared that he utilized students’ laptops and cellphones along with the SMART Board in class.

All participating teachers positively described their work environment and expressed that they were happy to work there. All participating teachers felt that they had good students and enjoyed working with such a diverse group. Many students were from the surrounding neighborhood, but a large number of students rode the school bus or were driven in from surrounding cities. Students who attend Private School represent various ethnic groups, socioeconomic levels, and religious backgrounds. When asked what it was like to work at Private School, one teacher said, “It’s a pretty neat experience. It is a diverse group and they come from many different backgrounds. And they’re all just ready to learn. And much different experience from where I was before, I guess.”

Data Sources

This study included multiple data sources to gather information. The CBAM instruments were utilized to assess teachers’ behaviors and concerns in relation to their adoption of BYOT. The following CBAM tools were used in the analysis: SoCQ, LoUIP, and the IC map (Hall & Hord, 2006). Collected data also included teacher interviews, following some guidelines from Seidman’s (2006) three-interview series, and class observations.

Instruments

The Concerns-Based Adoption Model

The CBAM provided a framework for better understanding and analyzing teachers’ feelings and behaviors related to the change process with the adoption of BYOT. All three diagnostic components were incorporated to create individual teacher profiles.
Survey of Concern Questionnaire

The first diagnostic component in the study was the SoCQ, which was utilized to identify the feelings of the individuals participating in the change. The developers of CBAM found that people’s feelings change as they “think about and try an innovation” (Loucks, 1983, p. 3).

Hall and Hord’s seven SoC are grouped by the following: self, task, and impact (Hord, Rutherford, et al., 2006). The following is a brief list and description of the seven stages from A. A. George et al. (2006, p. 8):

- **Stage 0: Unconcerned**-Individual has no concerns or involvement with the innovation (does not indicate use or nonuse).
- **Stage 1: Informational**-Individual is concerned about what the innovation is, its characteristics, effects, and implementation requirements.
- **Stage 2: Personal**-Individual is concerned about their own ability to implement the innovation. They may be concerned with their status in the organization as it relates to the innovation.
- **Stage 3: Management**-Individual is concerned with the day-to-day use of the innovations; specifically, management of time and materials and organization.
- **Stage 4: Consequence**-Individual is concerned about the impact the innovation has on students and thinks about whether changes need to be made.
- **Stage 5: Collaboration**-Individual is focused on collaborating with other users.
- **Stage 6: Refocusing**-Individual is concerned about making changes to the way they use the innovation or searches for an alternative program.

Concerns that fall into the dimension of self often occur in the early stages of adopting an innovation. These concerns are often from Stages 0, 1, and 2 (i.e., unconcerned, informational,
and personal, respectively). Teachers with self concerns are interested in having more information about the innovation such as the preparation that is required of them, the timeframe for implementation, and how they will implement it. These teachers may also have concerns about their ability to implement the innovation. Teachers with task concerns fall under Stage 3 (i.e., management) and are concerned about the time it takes to prepare, gather materials, and manage the innovation on a day-to-day basis. Finally, the third dimension, impact concerns, describes teachers who are categorized in Stages 4, 5, and 6 (i.e., consequence, collaboration, and refocusing, respectively). A teacher with impact concerns thinks about how the innovation will affect students and their success (2006, pp. 31-32).

The creators of CBAM have observed that teachers often will “progress through the stages in a developmental manner” (Hord, Rutherford, et al., 2006, p. 32). However, this pattern is not absolute and is not the same for all teachers. Additionally, teachers may progress through stages in a “wave pattern,” in which teachers’ self concerns are higher at the beginning of adopting an innovation (p. 32). These self concerns become less intense as time passes and teachers accomplish deeper levels of adoption. Other concerns become more intense, such as those in the dimensions of task and impact.

Hord, Rutherford, et al. (2006) offer general principles about concerns. The first general principle is that teachers’ particular concerns are not indicative of something good or bad, positive or negative; it is simply a description about their concerns. Type of interventions offered should target the teachers’ concerns. Teachers with self concerns may not benefit from information or interventions shared for concerns about task or impact. Teachers’ progression through the stages may be influenced by the support they receive but cannot be forced to change. In sum, “concerns are influenced by participants’ feelings about an innovation, by their
perception of their ability to use it, by the setting in which the change occurs, by the number of other changes in which they are involved and, most of all, by the kind of support and assistance they receive as they attempt to implement change” (Hord, Rutherford, et al. (2006), p. 43).

Table 1 provides information from Hord, Rutherford, et al. (2006, pp. 44-45) for change facilitators as they move implementers through the SoC.

Table 1

*Stages of Concern and Suggested Interventions*

<table>
<thead>
<tr>
<th>Stage of Concern</th>
<th>Intervention Ideas</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage 0 Awareness</td>
<td>Invite teachers to discussions and decisions about the innovation. Connect these teachers with those who are already using the innovation.</td>
</tr>
<tr>
<td>Stage 1 Informational</td>
<td>Provide information about the innovation through various channels. Take them to visit other classrooms or schools already using the innovation.</td>
</tr>
<tr>
<td>Stage 2 Personal</td>
<td>Provide them with encouragement and help them feel that they are able to implement the innovation. Connect them with other teachers who had Personal concerns and have move passed these concerns.</td>
</tr>
<tr>
<td>Stage 3 Management</td>
<td>Provide information with common problems and solutions that may arise from the day-to-day use of the innovation. Plan the use of the innovation with small steps and small goals.</td>
</tr>
<tr>
<td>Stage 4 Consequence</td>
<td>Provide positive feedback and allow teachers to learn more about the innovation by attending conferences or visiting other schools or teachers using the innovation successfully.</td>
</tr>
<tr>
<td>Stage 5 Collaboration</td>
<td>Encourage the teacher to collaborate with others and give them information about how to facilitate collaboration with others.</td>
</tr>
<tr>
<td>Stage 6 Refocusing</td>
<td>Give them resources and information to help them refine their use in a way that aligns with its intended implementation.</td>
</tr>
</tbody>
</table>

55
In this study, teachers’ individual SoC were identified through the SoCQ, which helped identify teachers’ ratings at various points of the study (G. Hall, George, & Rutherford, 1979). The specific questionnaire used in the study was an online version created by A.A. George, Hall, Stiegelbauer, and Litke (2008). The questionnaire is composed of 35 items. A. A. George et al. (2006) reported high internal reliability scores for the SoCQ. Alpha coefficients of internal reliability ranged from .64 to .83 for each stage; \( n = 830 \). Test-retest correlations on SoCQ ranged from .65 to .86; \( n = 132 \) (p. 20). One advantage of using the questionnaire is that the way in which it is written allows it to be applied to any educational innovation. Hall and Hord strongly advised against altering the questionnaire in order to conserve its strong reliability and validity (G. E. Hall & Hord, 2006). The questionnaire is formatted as a survey, which can be a disadvantage because some individuals may not complete every question.

Levels of Use Interview Protocol

The second component of the CBAM is LoU, which describe how individuals use the innovation. G. E. Hall and Hord (2006) described the LoU component as measuring the “behavioral side” of the change process (p. 159). The following is a list of the eight LoU identified by CBAM and brief descriptors:

- Level 0: Nonuse-Individual has no knowledge about the innovation or no intention of using the innovation.
- Level I: Orientation-Individual has or is getting information regarding the use of the innovation.
- Level II: Preparation-Individual is preparing him or herself for use of the innovation.
- Level III: Mechanical Use-Individual is using the innovation but is challenged by the day-to-day use of the innovation, time, and procedures for implementation.
• Level IVA: Routine-Individual has established a way to use the innovation.
• Level IVB: Refinement-Individual is focused and makes changes to the way he/she uses the innovation to achieve a higher level of results and impact.
• Level V: Integration-Individual collaborates with others to reach a higher level of results and impact.
• Level VI: Renewal-Individual examines the impact of the innovation on clients and considers major changes to the existing innovation or replacing it with something different (G. E. Hall & Hord, 2006, p. 160).

Levels 0, I, and II are descriptors for nonusers whereas Levels III through VI are descriptors for users of the innovation.

Hord, Rutherford, et al. (2006) stated that most people move through the LoU in sequential order, but very few individuals ever reach Level V and VI (i.e., integration and renewal, respectively; p. 65). The CBAM creators also shared that the majority of individuals will often stay at Level IVA (i.e., routine) after they have implemented the innovation for some time. Additionally, “60 to 70 percent of the first-year users of an innovation will be at the mechanical level (LoU III)” (p. 66). Furthermore, few individuals reach a level of use of integration unless the innovation specifically requires collaboration.

Assessing LoU can assist change facilitators or leaders in ensuring that those who adopt the innovation progress to higher LoU. G. E. Hall and Hord (2006) warned of consequences that could occur if teachers—especially those at the mechanical level—do not receive appropriate support. For example, these teachers are likely to implement the innovation in ways that are easier for them and different from change leaders’ intentions. Teachers may even forgo their use
of the innovation all together. Table 2 is a brief description of intervention ideas provided by G. E. Hall and Hord (2006, pp. 171-173).

Table 2

*Levels of Use and Suggested Interventions*

<table>
<thead>
<tr>
<th>Levels of Use</th>
<th>Intervention Ideas</th>
</tr>
</thead>
<tbody>
<tr>
<td>LoU I Orientation</td>
<td>Provide information about the requirements of the innovation, timelines for implementation, materials and equipment needed.</td>
</tr>
<tr>
<td>LoU II Preparation</td>
<td>Provide assistance and support in the organization and preparation of materials, planning the use of the innovation, and managing it use. Discuss potential problems and solutions that may arise from the use of the innovation.</td>
</tr>
<tr>
<td>LoU III Mechanical</td>
<td>Change facilitator should first examine that use is in alignment with the Innovation Configuration. If it is in alignment, then celebration is in order to reinforce the use. However, if the implementation is not in alignment then refinements to the use need to be recommended to ensure alignment with the Innovation Configuration.</td>
</tr>
<tr>
<td>LoU IVA Routine</td>
<td>Bring user together with other users to encourage collaboration and validation of their use.</td>
</tr>
<tr>
<td>LoU IVB Refinement</td>
<td>Provide time and structures so that user may coordinate work with others.</td>
</tr>
<tr>
<td>LoU V Integration</td>
<td>Provide support of their use of the innovation if user is continuing its use. If the user is not continuing its use, then help redirect them back to the intended implementation of the innovation.</td>
</tr>
</tbody>
</table>

One way to assess teachers’ LoU is to conduct a *branching interview*, which incorporates a “branching technique derived from the defined decision points which separate each level” (Loucks, 1977, p. 7). Loucks (1977) reported inter-rater reliability scores of .87 and .96 during the first trials of the interview protocol. Hall and Loucks (1977) reported that validity of the
interview protocol was established through ethnographic techniques that incorporated the given LoU ratings, which were based on the interview, along with ratings assigned through observations. This resulted in a correlation coefficient of .98, which indicated the LoU rating and the observations the researchers made of the use of the innovation were consistent.

In this study, the branching interview (Appendix A) and the basic interview protocol provided the data to identify teachers’ LoU. During the second interview, teachers responded to questions from the basic interview protocol. Later, their responses were compared against the branching interview and level descriptions using information from *Measuring Implementation in Schools: Levels of Use* (G.E. Hall, Dirksen, & George, 2006).

*I Innovation Configuration Map*

The final diagnostic tool is an IC map, which provides lists or descriptions of parts of the adapted innovation. An IC map illustrates various ways in which to implement the innovation so that the idea is not lost in translation or implementation. This third component of the CBAM provides a “word-picture description of what the use of an innovation can look like” (G. E. Hall & Hord, 2006, p. 112). Hall and Hord (2006) stated that the IC map is a useful tool because often the innovation is changed, adapted, or mutated as a natural reaction to the implementation process. Two purposes of the IC map are (a) to create a concrete plan of the program in order to provide individuals with a clear understanding of the program goals and (b) to monitor progress of the adoption of the innovation. In this study, the IC map allowed for comparisons between the actual implementation and the ideal, which provided information about progress made and identified areas in which teachers needed support (Loucks, 1983).

The following describes the various parts of an IC map. The first part includes a list of components that serve as the “major operational features or parts of any innovation” (p. 13).
Next are the variations, various ways in which a component is put into practice. The following is an example of one component with variations used in this particular study. A full copy of the IC map used in this study is included in Appendix B.

Component 5: Utilizes various types of tools

A. Teacher plans instructional activities in a way that allows students to use various types of mobile technology such as tablets, notebooks, cell phones, and iPods.

B. Teacher plans instructional activities in a way that allows students to use only traditional technologies such as laptops and desktops.

C. It is not evident the teacher encourages the students to use their mobile technology.

D. Teacher uses only paper-pencil type of resources for learning.

Hord, Rutherford, et al. (2006) recommended creation of an IC Component Map or Checklist when a program or innovation is implemented as part of the school improvement process. The researchers suggested that schools use an IC map for various benefits: as part of an introduction of a program, to let individuals know of the process for phasing in the components of the program, and/or to monitor or evaluate the progress of program implementation (p.16). If the change facilitator or researcher uses the IC map to identify how individuals implement the program, then interventions may follow to help particular individuals continue to progress towards the ideal variations of each component.

I created the IC map for this study by gathering input from the campus Director of Technology and Director of Curriculum and Instruction. I used the IC map to guide classroom observations. Each teacher was placed on the map based on materials used in class and
instructional practices with the technology. At the last interview, teachers placed themselves on the IC map for comparisons.

The Three-interview Series

Seidman (2006) three-interview series is an “in-depth, phenomenological based interview” model (p.15), which requires three interviews, each with open-ended questions, over a 2- to 3-week period. Conducting three interviews over time allows participants to reflect and consider the previous interview. This also allows participants to build a relationship with the interviewer so they feel more comfortable in sharing information.

The goal of the first interview is to understand participants’ life experiences in the context of the research topic. The interviewer asks participants to share information about their family, friends, school, and work. Additionally, the interviewer asks “how” questions so that participants can reconstruct life events that led to their current situation (p. 17). The goal of the second interview is to gather details about participants in the context of their lives in the present and as they relate to the research topic. The interviewer may ask participants to describe their relationships with others, to reconstruct a day in their lives, and discuss experiences they have had, all in the context of the topic (p. 18). Finally, the goal of the third interview is to lead participants into reflection “on the meaning of their experience” (p. 18). The interviewer should facilitate an interview that guides participants into reflecting on how the “factors in their lives interacted to bring them to their present situation” (p. 18).

Seidman (2006) claimed that features of the three-interview series provide data about the interviewee with validity for several reasons. First, the researcher places the experiences shared by the participant in context. Second, the interviews occur over time, which allows for internal consistency. Finally, the researcher can connect comments from each of the participants with
comments from others in the study. Table 3 lists some questions asked in the actual interviews. A full version of the questions is included Appendix C.

Table 3

Sample Interview Questions from Each Interview Interval

<table>
<thead>
<tr>
<th>Interview</th>
<th>Sample Questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interview 1</td>
<td>How did you come to teach at Private School?</td>
</tr>
<tr>
<td></td>
<td>How would you describe what it is like to teach at Private School?</td>
</tr>
<tr>
<td></td>
<td>What is your relationship like with your colleagues at this school?</td>
</tr>
<tr>
<td></td>
<td>What is your relationship like with the administrative team?</td>
</tr>
<tr>
<td>Interview 2</td>
<td>Can you describe a day of teaching before BYOT?</td>
</tr>
<tr>
<td></td>
<td>Can you describe a day of teaching since the introduction of BYOT?</td>
</tr>
<tr>
<td></td>
<td>What is easy about BYOT and what is most difficult about it?</td>
</tr>
<tr>
<td>Interview 3</td>
<td>What has helped or hindered you in implementing the BYOT program in your classroom?</td>
</tr>
<tr>
<td></td>
<td>How has staff on your campus or other district employees influenced your adoption of BYOT?</td>
</tr>
<tr>
<td></td>
<td>What would be most helpful for you to support you as you move deeper in your understanding and adoption of BYOT?</td>
</tr>
<tr>
<td></td>
<td>Where do you see yourself, in the future, regarding your use and comfort with BYOT?</td>
</tr>
</tbody>
</table>

The research in the current study followed the majority of Seidman’s guidelines with the exception of recommended duration for each interview and overall data collection period. Seidman recommends for interviews to last from about an hour to an hour and a half each. Sideman also recommends that the three interviews be conducted over a 3-week period, total.

Data Collection Procedures

The data collection process for the study began with campus administrators inviting participants to meet to obtain information about this study. Teachers voluntarily met to learn
about the intent of the study and their expected participation in the research. Following the conclusion of the meeting, 12 volunteer participants completed the first of three SoCQ electronically. Because the meeting occurred in the library, some teaches used computers in the library or their own mobile devices to complete their first questionnaire.

Based on the SoCQ results, participating teachers were invited to take part in a series of three one-on-one interviews following some of Seidman’s (2006) guidelines for the three-interview series. The three interviews took place over the course of a school semester. The first interview was conducted to gather background information about the teachers regarding their professional and personal experiences. The first interviews occurred during the first 6 weeks of the school year, took place either in the teachers’ classroom or in the school library, and lasted an average of 17 minutes. At this point in the school year, teachers felt rushed and busy with their own schoolwork, which made having a longer interview more difficult. Teachers shared information; such as the journey that led them to Private School, how long they had been at the school, and how long they had taught; and described their relationships with colleagues. The purpose of the second interview was to collect detailed information about their teaching experiences with BYOT. These interviews lasted an average of 26 minutes, took place in the teachers’ classrooms, and were conducted towards the end of the middle of the semester. Teachers shared information that included their experiences before BYOT and after BYOT. They discussed personal difficulties and ease regarding their use of BYOT. Additionally, issues of student equity and teachers’ ranking of their students’ use of technology were explored. Finally, the third interview took place immediately after the winter break of school. In the last interview, participants reflected on their experiences (Seidman, 2006). This last interview was helpful to identify and provide information about factors that have influenced teachers’ concerns
and behaviors towards the implementation of BYOT in their own classrooms. Teachers shared information about the support they would need in order to move forward in implementing BYOT, challenges, and their future goals for use of students’ technology. Additionally, teachers self-assessed their own SoC, LoU, and IC.

Between interviews, teachers were observed during instruction. In order to collect accurate data from classroom observations, the IC map for the BYOT program was created based on a series of meetings with school personnel. The collaboration resulted in a mapping of ideal components related to an accurate portrayal of the BYOT program. Each of the six teachers was observed at a designated time on a typical class day, and the duration of each observation was approximately 45 minutes. Classroom observations occurred after the first interview late in the school semester. At that time, classroom observation times were scheduled with each of the teachers to examine their use of student mobile technology during instruction. While in the classrooms, notes were recorded that included events that took place, materials used, and format of the instructional activities. These notes were later compared to the components and variations in the IC map. Later, at the third interview, teachers reviewed the IC map and placed themselves on each of the components and variations based on their perceptions of their use of BYOT.

Classroom observations and interview data were incorporated into the development of the user profile. Following the third interview, teachers discussed their practices using the IC map as a point of discussion for identifying their placement in the configuration. In the last interview, teachers identified their SoC and LoU. Finally, teachers reflected back on their experiences of BYOT.

I created the IC map utilized in this study after consulting with the Director of Technology and the Director of Curriculum from Private School. Their vision for the innovation
was to be in alignment with the ISTE (2012b); specifically, ISTE’s (2012a) NETS for Students (NETS-S). The NETS-S are standards created by ISTE (2012b) to evaluate students’ skills for using technology in a way that will prepare them for “an increasingly global and digital world” (ISTE 2012, n.p.). The NETS-S has six major components: (a) creativity and innovation, (b) communication and collaboration, (c) research and information fluency, (d) critical thinking, problem solving, and decision-making, (e) digital citizenship, and (f) technology operations and concepts.

After gathering ideas from the directors, I created and shared a draft IC map shared with them to ensure its alignment with their BYOT vision for the school. I then used the IC map to guide classroom observations and, later, discussions with the teachers (see Appendix B). Components 1, 2, 3, and 4 are from the NETS-S. Component 5 is from the campus’ goal to integrate various types of mobile technology beyond only laptops. These five components are divided into four variations (i.e., A, B, C, and D). Variation A is the ideal or closest to what school leaders had envisioned for the innovation, and Variation D is the least ideal or least similar to what the leaders had envisioned.

Data Analysis

To identify each participant’s SoC at the time of the study, I reviewed the SoCQ results using the guidelines provided by G. Hall et al. (1979). Because the SoCQ was administered three times, results from the three administrations were analyzed individually and then compared across time. Results were interpreted by examining the highest and second-highest peak scores. Scores for each stage were reviewed to provide information about the reasons for concerns, such as needing more information or not feeling any personal concerns about the innovation. I also
reviewed the data to determine whether patterns of change could be observed across the three administration points.

The three interviews were audio recorded and transcribed. I coded interview transcripts according to Glesne (2011) recommendations: The researcher should describe data, compare them against each case, create explanations for the observations made in the data, and link the stories in the case study (p. 184). Data analysis of the transcripts began with a reading of every transcription for each participant, which allowed for a full understanding of each participant’s individual story. Next, the transcripts were uploaded onto NVivo 9. Once in NVivo, the first level of analysis was completed by categorizing all of the responses by question. Then, each question response from the interviewees was compared against responses from other participants to find common themes. These common themes and patterns in the interview transcripts were then analyzed and compared against each participant and then against the full data set. This process provided a picture for each participant as well as the group as a whole. Additionally, data from the interviews were compared against the SoC results, and this information served to validate teachers’ feelings about BYOT.

Each participant’s LoUIP was analyzed by following the Guidelines for Rating Levels of Use Categories, the LoU rating sheet, and cross referencing all data against the branching interview, all of which is in *Measuring Implementation in Schools: Levels of Use* (G.E. Hall et al., 2006). Each participant’s interview was categorized by question responses first. Then each participant’s responses were highlighted and key words were extracted to serve as indicators or descriptors for each of the LoU categories. The LoU rating sheet served to finalize each participant’s overall ranking in the LoUIP.
Classroom observations were helpful in analyzing teachers’ actual practices of BYOT. I collected notes at each of the observations to record materials used, student groupings, and instructional practices. I then compared the notes against each of the five components on the IC map to identify which variation best described each teacher’s actual practices in the classroom.

All data collected from the SoCQ, LoUIP, IC map, interviews, and class observations were triangulated to create user profiles and to provide an overall snapshot of the adoption of BYOT by teachers at Private School. The triangulation process was completed in the following way. First, the results from each of the SoCQ served as benchmark points for teachers’ concerns at each of the three intervals. Information shared by teachers at each interview was compared against the SoC placements to determine whether the information they shared about themselves supported or conflicted with the SoC findings. Additionally, the SoCQ results were compared against subgroups. Then LoU placements based on the interview protocol were compared against IC to examine how the two data sets illustrated each teacher’s behaviors regarding BYOT. Finally, the teacher’s concerns, illustrated by the questionnaire and the interviews, were compared against the LoUIP and the IC map placements to investigate whether all three CBAM components aligned with each other. The following chapter provides the results of the analysis conducted from each of the data components that I gathered.

Summary

This chapter presented the case study design for this research. Multiple methods of data collection were utilized to gain an understanding of teachers’ behaviors and feelings towards the implementation of BYOT. Twelve teachers from a private school who were currently working with middle and early high school students were selected as participants. CBAM’s SoCQ,
LoUIP, and IC map were selected as the main data collection instruments along with a modified version of Siedman’s (2006) three-interview series and classroom observations.
CHAPTER 4

RESULTS

The findings from the data collection and analysis are presented in this chapter following the research questions as a guide:

1. What are teachers’ concerns as they implement bring your own technology (BYOT)?

2. What are teachers’ levels of use (LoU) regarding the implementation of BYOT?

3. What are teachers’ practices as they implement BYOT?

The results of the data collection are presented first for the SoCQ for the six individual teachers interviewed at the beginning, middle, and end of the semester. Following these results are the results of all 12 teachers’ Stages of Concern Questionnaires (SoCQs) from the beginning and end of the semester, reported by subgroup. The next section of the chapter includes a review of the LoU placements for each of the six teachers interviewed. Their LoU placements are supported with information they shared in their interviews. Following this section, the results of teachers’ placements on the innovative configuration (IC) map are included and are based on the classroom observations. The research results are organized in this way so that each research question is answered in order and so that the data may be triangulated to create teacher profiles illustrating each teacher’s place in the change process for adopting BYOT. Each section concludes with a reference to the research question and with a summary of the results for each source of data (i.e., SoCQ, levels of use interview protocol (LoUIP), and IC map). The teacher profiles are presented at the end of the chapter as a summary of what was learned from the three instruments and from the teacher placements across the three interval points.
Stages of Concern

The teachers completed the SoCQ three times throughout the course of a school semester. The purpose of the survey was to identify each teacher’s concerns about the innovation, BYOT, over a school semester. The following are the results of each teacher’s highest and second highest SoC at each administration of the survey. The SoCQ data are presented first with a figure illustrating each teacher’s concerns for the beginning, middle, and end of the semester. Each figure is followed by a discussion of each administration of the questionnaire. The discussions will focus on the questionnaire results and include information from the interviews with the teachers. Finally, the results are presented from comparing the SoCQ data across all 12 teachers who took the questionnaire online.

Mr. Lane’s Stages of Concern

Mr. Lane’s initial SoCQ (see Figure 1) indicated a peak score at Stage 0 (i.e., unconcerned). This SoC is typical of teachers who have other concerns that may not relate to the innovation or its use. Mr. Lane’s second SoCQ indicated a peak score at Stage 3 (i.e., management). Mr. Lane’s responses to the questions at the beginning of the year revealed that he may have had “other priorities” that prevented him from focusing on the innovation (Question 23) and that he spent little time thinking about the innovation (Question 30). Additionally, his responses to questions related to Stage 3 indicated that he was concerned about “time spent with nonacademic problems related to the innovation” (Question 25) and about time needed to coordinate people and tasks (Question 34).

Mr. Lane’s concerns at the beginning of the semester aligned with typical concerns of a first-year teacher (Fuller (1969). During the first administration of the SoCQ, Mr. Lane was in his first semester of teaching.
Mr. Lane’s concerns about time and his ability to coordinate tasks at the middle of the semester also aligned with Fuller’s (1969) research on first-year teachers. At the middle of the semester, Mr. Lane’s SoCQ scores still indicated Stage 0 (i.e., unconcerned) as his highest peak score and Stage 3 (i.e., management) as his second highest peak score. However, these scores did change in value when compared with Mr. Lane’s SoCQ scores at the beginning of the semester. For example, Mr. Lane’s Stage 0 scores increased from 81% to 94%, and his Stage 3 scores decreased dramatically from 73% to 39%. Mr. Lane’s survey indicated that he had other concerns that were unrelated to the innovation that were taking priority (Question 25: “time spent with nonacademic problems related to the innovation”), which continue to align with concerns of a first-year teacher. According to George et al. (2006), teachers with Stage 3 concerns worry about the “management, time, and logistical aspects of the innovation” (p. 33).

Mr. Lane confirmed his concerns as indicated by his scores on the SoCQ and expressed additional concerns about the time it takes to help students incorporate their own technologies in
the classroom. These concerns also aligned with Stage 3. In the structured interview, Mr. Lane shared that “making sure everyone has a computer [and] can use it . . . takes a lot of time to set up.” He also expressed concerns about being unsure of the materials that he needed to use in an upcoming lesson that involved acting out a play. He was not quite sure about the logistics of accessing the lines of the play while the students acted them out. Mr. Lane also shared that as a new teacher, he places some importance on using BYOT but is not currently interested in becoming an expert. Instead, he said that he was primarily concerned about learning everything else there is to know about teaching.

Mr. Lane’s scores on the final SoCQ indicated a peak score at Stage 0 (i.e., unconcerned) with a score of 99%. His second highest peak score was at Stage 3 (i.e., management) with a score of 83%. Mr. Lane’s concern levels were consistent over the course of the school semester. He maintained concerns at the unconcerned and at the management stages. As a new teacher, Mr. Lane seemed more concerned with managing his class and scheduling and organizing his materials and lessons. His responses to the questions in the survey indicated his concerns about his lack of time thinking about the innovation (Question 23), his inability to focus on the innovation because of other priorities (Question 30), and his time spent dealing with the problems resulting from the innovation (Question 25).

Ms. Ponce’s Stages of Concern

Ms. Ponce’s initial SoCQ indicated that she was at Stage 2 (i.e., personal) with a peak score of 63% (see Figure 2). Her second highest peak score of 61% indicated that she was at Stage 0 (i.e., unconcerned). Ms. Ponce’s responses to the SoCQ indicated that she was not concerned about the innovation at this time (Question 12). Additionally, her responses to Stage 2 questions expressed her interest in knowing more about how BYOT would affect her position
at work, how her teaching would need to change, and how her time and commitment would be changed by the innovation (Questions 7, 17, and 28).

![Figure 2. Ms. Ponce’s SoC relative intensity on the SoCQ.](image)

At the middle of the semester, Ms. Ponce’s concerns about the innovation dropped across all stages; however, her two highest peak scores were in Stage 1 (i.e., informational) and Stage 2 (i.e., personal). Ms. Ponce indicated several ways in which she used the technology in her classroom and found BYOT provided many advantages in her classroom, but her concerns at this time of the semester were mainly related to self. Teachers with high Stage 1 concerns or concerns related to self are usually interested in learning more about an innovation (Hord, Rutherford, et al., 2006). Ms. Ponce’s statements during her interview supported these concerns. Ms. Ponce shared that although she did not have much time, she did try to research ways to incorporate mobile technology in her classroom. Because of some of her research, she recently checked out e-readers from the private school library for the students to use in an assignment.
She also expressed an interest in wanting to learn more about implementing different types of mobile technology (e.g., iPads) because of their size and ease of mobility.

Ms. Ponce’s final SoCQ resulted in a tie score of 57% between Stage 1 (i.e., informational) and Stage 2 (i.e., personal). Over the course of the school semester, Ms. Ponce’s concerns remained relatively consistent with concerns about self (i.e., Stage 0, 1, and 2). Hord, Rutherford, et al. (2006) described teachers with concerns about self as wanting more information about the innovation so that they can prepare for the innovation, be aware of the innovation timeline, and know how to implement the innovation. Often, teachers with concerns about self are in the process of discerning their abilities to implement the innovation successfully. Concerns about self are common in the early stages of adopting an innovation. This understanding of self concerns aligns with Ms. Ponce because she had 10 years of teaching experience but experiencing her first year at a school with BYOT and her first year implementing such an innovation. Ms. Ponce’s responses to the survey questions indicated her concerns about her professional status (Question 7), the resources that are available for her to implement the innovation (Question 15), and the differences between innovation and her current technology use in the classroom (Question 35).

Ms. Casey’s Stages of Concern

At the beginning of the semester, Ms. Casey’s SoCQ (Figure 3) revealed a peak score in Stage 2 (i.e., personal). The second highest scores fell under Stage 1 (i.e., information). The range in Ms. Casey’s scores between Stage 2 and Stage 1 indicated a negative 1-2 split, indicating that Ms. Casey’s concerns about the innovation could have resulted from her insecurities about her position or job. Ms. Casey’s responses to the questions indicated that she
was concerned about “the effect of reorganization” on her job (Question 7), her teaching (Question 17), and her “role” being changed when she is using the innovation (Question 33).

At the middle of the school semester, Ms. Casey’s concerns primarily decreased in Stage 1 (i.e., information) and made the negative 1-2 split less of an issue. Ms. Casey’s scores for Stage 2 (i.e., personal) were maintained as the highest peak score. However, Ms. Casey’s scores for Stage 3 (i.e., management) increased slightly. Her biggest concern in Stage 3 was about her “inability to manage all that the innovation requires” (Question 16). She mentioned this concern several times during her interviews. Ms. Casey maintained high concerns in Stage 2, specifically related to her professional status and her role at work. Her concerns in Stage 1 were about her limited knowledge about the innovation and technology and about the requirements for implementing the innovation. These results aligned with the information she shared during her interviews. Ms. Casey mentioned several times that she felt she was having trouble keeping up with technology:
I can honestly say I still love teaching. Even though I know that once I retire, it’s gonna [sic] be probably because I can’t keep up with the technology. . . . But I feel like in all fairness to this school, that it has so much technology in it, and to my students, I don’t feel like it’s fair to—’cause [sic] I can’t keep up with it. I’m being honest. I honestly can’t keep up with the technology as fast as it’s coming. I’d rather go out loving teaching than retiring simply because I don’t like it anymore. And I don’t feel that way.

At the end of the semester, Ms. Casey’s SoCQ scores again indicated a negative 1-2 split. A peak score in Stage 2 (52%) with a second highest peak in Stage 1 (45%) indicated that her concerns about the innovation could have resulted from her insecurities about her position or job. Across all three periods of data collection, Ms. Casey’s concerns remained about self. Ms. Casey was a teacher with many years of experience, but as indicated previously in her interviews, she was insecure about her ability to keep up with the speed of technology integration in education. Ms. Casey’s responses to the questions on the survey revealed concerns about her professional status (Question 7) and about the changes she needed to make in her teaching because of the innovation (Question 17).

Mr. Belagio’s Stages of Concern

At the beginning of the semester, Mr. Belagio showed the highest concerns in Stage 1 (i.e., information) and Stage 2 (i.e., personal). Both stages resulted in scores of 48% (see Figure 4). The questions he rated highest revealed that he would like to know more about the resources available for BYOT (Question 15). He was concerned about who would be the decision-maker with BYOT (Question 13) and how the innovation would be better than the innovations that the school had already integrated (Question 35). Teachers with a profile similar to that of Mr. Belagio often want to learn more about an innovation and have a positive attitude toward the innovation (George et al., 2006).
At the middle of the semester, Mr. Belagio’s concerns across the majority of the stages had decreased. His scores for Stage 1 (i.e., information) remained at a peak score at 45%, and his scores at Stage 2 (i.e., personal) became his second highest peak score at 41%. Mr. Belagio remained positive about the innovation and was eager to learn more about how to integrate BYOT in his classroom. He shared that he does talk with teachers on his team to learn how they are using BYOT in their rooms: “I’m constantly talking to . . . the other teachers [about] how they’ve been using [BYOT] the last couple of years.”

Mr. Belagio maintained self concerns through the end of the semester. In his last survey, Mr. Belagio’s highest score was at Stage 2 (i.e., personal; 48%), and his second highest score was at Stage 1 (i.e., informational; 43%). These results also indicated a negative 1-2 split; Mr. Belagio’s concerns could have resulted from his insecurities in his work or his position at work. When Mr. Belagio’s responses to the questions were reviewed, concerns about his professional
status (Question 7) and concerns about the time and commitment required for the innovation were prominent.

**Ms. Alvin’s Stages of Concern**

Ms. Alvin’s highest level on the SoCQ (Figure 5) for the beginning of the semester was Stage 0 (i.e., unconcerned). Ms. Alvin’s responses to the questions revealed that she was not concerned about the innovation (Question 12) and that she spent little time thinking about it (Question 23). Ms. Alvin’s second highest peak score was Stage 5 (i.e., collaboration). She had the strongest concerns about coordinating with other staff members to maximize the effect of the innovation (Question 27). In her interview, Ms. Alvin shared that she worked well with her team and had a good relationship with them: “We work together if we need something or if I have solutions, . . . if I can help with any projects. . . . We all just kind of work together on different projects in the community, also.” She also shared that her team is beginning to collaborate more with the math and science department by “evaluating test scores to [determine] where we’re lacking and how we can better prepare the kids for the next year. . . . but I think we need some more work in that area.”

![Figure 5](image)

*Figure 5.* Ms. Alvin’s SoC relative intensity on the SoCQ.
Ms. Alvin’s level of concerns for Stage 0 (i.e., unconcerned) decreased drastically at the middle of the semester from 81% to 31%. In the middle of the semester, her main concerns were in Stage 2 (i.e., personal), and her peak score for this stage was 31%; which tied with her score for Stage 0 (i.e., unconcerned). A closer analysis of Ms. Alvin’s SoCQ responses revealed her concerns about her professional status (Question 7). However, she expressed more interest during her interview in wanting to enhance her use of the innovation by integrating new resources and applications than in being concerned about her professional status: “I need to branch out a little bit more with [the innovation]. . . . I probably need to try and incorporate more things here and there than just the norm.”

At the end of the semester, Ms. Alvin’s SoCQ scores peaked at Stage 2 (i.e., personal; 45%) and at Stage 5 (i.e., collaboration; 40%). Ms. Alvin maintained her concerns about self throughout the semester; her highest peak score was Stage 0 at the beginning of the semester, Stage 2 at the middle of the semester, and Stage 2 again at the end of the semester. Ms. Alvin’s responses to SoCQ questions revealed her main concerns were about the effects of the innovation on her professional status (Question 7) and about the relationships she was building with others who were using the innovation (Question 10). She was also concerned about collaborating with others (Question 27) and wanting to know what others were doing with the innovation (Question 29). Ms. Alvin’s concerns about collaboration were evident during the second interview when she shared her interest in wanting to know how others have been using the innovation:

I’ve been just talking with other teachers and [learning] what they do in their classes with different things. . . ., what projects they have the students do particularly. . . . A lot of teachers do these homework hand-in things [in which students] submit work online and then they check it and grade it and all that stuff all online. So I’d like to be able to move to that.
Ms. Manning’s Stages of Concern

At the beginning of the semester, Ms. Manning had two high peak scores, Stage 0 (i.e., unconcerned) and Stage 6 (i.e., refocusing); see Figure 6. Her concerns at Stage 0 aligned with the concerns of first-year teachers as described by Fuller (1969). Her question responses indicated that her time was occupied by other things (Question 21) and that other things might be taking priority to the innovation (Question 30). During the interview, Ms. Manning supported her feelings of being a new teacher and working on figuring things out:

And I think it’s hard for me right now as a new teacher to figure out what to do with the laptops because of the fact that not all of [the students], especially the younger ones, know what to do quite yet. So they’re still also learning, and I’m still also learning how I can put their laptops to good use without just using the textbooks. So it’s an interesting balance to figure out what we can do with [BYOT].

![Figure 6. Ms. Manning’s SoC relative intensity on the SoCQ.](image)

For Ms. Manning’s SoCQ during the middle of the semester, Stage 0 (i.e., unconcerned) decreased from 69% to 31%, which made her highest peak score (57%) for the middle of the semester at Stage 6 (i.e., refocusing). In SoCQ questions, Ms. Manning expressed concerns
about revising and modifying the innovation or the way it is used (Questions 9, 20, and 22). In her interview, Ms. Manning shared concerns about how best to manage the time, the students’ use of technology, and the logistics of the technology, which could explain why her highest level of concern at the middle of the semester is that of refocusing. At this time of the semester, Ms. Manning felt that the innovation was not working in a way that was valuable, so she was concerned about changing her use of BYOT so that she and the students could get more out of the innovation.

Ms. Manning’s final SoCQ scores indicated concerns at Stage 3 (i.e., management; 65%). Her second highest score was at Stage 0 (i.e., unconcerned; 55%). Her concerns at the end of the semester were very different from her concerns at the beginning of the semester. Her responses to SoCQ questions revealed her concerns about spending time on nonacademic issues related to the innovation (Question 25) and about having enough time to organize and prepare for each day (Question 4). Her concerns about management also fell in the category of concerns about task. At this time of the semester, she was concerned about managing the innovation on a day-to-day basis.

Group Analysis of the Six Teachers’ Stages of Concern

Over the course of the school semester, the majority of the teachers had high concerns in Stages 1 and 2 (i.e., informational and personal, respectively). At every administration of the SoCQ, three to four of the six teachers displayed concerns at the informational or personal stage as either their highest concern or second highest concern. For the group, there was an overall pattern indicating low concerns about consequence (i.e., Stage 4) and collaboration (i.e., Stage 5). There was only one occasion during the school semester when collaboration was the second highest concern for one of the participants, which occurred at the end of the semester with Ms.
Alvin. Refocusing was the second lowest occurring SoC for the group. There were two occasions for one teacher (i.e., Ms. Manning) when refocusing was either the highest concern or tied to be the highest concern at the beginning and end of the semester. Table 4 summarizes the results of the SoCQ for all six teachers over the three administrations of the survey.

Table 4

*Six Teachers’ SoCs Across the Three SoCQ Administrations*

<table>
<thead>
<tr>
<th>Stages of Concern</th>
<th>Stage 0</th>
<th>Stage 1</th>
<th>Stage 2</th>
<th>Stage 3</th>
<th>Stage 4</th>
<th>Stage 5</th>
<th>Stage 6</th>
</tr>
</thead>
<tbody>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lane</td>
<td>81%</td>
<td>27%</td>
<td>35%</td>
<td>73%</td>
<td>16%</td>
<td>16%</td>
<td>65%</td>
</tr>
<tr>
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<td>51%</td>
<td>63%</td>
<td>23%</td>
<td>7%</td>
<td>25%</td>
<td>20%</td>
</tr>
<tr>
<td>Casey</td>
<td>22%</td>
<td>72%</td>
<td>89%</td>
<td>34%</td>
<td>38%</td>
<td>16%</td>
<td>17%</td>
</tr>
<tr>
<td>Belagio</td>
<td>31%</td>
<td>48%</td>
<td>48%</td>
<td>23%</td>
<td>13%</td>
<td>16%</td>
<td>9%</td>
</tr>
<tr>
<td>Manning</td>
<td>69%</td>
<td>48%</td>
<td>45%</td>
<td>47%</td>
<td>21%</td>
<td>9%</td>
<td>69%</td>
</tr>
<tr>
<td>Alvin</td>
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<tr>
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<tr>
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</tr>
<tr>
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<td>51%</td>
<td>85%</td>
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<tr>
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<td>10%</td>
<td>57%</td>
</tr>
<tr>
<td>Alvin</td>
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<td>15%</td>
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<td>25%</td>
<td>20%</td>
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<td></td>
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<td></td>
</tr>
<tr>
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<td>10%</td>
<td>42%</td>
</tr>
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<td>57%</td>
<td>30%</td>
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<td>19%</td>
<td>30%</td>
</tr>
<tr>
<td>Casey</td>
<td>7%</td>
<td>45%</td>
<td>52%</td>
<td>43%</td>
<td>30%</td>
<td>16%</td>
<td>30%</td>
</tr>
<tr>
<td>Belagio</td>
<td>14%</td>
<td>43%</td>
<td>48%</td>
<td>23%</td>
<td>9%</td>
<td>16%</td>
<td>17%</td>
</tr>
<tr>
<td>Manning</td>
<td>55%</td>
<td>34%</td>
<td>48%</td>
<td>65%</td>
<td>8%</td>
<td>14%</td>
<td>42%</td>
</tr>
<tr>
<td>Alvin</td>
<td>14%</td>
<td>23%</td>
<td>45%</td>
<td>23%</td>
<td>21%</td>
<td>40%</td>
<td>17%</td>
</tr>
</tbody>
</table>
Results of All 12 Teachers’ Stages of Concern

The following section includes an analysis of the SoCQ data for all 12 teachers who took the survey across the semester. The data were compared across the teacher subgroups according to the following categories: years of teaching experience, years teaching at Private School, content area, age, gender, and ethnicity. The results were analyzed from the SoCQ administrations at the beginning and end of the school semester. Each section below has a description of the results followed by a figure illustrating the teachers’ concerns for each subgroup and a table illustrating the range in scores for each subgroup.

Years of Teaching Experience

Teachers who participated in the study had a broad range of teaching experiences. Four teachers had 1-2 years of teaching experience, six teachers had 5-10 years, and two teachers had 21-30 years. In analyzing the SoCQ results for the whole group at the beginning of the semester, a few differences appeared among the teachers in each of the groups for years of teaching experience. For example, teachers who had 1-2 years of teaching experience had the following as the highest scores: Stage 0 (i.e., unconcerned; 94%) and Stage 3 (i.e., management; 69%). This group was the most different when compared to the other experience groups. Teachers who had 5-10 years of teaching experience had the following highest scores: Stage 0 (i.e., unconcerned; 61%) and Stage 2 (i.e., personal; 57%). Teachers who had 21-30 years of experience had the following highest scores: Stage 0 (i.e., unconcerned; 87%) and Stage 2 (i.e., personal; 80%). Teachers with 5-10 years and 21-30 years of teaching experience both had concerns related to self, and teachers with 1-2 years of teaching experience had concerns related to task. Figure 7 illustrates the SoC relative intensities for each teacher group representing years
of teaching experience. Table 5 illustrates the range in relative intensity by years of teaching experience.

Figure 7. SoC relative intensity at beginning of semester by years of teaching experience.

Table 5

<table>
<thead>
<tr>
<th>Range of SoC Relative Intensity Percentages at Beginning of Semester by Years of Teaching Experience</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage 0</td>
</tr>
<tr>
<td>---------</td>
</tr>
<tr>
<td>1-2 years (n = 4)</td>
</tr>
<tr>
<td>5-10 years (n = 6)</td>
</tr>
<tr>
<td>21-30 years (n = 2)</td>
</tr>
</tbody>
</table>
At the end of the semester, there were four teachers who had 1-2 years of experience, five teachers who had 5-10 years of experience, and two teachers who had 21-30 years of experience, with SoCQ responses (see Figure 8). All three groups had the highest scores in Stage 0 (i.e., unconcerned). The differences in the groups appeared greatest in their second highest concern. Teachers with 5-10 years and 21-30 years of experience had their second highest concern in Stage 2 (i.e., personal; 57% and 41%, respectively). Teachers with 1-2 years of experience had their second highest concern at Stage 3 (i.e., management; 80%). Overall, the concerns for all three groups had relatively the same concerns at the beginning of the semester and at the end of the semester. Table 6 illustrates the range in relative intensity by years of teaching experience.

Figure 8. SoC relative intensity at end of semester by years of teaching experience.
Table 6

Range of SoC Relative Intensity Percentages at End of Semester by Years of Teaching Experience

<table>
<thead>
<tr>
<th>Years Teaching at Private School</th>
<th>Stage 0</th>
<th>Stage 1</th>
<th>Stage 2</th>
<th>Stage 3</th>
<th>Stage 4</th>
<th>Stage 5</th>
<th>Stage 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-2 years</td>
<td>40-99</td>
<td>19-84</td>
<td>25-76</td>
<td>47-97</td>
<td>5-48</td>
<td>10-25</td>
<td>42-69</td>
</tr>
<tr>
<td>5-10 years</td>
<td>14-99</td>
<td>23-99</td>
<td>14-96</td>
<td>23-65</td>
<td>5-96</td>
<td>9-93</td>
<td>14-99</td>
</tr>
<tr>
<td>21-30 years</td>
<td>7-96</td>
<td>30-45</td>
<td>28-52</td>
<td>27-43</td>
<td>2-30</td>
<td>5-16</td>
<td>5-30</td>
</tr>
</tbody>
</table>

Years Teaching at Private School

The majority of the teachers in the study had taught at Private School for 10 years or less. Four teachers had been at Private School for 1-2 years, two had been there 3-4 years, and six had been there 5-10 years. At the beginning of the semester, SoCQ scores revealed that all three groups had primary concerns at Stage 0 (i.e., unconcerned). However, their second highest concerns differed. Teachers who had been at Private School for 1-2 years had their second highest concerns at Stage 3 (i.e., management; 69%), but teachers who had been at Private School either 3-4 years or 5-10 years had their second highest concerns at Stage 2 (i.e., personal; 31% and 72% respectively). Figure 9, below, illustrates the SoC relative intensities for each teacher group representing years at Private School. Table 7 illustrates the range in relative intensity by years teaching at Private School.
Figure 9. SoC relative intensity at beginning of semester by years teaching at Private School.

Table 7

Range of SoC Relative Intensity Percentages at Beginning of Semester by Years Teaching at Private School

<table>
<thead>
<tr>
<th>Years Teaching</th>
<th>Stage 0</th>
<th>Stage 1</th>
<th>Stage 2</th>
<th>Stage 3</th>
<th>Stage 4</th>
<th>Stage 5</th>
<th>Stage 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-2 years (n = 4)</td>
<td>94%</td>
<td>43%</td>
<td>48%</td>
<td>69%</td>
<td>19%</td>
<td>16%</td>
<td>57%</td>
</tr>
<tr>
<td>3-4 years (n = 2)</td>
<td>55%</td>
<td>19%</td>
<td>31%</td>
<td>27%</td>
<td>16%</td>
<td>19%</td>
<td>14%</td>
</tr>
<tr>
<td>5-10 years (n = 6)</td>
<td>75%</td>
<td>66%</td>
<td>72%</td>
<td>43%</td>
<td>24%</td>
<td>31%</td>
<td>30%</td>
</tr>
</tbody>
</table>

At the end of the semester, all groups based on years teaching at Private School had the same highest and second highest concerns as they did at the beginning of the semester (see Figure 10). Teachers in their first or second year at Private School continued to have second...
highest concerns at the management stage, and other teacher groups had second highest concerns at the personal stage. Table 8 illustrates the range in relative intensity by years teaching at Private School.

Table 8

| Range of SoC Relative Intensity Percentages at End of Semester by Years Teaching at Private School |
|----------------------------------|--------|--------|--------|--------|--------|--------|--------|
|                                  | Stage 0 | Stage 1 | Stage 2 | Stage 3 | Stage 4 | Stage 5 | Stage 6 |
| 1-2 years (n = 5)                | 40-99   | 19-84  | 25-76  | 30-97  | 5-48   | 10-25  | 30-69  |
| 3-4 years (n = 2)                | 14-97   | 23     | 14-45  | 23-27  | 5-21   | 9-40   | 14-17  |
| 5-10 years (n = 4)               | 7-99    | 30-99  | 28-96  | 23-52  | 2-96   | 5-93   | 5-99   |

Figure 10. SoC relative intensity at end of semester by years teaching at Private School.
In this study, three teachers taught reading/English language arts, two taught math, two taught science, one taught social studies, and four taught an elective. The three teachers who taught reading/English Language Arts had their highest peak score at Stage 0 (i.e., unconcerned; 91%) with a second highest peak score at Stage 2 (i.e., personal; 55%). The two math teachers had their highest peak score at Stage 2 (i.e., personal; 72%) with a second highest peak score at Stage 1 (i.e., informational; 60%). The two Science teachers had their highest peak score at Stage 0 (i.e., unconcerned; 75%) with a second highest peak score at Stage 6 (i.e., refocusing; 42%). The one social studies teacher had a peak score at Stage 2 (i.e., personal; 48%) with a second highest peak score at Stage 3 (i.e., management; 43%). Finally, the four elective teachers had their highest peak score at Stage 0 (i.e., unconcerned; 96%) with a second highest peak score at Stage 2 (i.e., personal; 67%).

The teachers from all five content area groups had their highest concerns at either Stage 0 (i.e., unconcerned) or at Stage 2 (i.e., personal). In other words, teachers in all five content area groups had their highest concerns at the level of self. For the second highest concerns, science teachers had concerns related to impact and social studies teacher had concerns related to task (see Figure 11). Table 9 illustrates the range in relative intensity by content area taught.
**Table 9**

*Range of SoC Relative Intensity Percentages at Beginning of Semester by Content Area*

<table>
<thead>
<tr>
<th>Content Area</th>
<th>Stage 0</th>
<th>Stage 1</th>
<th>Stage 2</th>
<th>Stage 3</th>
<th>Stage 4</th>
<th>Stage 5</th>
<th>Stage 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>English Language Arts</td>
<td>61-99</td>
<td>27-51</td>
<td>35-63</td>
<td>23-73</td>
<td>7-16</td>
<td>16-25</td>
<td>20-65</td>
</tr>
<tr>
<td>Math</td>
<td>22-31</td>
<td>48-72</td>
<td>48-89</td>
<td>23-34</td>
<td>13-38</td>
<td>16</td>
<td>9-17</td>
</tr>
<tr>
<td>Science</td>
<td>69-81</td>
<td>12-48</td>
<td>35-45</td>
<td>30-47</td>
<td>21-33</td>
<td>9-36</td>
<td>17-69</td>
</tr>
<tr>
<td>Social Studies</td>
<td>31</td>
<td>40</td>
<td>48</td>
<td>43</td>
<td>13</td>
<td>14</td>
<td>22</td>
</tr>
<tr>
<td>Elective</td>
<td>22-99</td>
<td>27-98</td>
<td>25-96</td>
<td>23-88</td>
<td>5-96</td>
<td>7-98</td>
<td>9-90</td>
</tr>
</tbody>
</table>

*Figure 11.* SoC relative intensity at the beginning of semester by content area.
At the end of the semester, most of the teachers in the content area groups had the same concerns with the exception of social studies teachers (see Figure 12). Overall, most of the concerns for content area groups related to self (i.e., Stages 0, 1, and 2). However, there were some changes in concerns within the groups across time. For example, the teachers who taught Reading/English Language Arts shift their second highest concern from Stage 2 (i.e., personal) to Stage 3, (i.e., management). Science teachers had the greatest change in concerns, which shifted away from Stage 0 and Stage 6 (i.e., unconcerned and refocusing respectively) to Stage 2 and 3 (i.e., personal and management). Additionally, the second highest concerns for the elective teachers’ shifted from Stage 2 (i.e. personal) to Stage 1 (i.e., information). Table 10 illustrates the range in relative intensity by content area.

<table>
<thead>
<tr>
<th></th>
<th>Stage 0</th>
<th>Stage 1</th>
<th>Stage 2</th>
<th>Stage 3</th>
<th>Stage 4</th>
<th>Stage 5</th>
<th>Stage 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>English Lang Arts (n = 3)</td>
<td>75%</td>
<td>40%</td>
<td>39%</td>
<td>56%</td>
<td>9%</td>
<td>14%</td>
<td>42%</td>
</tr>
<tr>
<td>Math (n = 2)</td>
<td>14%</td>
<td>45%</td>
<td>52%</td>
<td>34%</td>
<td>19%</td>
<td>16%</td>
<td>22%</td>
</tr>
<tr>
<td>Science (n = 2)</td>
<td>40%</td>
<td>30%</td>
<td>48%</td>
<td>43%</td>
<td>13%</td>
<td>25%</td>
<td>30%</td>
</tr>
<tr>
<td>Elective (n = 4)</td>
<td>98%</td>
<td>60%</td>
<td>59%</td>
<td>56%</td>
<td>24%</td>
<td>28%</td>
<td>47%</td>
</tr>
</tbody>
</table>

*Figure 12. SoC relative intensity at the end of semester by content area.*
Table 10

*Range of SoC Relative Intensity Percentages at End of Semester by Content Area*

<table>
<thead>
<tr>
<th></th>
<th>Stage 0</th>
<th>Stage 1</th>
<th>Stage 2</th>
<th>Stage 3</th>
<th>Stage 4</th>
<th>Stage 5</th>
<th>Stage 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>English Language Arts</td>
<td>40-99</td>
<td>19-57</td>
<td>25-57</td>
<td>30-83</td>
<td>5-13</td>
<td>10-19</td>
<td>30-57</td>
</tr>
<tr>
<td>Math</td>
<td>7-14</td>
<td>43-45</td>
<td>48-52</td>
<td>23-43</td>
<td>9-30</td>
<td>16</td>
<td>17-30</td>
</tr>
<tr>
<td>Science</td>
<td>14-55</td>
<td>23-34</td>
<td>45-48</td>
<td>23-65</td>
<td>8-21</td>
<td>14-40</td>
<td>17-42</td>
</tr>
<tr>
<td>Elective</td>
<td>96-99</td>
<td>23-99</td>
<td>14-96</td>
<td>27-97</td>
<td>2-96</td>
<td>5-93</td>
<td>5-99</td>
</tr>
</tbody>
</table>

Age

Participants in the current study represented the following age groups: 20-25, 26-30, 31-35, 36-40, 41-45, and over 56. Three teachers were in the 20-24 age groups. Their highest peak score was at Stage 0 (i.e., unconcerned; 87%) with a second highest peak score at Stage 3 (i.e., management; 73%). Three teachers comprised the 26-30 age group with a high peak score at Stage 0 (i.e., unconcerned; 75%) and a second highest peak score at Stage 2 (i.e., personal; 52%). Two teachers were in the 31-35 age group with a high peak score in Stage 0 (i.e., unconcerned; 61%) and a second highest peak score at Stage 2 (i.e., personal; 41%). One teacher represented the 36-40 age group with a peak score at Stage 1 and Stage 2 (48%). One teacher represented the 41-45 age group with a peak score at Stage 0 (i.e., unconcerned; 99%) and a second highest peak score at Stage 1 and Stage 5 (98%). Finally, two teachers represented the over 56 age group. Their highest peak score was at Stage 0 (i.e., unconcerned; 87%) and had a second highest peak score at Stage 2 (i.e., personal; 80%). Overall, nearly all age groups had concerns related to self with the exception of the teacher representing the 41-45 age group (see Figure 13). Table 11 illustrates the range in relative intensity by age group.
Table 11

Range of SoC Relative Intensity Percentages at Beginning of Semester by Age Group

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Stage 0</th>
<th>Stage 1</th>
<th>Stage 2</th>
<th>Stage 3</th>
<th>Stage 4</th>
<th>Stage 5</th>
<th>Stage 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>26-30</td>
<td>22-99</td>
<td>27-51</td>
<td>25-63</td>
<td>23-52</td>
<td>5-9</td>
<td>7-25</td>
<td>9-26</td>
</tr>
<tr>
<td>31-35</td>
<td>31-81</td>
<td>12-40</td>
<td>35-48</td>
<td>30-43</td>
<td>13-33</td>
<td>14-36</td>
<td>17-22</td>
</tr>
<tr>
<td>36-40</td>
<td>31</td>
<td>48</td>
<td>48</td>
<td>23</td>
<td>13</td>
<td>16</td>
<td>9</td>
</tr>
<tr>
<td>41-45</td>
<td>99</td>
<td>98</td>
<td>96</td>
<td>60</td>
<td>96</td>
<td>98</td>
<td>90</td>
</tr>
<tr>
<td>Over 56</td>
<td>22-99</td>
<td>72</td>
<td>67-89</td>
<td>34-73</td>
<td>11-38</td>
<td>16-25</td>
<td>17-42</td>
</tr>
</tbody>
</table>

Figure 13. SoC relative intensity at the beginning of semester by age group.
The same age groups were represented at the end of the semester. Teachers representing the age group 20-25 maintained their highest concerns at Stage 0 (i.e., unconcerned) and Stage 3 (i.e., management). The 26-30 group shifted from a second highest concern at Stage 2 (i.e., personal) to Stage 1 (i.e., information). The 31-35 age group had the biggest change from the beginning of semester to the end of semester; their concerns shifted from Stages 0 and 2 to Stages 2 and 5. The 36-40 age group’s concerns at Stage 1 decreased from 48% to 43%. Finally, the over-56 group maintained their concerns at Stage 0 (i.e., unconcerned) and Stage 2 (i.e., personal). Nearly all age groups, with the exception of the 31-35 group and the 41-45 group, had concerns related to self (see Figure 14). Both age 31-35 and 41-45 groups had concerns related to impact at the end of the semester. Table 12 illustrates the range in relative intensity by age group.

![Figure 14. SoC relative intensity at the end of semester by age group.](image-url)
Table 12

Range of SoC Relative Intensity Percentages at End of Semester by Age Group

<table>
<thead>
<tr>
<th></th>
<th>Stage 0</th>
<th>Stage 1</th>
<th>Stage 2</th>
<th>Stage 3</th>
<th>Stage 4</th>
<th>Stage 5</th>
<th>Stage 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>31-35</td>
<td>14</td>
<td>23</td>
<td>45</td>
<td>23</td>
<td>21</td>
<td>40</td>
<td>17</td>
</tr>
<tr>
<td>36-40</td>
<td>14</td>
<td>43</td>
<td>48</td>
<td>23</td>
<td>9</td>
<td>16</td>
<td>17</td>
</tr>
<tr>
<td>41-45</td>
<td>99</td>
<td>99</td>
<td>96</td>
<td>52</td>
<td>96</td>
<td>93</td>
<td>99</td>
</tr>
<tr>
<td>Over 56</td>
<td>7-96</td>
<td>30-45</td>
<td>28-52</td>
<td>27-43</td>
<td>2-30</td>
<td>5-16</td>
<td>5-30</td>
</tr>
</tbody>
</table>

Gender

Nine of the participants were female and three were male. Both the female and male groups had concerns related to the self at the beginning of the semester, and the groups differed in their second highest peak score. The second highest peak score for the females was Stage 2 (i.e., personal; 59%) whereas the second highest peak score for the males was Stage 3 (i.e., management; 56%), see Figure 15 below. Table 13 illustrates the range in relative intensity by gender.
At the end of the semester, participants included eight females and three males. Both female and male groups maintained concerns related to self and maintained concerns in the same stages (Figure 14). The females’ highest concerns were at Stage 0 (i.e., unconcerned; 69%) and Stage 2 (i.e., personal; 55%). The males had their highest concerns at Stage 0 (i.e., unconcerned; 87%) and Stage 2 (i.e., personal; 43%). Table 14 illustrates the range in relative intensity by gender.
Figure 16. SoC relative intensity at the end of semester by gender.

Table 14

<table>
<thead>
<tr>
<th></th>
<th>Stage 0</th>
<th>Stage 1</th>
<th>Stage 2</th>
<th>Stage 3</th>
<th>Stage 4</th>
<th>Stage 5</th>
<th>Stage 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>7-99</td>
<td>23-99</td>
<td>14-96</td>
<td>23-97</td>
<td>5-96</td>
<td>9-93</td>
<td>14-99</td>
</tr>
<tr>
<td>Male</td>
<td>14-99</td>
<td>19-43</td>
<td>25-48</td>
<td>23-83</td>
<td>2-9</td>
<td>5-16</td>
<td>5-42</td>
</tr>
</tbody>
</table>

Ethnicity

This study included a representation of various ethnicity groups of teachers. Six teachers were White. As a group, their highest peak score was at Stage 0 (i.e., unconcerned; 87%) and a second highest peak score at Stage 2 (i.e., personal; 59%); see Figure 17. One teacher was Hispanic. The Hispanic teacher had a peak score at Stage 0 (i.e., unconcerned; 99%) and a tie score between Stage 1 (i.e., informational) and Stage 5 (i.e., refocusing; 98%) as the second
highest peak scores. Three teachers were African American. As a group, their highest peak score was at Stage 0 (i.e., unconcerned; 48%) and a second highest peak score at Stage 2 (i.e., personal; 45%). Finally, two teachers were Asian. As a group, their highest peak score was at Stage 0 (i.e., unconcerned; 75%) and second highest peak score at Stage 3 (i.e., management; 60%). Table 15 illustrates the range in relative intensity by ethnicity.

Figure 17. SoC relative intensity at the beginning of semester by ethnicity.

Table 15

Range of SoC Relative Intensity Percentages at Beginning of Semester by Ethnicity

<table>
<thead>
<tr>
<th>Ethnicity</th>
<th>Stage 0</th>
<th>Stage 1</th>
<th>Stage 2</th>
<th>Stage 3</th>
<th>Stage 4</th>
<th>Stage 5</th>
<th>Stage 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>White (n = 6)</td>
<td>87%</td>
<td>51%</td>
<td>59%</td>
<td>52%</td>
<td>13%</td>
<td>19%</td>
<td>26%</td>
</tr>
<tr>
<td>Hispanic (n = 1)</td>
<td>99%</td>
<td>98%</td>
<td>96%</td>
<td>60%</td>
<td>96%</td>
<td>98%</td>
<td>90%</td>
</tr>
<tr>
<td>African American (n = 3)</td>
<td>48%</td>
<td>34%</td>
<td>45%</td>
<td>30%</td>
<td>19%</td>
<td>22%</td>
<td>17%</td>
</tr>
<tr>
<td>Asian (n = 2)</td>
<td>75%</td>
<td>40%</td>
<td>41%</td>
<td>60%</td>
<td>19%</td>
<td>12%</td>
<td>69%</td>
</tr>
</tbody>
</table>
At the end of the semester, the same ethnic groups were represented within the study with the exception of one less teacher in the African American group. Several changes occurred in areas of concern for the ethnic groups (see Figure 18). Teachers representing the White ethnic group had the same highest concern at Stage 0, but their second highest concern shifted away from Stage 2 to Stage 3 (i.e., management). The African American group’s highest concerns changed from Stage 0 and Stage 2 to Stage 2 and Stage 1. Additionally, the Asian group had the biggest change in concerns. At the beginning of the semester, their second highest concern was at Stage 6, but at the end of the semester, their second highest concern was at Stage 3 (i.e., management). At the end of the semester, all ethnic groups had concerns related to self. Table 16 illustrates the range in relative intensity by ethnicity.

![Figure 18. SoC relative intensity at the end of the semester by ethnicity.](image)

<table>
<thead>
<tr>
<th>Ethnicity</th>
<th>Stage 0</th>
<th>Stage 1</th>
<th>Stage 2</th>
<th>Stage 3</th>
<th>Stage 4</th>
<th>Stage 5</th>
<th>Stage 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>White (n = 6)</td>
<td>75%</td>
<td>45%</td>
<td>45%</td>
<td>47%</td>
<td>13%</td>
<td>14%</td>
<td>30%</td>
</tr>
<tr>
<td>Hispanic (n = 1)</td>
<td>99%</td>
<td>99%</td>
<td>96%</td>
<td>52%</td>
<td>96%</td>
<td>93%</td>
<td>99%</td>
</tr>
<tr>
<td>African American (n = 2)</td>
<td>14%</td>
<td>34%</td>
<td>48%</td>
<td>23%</td>
<td>16%</td>
<td>28%</td>
<td>17%</td>
</tr>
<tr>
<td>Asian (n = 2)</td>
<td>94%</td>
<td>27%</td>
<td>39%</td>
<td>77%</td>
<td>7%</td>
<td>12%</td>
<td>42%</td>
</tr>
</tbody>
</table>
Table 16

Range of SoC Relative Intensity Percentages at End of Semester by Ethnicity

<table>
<thead>
<tr>
<th>Ethnicity</th>
<th>Stage 0</th>
<th>Stage 1</th>
<th>Stage 2</th>
<th>Stage 3</th>
<th>Stage 4</th>
<th>Stage 5</th>
<th>Stage 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>White</td>
<td>7-98</td>
<td>23-84</td>
<td>14-76</td>
<td>27-97</td>
<td>2-48</td>
<td>5-25</td>
<td>5-69</td>
</tr>
<tr>
<td>Hispanic</td>
<td>99</td>
<td>99</td>
<td>96</td>
<td>52</td>
<td>96</td>
<td>93</td>
<td>99</td>
</tr>
<tr>
<td>African American</td>
<td>14</td>
<td>23-43</td>
<td>45-48</td>
<td>23</td>
<td>9-21</td>
<td>16-40</td>
<td>17</td>
</tr>
<tr>
<td>Asian</td>
<td>55-99</td>
<td>19-34</td>
<td>25-48</td>
<td>65-83</td>
<td>5-8</td>
<td>10-14</td>
<td>42</td>
</tr>
</tbody>
</table>

Research Question 1: What Are Teachers’ Concerns as They Implement BYOT?

The data presented in this section indicate that a majority of the teachers, and the teachers as a group, primarily had concerns related to self (i.e., Stages 0, 1, and 2). At the end of the semester, five of the six teachers interviewed had concerns related to self. Additionally, all subgroups (i.e., content area taught, age, gender, ethnicity, and years at school) had concerns related to self. These concerns indicate teachers’ needs for additional information about the innovation and their ability to implement the innovation as desired by the change leaders. The concerns related to self were present throughout all three administrations of the SoCQ.

Levels of Use

The following section presents each teacher’s LoU as determined by following the guidelines in Measuring Implementation in Schools: Levels of Use (Hall et al., 2006). The section is organized by first identifying each teacher’s LoU and then presenting the overall patterns of the group’s LoU found in the data to address the research question.
Mr. Lane’s Level of Use

Based on the LoUIP, Mr. Lane’s use was at the mechanical level. He discussed strengths and weaknesses of the innovation relating to student focus and the length of time setting up all students on their laptops. He expressed that, at that time, he was not looking for any information: “I think right now as far as a first year teacher, I’m kind of at the point where I’m just trying to use it, and I’m not looking too much advanced.” His focus was to ensure that he used the innovation and the tools it offers, mostly at the basic level. Although he was not collaborating with anyone, he mentioned that he discussed the day-to-day challenges related to time and management of the technology when he had the opportunity to talk with others about the innovation. Teachers with more experience offered him tips. Mr. Lane also mentioned that he was not thinking of making any changes as “getting everyone set just took a while.” In class, Mr. Lane’s students used BYOT mostly to access electronic texts through their laptops. His students looked up definitions and vocabulary words using Google or dictionary websites.

Ms. Ponce’s Level of Use

Ms. Ponce’s LoUIP indicated a level at mechanical. She felt strengths and weaknesses of BYOT related to classroom management and time. She thought the students were more engaged with the technology and, because of students’ use of mobile technology in the class, she spent less time preparing materials and organizing students. She shared that she integrated technology every day; she posted all assignments online, and students could analyze stories on their computer and take notes about texts on Microsoft Word. One project this semester was to record a movie about irony and literary elements. Ms. Ponce felt that BYOT facilitated students’ creativity and allowed them to accomplish and learn more with less time wasted. Although she did not have time to actively search for information, she said she was always thinking about
finding different ways to incorporate technology in her lessons, including different types of mobile technology such as Nooks, cell phones, and tablets. She had explored the use of Nooks in her class and allowed her students to create videos with their cell phones. Her assessments of the innovation were based on informal observations of student work and student feedback about the innovation.

*Ms. Casey’s Level of Use*

Ms. Casey’s LoUIP indicated she was using the innovation at the routine level. Ms. Casey described her use of the innovation with no indication that she struggled with it in class; she had a set daily routine for how she used the students’ technology. Everything she shared supported her use of students’ mobile technology with few to no problems. In her interviews, she said that she allowed students to use e-text through the laptops on a daily basis. Students could take notes on their mobile technology and play math games after they completed their work. When students went home, she asked them to complete homework videos from the e-textbook to review concepts taught in class. She reported that she had assessed her students over the past few years, and her data showed that students were able to learn more information more quickly with the technology. Students could review videos, play games, and access visuals of math concepts to help them in their learning. Although she was not actively seeking information about BYOT, she wanted to learn how to Skype with students and about more games to incorporate into their learning. Ms. Casey did not actively seek to share information, but she was happy to share with her community when asked about BYOT. At the time of the current study, she lived with other educators who were interested in BYOT, and she shared with them the impact it has had on her students’ learning and the advantages of using technology. Ms. Casey
evaluated her students but not necessarily to change the innovation. She used assessments to ensure that her students were learning.

Mr. Belagio’s Level of Use

Overall, Mr. Belagio’s LoU was at the mechanical level. Mr. Belagio shared that he allowed students to use their laptops to take notes in class. His students also used laptops to access their e-textbooks. The strengths and weaknesses he expressed about the innovation related to organization of materials and keeping students on task. He shared,

[I]’t’s easier ‘cause you take away the excuse of I forgot my book, I don’t have my book, it’s in my locker. The difficulty is keeping them on task. So you do different things like have them turn the desk around so you can see their screen.

He shared that he often talked with other team members to learn how they integrated laptops and other technologies in their lessons. He also noted that the changes he has made are “making sure that they keep them closed ‘til I tell them it’s okay to open.” This has helped students stay on task and focus on the teacher’s lecture.

Ms. Alvin’s Level of Use

Ms. Alvin’s LoU fell closer to routine; possibly approaching a level of refinement. She was aware of and interested in alternative ways to use the innovation in her class. Her knowledge, acquiring information, and planning was at the refinement level; however, her sharing, assessing, status reporting, and performing categories were at the routine level. In her interview, she said several things that supported her levels of refinement in knowledge, information, and planning. She said, “I probably need to try and incorporate more things here and there than just the norm.” She also talked with others to collect ideas for her own class; “I’ve been just talking with other teachers and see what they do in their classes with different things.” When asked her about her future use of the innovation, she shared that she planned to
explore new things such as Skype, teacher recordings, and new ways to foster more interactive learning with the use of students’ laptops. The categories of sharing, assessing, status reporting, and performing remained at a routine level. Ms. Alvin did not actively pursue ways to share information with others, but she did look for new ways to use the innovation. She assessed her students but not to inform decisions about ways to change the innovation to maximize student achievement. Finally, her use of the innovation was routine, smooth, and without any major logistical issues.

Ms. Manning’s Level of Use

Ms. Manning’s overall LoU was at the mechanical level. She allowed her students to take notes on their laptops, research information, and create presentations about what they learned. She also had students access the e-text with their laptops and submit work through e-mail. She felt that strengths of BYOT included the fact that that she could show her students many more scientific concepts through the multimedia apps of technology than she would have been able to do without the technology. She struggled with managing the technology in the classroom with her students and did not actively seek information on BYOT. A new teacher, Ms. Manning shared, “I think a part of me doesn’t even know where to begin as to what I should look for.” She did talk to the community she lives with about BYOT but didn’t “think we’ve come up with specific solutions that we have as to ways we can improve it [BYOT], and ways that we can utilize it in our classrooms.” Other than talking with her community at home about BYOT, she had not collaborated with others on the innovation. Looking into the future, she did not have any “major ideas” for how she would use laptops with the students.
Group Analysis of the Six Teachers’ Levels of Use

As a group, four of the six participants had a LoU at mechanical, and two were at the routine level (see Table 17). All four teachers at the mechanical level were in either their first or second year of teaching, new to Private School, or new to the content area. The two teachers at the routine level had 5 or more years of teaching experience, had been at Private School for 3 or more years, and had been at Private School since the initial implementation of BYOT in 2009. No differences were observed in the LoU by content area taught; all male teachers were at the mechanical level.

Table 17

Teachers’ Demographics and Level of Use Based on Interview Protocol

<table>
<thead>
<tr>
<th></th>
<th>Lane</th>
<th>Ponce</th>
<th>Casey</th>
<th>Belagio</th>
<th>Alvin</th>
<th>Manning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subject</td>
<td>Reading</td>
<td>Reading</td>
<td>Math</td>
<td>Math</td>
<td>Science</td>
<td>Science</td>
</tr>
<tr>
<td>Years Taught</td>
<td>1-2</td>
<td>5-10</td>
<td>21-30</td>
<td>5-10</td>
<td>5-10</td>
<td>1-2</td>
</tr>
<tr>
<td>Years at School</td>
<td>1-2</td>
<td>1-2</td>
<td>5-10</td>
<td>5-10</td>
<td>3-4</td>
<td>1-2</td>
</tr>
<tr>
<td>Age</td>
<td>20-25</td>
<td>26-30</td>
<td>over 56</td>
<td>36-40</td>
<td>31-35</td>
<td>20-25</td>
</tr>
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<td>Ethnicity</td>
<td>Asian</td>
<td>White</td>
<td>White</td>
<td>African American</td>
<td>African American</td>
<td>Asian</td>
</tr>
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<td>Male</td>
<td>Female</td>
<td>Female</td>
</tr>
<tr>
<td>Level Of Use</td>
<td>Mechanical</td>
<td>Mechanical</td>
<td>Routine</td>
<td>Mechanical</td>
<td>Routine</td>
<td>Mechanical</td>
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</tbody>
</table>
In the last interview, I described to the teachers the different LoU. As part of the interview, teachers placed themselves on a level so that their perception of use could be compared with conclusions from the study. Four of the six teachers’ perceived LoU were in agreement with the calculated LoU. The two exceptions were Ms. Ponce and Ms. Manning. Ms. Ponce’s interview data indicated a mechanical LoU, but she placed herself at the routine level because she felt she had stability in her use of BYOT. She didn’t feel that she needed to introduce anything new at the time of the exit interview; however, this was contrary to what she had shared in the LoUIP. Additionally, Ms. Manning’s interview data indicated placement at the mechanical level, but she placed herself at the routine level because she felt that she was beyond the day-to-day management of the innovation.

Research Question 2: What Are teachers’ LoU Regarding the Implementation of BYOT?

Based on interviews with the participants, the majority of teachers in this study (four out of six) were at the mechanical level. The remaining two teachers were at the routine level. Teachers at the mechanical level often focus on their day-to-day use of the innovation without consideration of how the innovation affects their students. Teachers at the routine level are one step further in implementation; the difference in the routine level is that teachers’ use is stable and without plans for improvement.

Innovation Configurations

The following section presents teachers’ IC, as determined by their placements on the IC map. This section begins with a table illustrating notes from class observations and indicating each teacher’s placement on each component of the IC map. Following the table is a discussion of each teacher’s IC along with supporting data. Patterns of the group’s actual use are presented, and the section concludes by referencing the research question that guided this part of the study.
Table 18 is organized by each teacher’s demographic information, placement on the IC map by each component, materials used during class observations, and observed instructional practices. As illustrated in the full version of the IC map in Appendix B, the letters A, B, C, and D identify where the teacher was placed for each component. Letter A signifies closest to the ideal implementation, while D signifies the least ideal implementation variation.

Based on observations, Mr. Lane’s practices on Components 1 (i.e., facilitate and inspire student learning), 2 (i.e., design and develop digital age learning experiences), and 3 (i.e., design and develop digital age assessments) were at Level D. For Components 1, 2, and 3, Mr. Lane’s use of e-textbooks and laptops was mostly teacher-directed. No evidence indicated his promotion of innovative thinking, opportunities for students to collaborate with each other, or connection with other learning communities. All students in his class accessed the same text, and he appeared to assess all students in the same way. He placed at Level B for Components 4 (i.e., model digital age work and learning) and 5 (i.e., utilizes various types of tools). As an observation of the practice of Component 4, Mr. Lane modeled and used digital tools in the classroom, such as the SMART Board, projector, and the laptops. Finally, for Component 5 (i.e., utilizes various types of tools), Mr. Lane planned instructional activities in a way that allowed students to use technology in traditional ways. Mr. Lane called on students to read aloud to the class and asked questions about the reading in the whole group.

Some things that Mr. Lane shared in an earlier interview were aligned with observations made in the IC map. “So, on the e-book they'll read when they have questions at the end. So we don't really use it in class as much. And generally I don't think they use their technology too much in class.”
<table>
<thead>
<tr>
<th></th>
<th>Lane</th>
<th>Ponce</th>
<th>Casey</th>
<th>Belagio</th>
<th>Alvin</th>
<th>Manning</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Subject</strong></td>
<td>Reading</td>
<td>Reading</td>
<td>Math</td>
<td>Math</td>
<td>Science</td>
<td>Science</td>
</tr>
<tr>
<td><strong>Years Taught</strong></td>
<td>1-2</td>
<td>5-10</td>
<td>21-30</td>
<td>5-10</td>
<td>5-10</td>
<td>1-2</td>
</tr>
<tr>
<td><strong>Years at School</strong></td>
<td>1-2</td>
<td>1-2</td>
<td>5-10</td>
<td>5-10</td>
<td>3-4</td>
<td>1-2</td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td>20-25</td>
<td>26-30</td>
<td>over 56</td>
<td>36-40</td>
<td>31-35</td>
<td>20-25</td>
</tr>
<tr>
<td><strong>Ethnicity</strong></td>
<td>Asian</td>
<td>White</td>
<td>White</td>
<td>African American</td>
<td>African American</td>
<td>Asian</td>
</tr>
<tr>
<td><strong>Gender</strong></td>
<td>Male</td>
<td>Female</td>
<td>Female</td>
<td>Male</td>
<td>Female</td>
<td>Female</td>
</tr>
<tr>
<td><strong>IC</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Facilitate &amp; Inspire</td>
<td>D</td>
<td>D</td>
<td>D</td>
<td>D</td>
<td>B</td>
<td>B</td>
</tr>
<tr>
<td>Design &amp; Develop Digital Age Learning Experiences</td>
<td>D</td>
<td>D</td>
<td>D</td>
<td>D</td>
<td>B</td>
<td>B</td>
</tr>
<tr>
<td>Design &amp; Develop Digital Age Assessments</td>
<td>D</td>
<td>D</td>
<td>D</td>
<td>D</td>
<td>C</td>
<td>C</td>
</tr>
<tr>
<td>Model Digital Age Work &amp; Learning</td>
<td>B</td>
<td>D</td>
<td>D</td>
<td>D</td>
<td>B</td>
<td>B</td>
</tr>
<tr>
<td>Utilizes Various Tools</td>
<td>B</td>
<td>D</td>
<td>B</td>
<td>D</td>
<td>C</td>
<td>B</td>
</tr>
</tbody>
</table>

*(table continues)*
<table>
<thead>
<tr>
<th>Lane</th>
<th>Ponce</th>
<th>Casey</th>
<th>Belagio</th>
<th>Alvin</th>
<th>Manning</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Materials Used</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• laptops</td>
<td>• paper and pencil</td>
<td>• e-text</td>
<td>• projector on SMART</td>
<td>• paper</td>
<td>• student-created pamphlets</td>
</tr>
<tr>
<td>• e-text</td>
<td></td>
<td>• projector on SMART</td>
<td></td>
<td>• white board</td>
<td></td>
</tr>
<tr>
<td>• projector on SMART</td>
<td></td>
<td>• white board</td>
<td></td>
<td>• paper</td>
<td></td>
</tr>
<tr>
<td>• paper</td>
<td></td>
<td>• dry erase boards</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Observed Instructional Activities</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• students took turns reading aloud from e-text (on laptop or projector)</td>
<td>• students sat in a circle while they engaged in a conversation about a poem</td>
<td>• students solved inequalities on paper</td>
<td>• students solved inequalities on paper</td>
<td>• students worked in groups of 4 to research how rocks form, how they are used in the industry, architecture, arts &amp; how rocks have formed special tourist attractions</td>
<td></td>
</tr>
<tr>
<td>• teacher-directed question and answer</td>
<td>• conversation was teacher-led</td>
<td>• students invited to show solutions on white board</td>
<td>• students invited to show solutions on white board</td>
<td>• students would later present their findings to the class through ppt</td>
<td></td>
</tr>
<tr>
<td>• students completed a prediction sheet</td>
<td>• teacher asked the students to look at the poem for specific reasons</td>
<td>• answers to homework problems from e-text were checked</td>
<td>• review for Chapter 2 by solving problems from the e-text on paper or dry erase board</td>
<td>• teacher monitored and assisted students</td>
<td></td>
</tr>
</tbody>
</table>
Ms. Ponce, also a reading teacher, placed at Level D for all IC. The students observed participated in a teacher-led discussion about various parts of a piece of text and its meaning. Students used paper and pencil throughout the lesson. No signs of technology use or digital work were observed during the observation. The observed lesson did not align with what she described as a typical day for her. She described her daily experience with technology in the classroom as follows:

All the time. We have, I have all my assignments online. So they—when you analyze stories, for example, they were analyzing stories instead of printing the paper and wasting all this paper. They are able to copy and paste the story into a Word document. And as they read, they were analyzing it and which is a lot easier because I do have quite a lot of dyslexic kids and distracted kids, where the computer comes in very handy. And so that helps a lot. But we use computers literally every single day. In fact, we're actually about to start filming a movie based on, 'cause we're studying irony and the literary elements. And so I have them write a script for a five minute video. And they're going to be using their smart phones to film an ironic situation.

Ms. Ponce’s description of her use of BYOT in the interviews was not supported by the data collected during the classroom observation.

Ms. Casey and Mr. Belagio, the two math teachers, placed at a Level D for the majority of IC. Work in their classrooms was independent of real-world connections, and the majority of work and instructional activities were teacher-directed. Observations of instructional activities in both classrooms were mostly teacher-directed with students solving problems independently followed by students modeling how they solved the problem. The majority of the questions were teacher-directed, targeting either individual students or the whole class. The teachers assessed all students in the same way and with traditional methods. Students mostly used paper-pencil types of resources in class.

Observations of Ms. Casey’s classroom aligned with what she had described in the first interview as her day-to-day use of technology in her classroom.
My day to day. . . . well I do have most of the notes that I give to the students. I do have it on a flash drive. And I'll put it on the SMART Board. And I have an AirLiner. And because these are math problems, I'm able to work the problems out for the students to see. . . . And we do a lot of practice problems that I put the problems on the AirLiner mainly. And I use the SMART Board mainly—I don't use it enough because I don't really use it as an interactive tool, which I really feel bad about. But that's something that I think I just gradually need to get. . . . I guess because I don't do a whole wealth of things with the technology. I haven't noticed that it's disrupted my teaching at all.

In an interview with Mr. Belagio, he also described his daily use of technology in traditional ways: “The laptops we use pretty much just taking notes. I have my notes on the SMART Board. So, I do some of my notes. And the kids come up and work examples and problems.”

The two science teachers, Ms. Alvin and Ms. Manning, placed at Level B in Components 1, 2, and 4 (i.e., facilitate and inspire student learning, design and develop digital age learning experiences, and model digital age work and learning, respectively). They both placed at Level C for Component 3 (i.e., design and develop digital age assessments). Both teachers planned instructional activities that allowed students to use their creativity and explore real-world problems. For example, Ms. Alvin had her students digitally create pamphlets to share their online research on genetic diseases. Ms. Manning asked her students to work in groups to research rock formation as well as how architects and artists use rocks in the industry. Additionally, students researched tourist attractions formed by rocks. The two teachers differed in their actual practices of BYOT in Component 5 (i.e., utilizes various types of tools). Based on the observation, Ms. Alvin placed at a Level C, whereas Ms. Manning placed at Level B. Although during the observation, Ms. Alvin’s class presented their digitally created pamphlets, the technology students had used to create their work was unknown. However, during Ms. Manning’s observation, students were using their laptops (i.e., traditional technology).
Some things Ms. Manning had shared in the interviews confirmed her use of technology with students in ways that promote digital work and learning experiences:

. . . . [W]e give students a different way to access their educational materials. And I think it's great because that opens up so many doors to giving them different ways of learning and different ways of input for the different topics that we talk about, especially in science. . . . It's just great to be able to show kids things that you can't show them in the classroom. And so even though I would love to take all of my eighth graders outside to see a half pipe and apply the concepts of kinetic, potential and thermal energy out there, it's not feasible 'cause we don't have one.

In Ms. Alvin’s interviews, she shared the following, which illustrated her understanding of designing digital learning experiences:

It is a neat, innovative way to get kids in today's world to be excited about learning in different modes. They have information accessible to them that wasn't readily accessible in other modes. Maybe a stack of encyclopedias. It's just completely different from the old days.

*Overall Patterns in Actual Use Based on Classroom Observations*

A pattern emerges when examining teacher groups by content area. Math and reading teachers ranked furthest from the ideal variation of implementation on the IC map, whereas science teachers placed closest to the ideal implementation of the innovation. Both math teachers used traditional resources such as the white board, the projector, and paper-pencil. Both science teachers had students work in groups or deliver presentations for the group. In the science classes, students used their laptops to research and create presentations either individually or in collaborative groups. One reading teacher used laptops, the e-textbook, the projector, and paper-pencil. Although he used a variety of tools, he used them in traditional ways (i.e., to follow along on an e-text book and read aloud from the text). The other reading teacher was observed using only paper-pencil with no evidence of technology use.
No patterns are observed when analyzing teachers’ placements on the IC map related to gender, ethnicity, or years of teaching experience. The main pattern that emerged was how differently the science teachers used the innovation compared to the math and reading teachers.

*Research Question 3: What are Teachers’ Practices as They Implement BYOT?*

The majority of the teachers have implemented BYOT at Level D. Two of the six teachers have moved past Level D to level B for Component 1 (i.e., facilitate and inspire student learning). Two of the six teachers have progressed from Level D and to Level B for Component 1 (i.e., design and develop digital age learning experiences). Two out of six teachers have advanced to Level C for Component 3 (i.e., design and develop digital age assessments). Fifty percent of the teachers (three of the six) have reached Level B for Component 4 (i.e., model digital age work and learning). Finally, 50% of the teachers (three of the six) have reached Level B for Component 5 (i.e., utilize various types of tools). The table below (Table 19) summarizes participants’ placements on the IC map.

Table 19

*Percent of Teachers at each Variation Level by Component*

<table>
<thead>
<tr>
<th>Component</th>
<th>Level A</th>
<th>Level B</th>
<th>Level C</th>
<th>Level D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Component 1: Facilitate and Inspire Student Learning</td>
<td>33%</td>
<td>66%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Component 2: Design and Develop Digital Age Learning Experiences</td>
<td>33%</td>
<td>66%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Component 3: Design and Develop Digital Age Assessments</td>
<td></td>
<td>33%</td>
<td>66%</td>
<td></td>
</tr>
<tr>
<td>Component 4: Model Digital Age Work and Learning</td>
<td>50%</td>
<td>50%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Component 5: Utilize Various Types of Tools</td>
<td>50%</td>
<td>17%</td>
<td>33%</td>
<td></td>
</tr>
</tbody>
</table>
Teacher Profiles Based on the Concerns-Based Adoption Model

This section incorporates each teacher’s placement on the SoC chart, LoU table, and IC map, resulting in individual profiles, which are illustrated in the following table. Because Table 20, below, is inclusive of all teachers’ profiles, trends in teachers’ concerns, use, and practices can be examined.

Table 20

*Teacher Profiles Across SoCQ, LoU, and IC*

<table>
<thead>
<tr>
<th></th>
<th>Beginning</th>
<th>Middle</th>
<th>End</th>
<th>Level of Use</th>
<th>IC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mr. Lane</td>
<td>Stage 0</td>
<td>Stage 0</td>
<td>Stage 0</td>
<td>Level 3</td>
<td>DDDBB</td>
</tr>
<tr>
<td></td>
<td>Stage 3</td>
<td>Stage 3</td>
<td>Stage 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ms. Ponce</td>
<td>Stage 2</td>
<td>Stage 1</td>
<td>Stage 1 and 2</td>
<td>Level 3</td>
<td>DDDDD</td>
</tr>
<tr>
<td></td>
<td>Stage 0</td>
<td>Stage 2</td>
<td>Stage 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ms. Casey</td>
<td>Stage 2</td>
<td>Stage 1</td>
<td>Stage 1</td>
<td>Level IV A</td>
<td>DDDDB</td>
</tr>
<tr>
<td></td>
<td>Stage 1</td>
<td>Stage 2</td>
<td>Stage 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mr. Belagio</td>
<td>Stage 1</td>
<td>Stage 1</td>
<td>Stage 2</td>
<td>Level 3</td>
<td>DDDDD</td>
</tr>
<tr>
<td></td>
<td>Stage 2</td>
<td>Stage 2</td>
<td>Stage 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ms. Alvin</td>
<td>Stage 0</td>
<td>Stage 0</td>
<td>Stage 2</td>
<td>Level IV A</td>
<td>BBCBC</td>
</tr>
<tr>
<td></td>
<td>Stage 5</td>
<td>Stage 2</td>
<td>Stage 5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ms. Manning</td>
<td>Stage 0</td>
<td>Stage 0</td>
<td>Stage 3</td>
<td>Level 3</td>
<td>BBCBB</td>
</tr>
<tr>
<td></td>
<td>Stage 6</td>
<td>Stage 6</td>
<td>Stage 0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

To gather additional information about the teachers’ experiences with BYOT, three interviews were conducted with each of six teachers. This helped to complete the teachers’ profiles and gain a better understanding of each teacher’s position in the change process. Each section below is organized by interview question and accompanied by a brief summary of
common concerns or ideas teachers shared about BYOT. Following the interview data is a
summary for each teacher’s profile. Appendix D includes these questions in addition to quotes
from the teachers.

“What is your relationship with the campus’ administrative team?” Participating teachers
felt they had a good relationship with the administrative team, describing the administrative staff
as very open with their communication and supportive.

“Do you plan together as a team?” The math teachers revealed that they met as a
department once a month and have designated times to observe each other in their classrooms.
The science teachers also meet once a month. However, Mr. Lane, the first-year reading teacher,
does not meet as often with his department.

“Can you describe a day of teaching before BYOT?” When teachers were asked to
describe a day before BYOT, they mostly talked about three things. They felt that instruction
was more teacher-directed and more work for teachers and that students struggled with
organization. Before BYOT, they felt that teachers had to do more work in making copies and
organizing instructional materials. They also expressed that students struggled to keep up with
assignments, textbooks, and other materials before BYOT.

“Can you describe a day now with BYOT?” The most common reoccuring theme that
arose from questions about BYOT was that teachers have to monitor students to ensure that they
visited only appropriate websites on their technology and remained on task. The teachers felt
that they now have to take extra steps to ensure they can see students’ computer monitors when
they work on their laptops.
“How would you describe your students’ ability to use technology for personal use?”

Four of the six teachers rated students a 10 out of 10 on their ability to use technology for personal use. Two of the six teachers rated students a 9 out of 10.

“How would you describe your students’ ability to use technology in the classroom?”

One teacher rated the students between a 6 and 7 out of 10. She talked about students’ not knowing how to use productivity tools for the classroom. One teacher said,

Because they're getting better at it I feel, but there are still some things that they don't know. Like some of them still don't know how to use a flash drive. And maybe it's not common for kids to know how to e-mail attachments to themselves, or maybe it's just the e-mail program that we use that's difficult. They don't know how to do that either. But I think they're steadily growing with more assignments that are given to them. I just really believe that they need a basic computer class to teach them about how to use Microsoft Word, and PowerPoint, and Excel.

One teacher rated the students between an 8 and 9 out of 10. This teacher said, “I’m not gonna [sic] give them a perfect 10, ‘cause they can learn more, too. But these kids really—they’re very adept users.”

Two teachers rated the students a 9 out of 10. One teacher mentioned that she gave them a 9 because she wanted to leave room for being responsible technology users. She said, “Just leaving room for knowing appropriate times, where to be on and when to be on. Leaving some room for that. But they’re pretty good about it.” Finally, the teacher who rated students between a 9 and 10 out of 10 said the following about their use: “Unless it's a program that they've never used before or some kind of website they've never used before, it's usually a 9, 10. They're really computer savvy [laughter]. More than me actually sometimes.”

“Do you see issues with equity between students?” The majority of teachers felt there have been no major issues regarding equity between students. All students have a laptop that they either bring from home or have received on loan from the campus. Overall, the teachers felt
students work well together and are willing to help each other if someone does not have a laptop, or their laptop is being repaired or out of battery.

“What do you do if you have issues with Internet or with the students’ mobile technology?” When the teachers encounter issues with technology, they all have a backup plan that may involve changing materials used for the lesson. If individual students have problems with their own technology, then they ask students to share. Some common issues students have with their technology include broken laptops or battery issues.

“What does BYOT mean to you?” For many of the teachers, BYOT meant that students could bring various types of technology to school and incorporate it into their learning.

“What does BYOT look like at your campus?” When asked about what BYOT looked like across campus, the teachers expressed that it varied depending on content area.

“Do you invite other types of technology besides laptops? How do you plan for the different types of technology that students bring into the classroom and the actual content that needs to be taught?” Overall, the majority of teachers did not deliberately make plans to use other types of mobile technology, such as cell phones or tablets, in the classroom. Often, teachers allowed students to use their cell phones, tablets, or e-readers if the students asked to use them. Only one teacher allowed students to read on other mobile devices; however, she never allowed the use of cell phones.

“How has your use of BYOT evolved since you first started using the innovation?” Three of the teachers quickly learned that they needed to closely monitor students with mobile devices and have since adjusted in the way they allow students to use this technology in order to do so. One teacher explained that her use continues to evolve. She was now attempting to learn
a new program that would allow her to connect virtually with students who are at home. Two of the teachers shared that they use BYOT to take notes in class.

“If you were welcoming a new staff member to the school, how would describe BYOT to them?” The majority of teachers described BYOT as exciting and a way to engage students. Two of the teachers said they would tell the new staff member about the challenges of managing the technology and share aspects of the management piece of BYOT.

“What would you say are the expectations for BYOT for the staff?” Receiving detailed answers regarding what expectations were for teachers and their use of BYOT was a struggle. Most of their responses were about monitoring students and the expectations for usage.

“Where do you see yourself in the future regarding your use of BYOT?” The majority of teachers talked about their desire to continue learning about technology and ways to use it in the classroom. Three of the teachers shared specific things they wanted to learn about such as Skype, blogs, and incorporating more into their websites.

“What has helped you in your use of BYOT?” The common theme in teachers’ responses to this question was about the support and help they had available at school, either from their peers, the technology director, or the students.

“What has been some of the barriers in your implementation of BYOT?” Teachers shared several different responses regarding the barriers they have experienced. Two teachers mentioned barriers related to managing the technology from day-to-day, and two teachers mentioned the monitoring of students. One of the new teachers said that simply being a new teacher was a major barrier.

“How has the staff you work with influenced your adoption of BYOT?” A majority of teachers felt that their colleagues had the greatest influence on their own adoption of BYOT.
Only one teacher felt the organization’s leaders had influenced her adoption through the professional development offered once a year.

“What would be the most helpful to support you as you move deeper into your understanding and adoption of BYOT?” Teachers provided a variety of responses to this question without an overarching theme. The teachers felt that they needed (a) to collaborate with others, (b) more technology, (c) people to show them how to do things, or (d) time.

“What does it mean to prepare students for the 21st century to you?” All teachers who answered this question, five of the six, felt that preparing students for the 21st century must incorporate preparing students to use technology.

Summary of Teacher Profiles

Mr. Lane’s collective data show a first-year teacher whose concerns were consistently at the unconcerned and the management stages. His interview supported that his goal was to manage his class on a day-by-day basis and use the innovation at a very basic level. His LoU was at the mechanical level. Mr. Lane’s placement on the IC map reveals that he utilized students’ technology (e.g., laptops) but in a very traditional way; much like teachers would use a printed textbook. The juxtaposition of concerns in the unconcerned and management stages and LoU at the mechanical level suggests a teacher who is complying, yet disconnected from the vision of the innovation. Mr. Lane’s adoption of the innovation was perfunctory, signifying a teacher who is willing to implement the innovation, but without commitment to growth or change because he is unconcerned with this and more concerned with other things that take his time and energy.

At the time of the current study, Ms. Ponce had 5-10 years of teaching experience and currently taught reading. Her concerns were consistently at the informational or personal stage,
and this was her first year to work at a school with BYOT. Ms. Ponce’s LoU was at the mechanical level based on the interviews. However, her actual use of the innovation was non-existent during the observation. Ms. Ponce’s observation conflicted with the information she shared in her interviews when she said she used technology for everything in her class every day. Ms. Ponce’s observation data was more aligned with her actual practices than what she shared in her interview. Ms. Ponce knew that BYOT is an expectation on campus and spoke as though she had put it in practice; however, she may have been failing to implement the innovation in her class. Ms. Ponce’s concerns at the informational and personal stages support her non-use of the innovation. She planned to search for more information about the innovation and doubted her abilities to put it into practice.

Ms. Casey’s concerns were consistently at the personal and informational stage. Her LoU was at the routine level based on our interview; however, her actual use revealed a teacher who uses students’ technology in traditional ways. Her use of e-textbooks paralleled how printed textbooks are used, which placed her use as mostly least ideal in terms of BYOT on the IC map. Ms. Casey was one of the oldest teachers on the campus, over 56. She felt that her age was a barrier to her use of technology, and she could not keep up with how best to use it in class. Her concerns, at the personal stage with a routine level of use, illustrated her personal doubts about her ability to use technology in any way different from the class routines she had established for herself and her students. Additionally, because was unaware of the campus’ vision for BYOT, she implemented the innovation in her own way. Her LoU supports her plans to continue with her own vision of BYOT; the same day-to-day tasks and routines of a teacher in a traditional setting with paper and pencil.
Mr. Belagio’s concerns were also consistently at the personal and information stage. His LoU was at the mechanical level. This was Mr. Belagio’s first year to teach math and implement BYOT in this content area. His use of students’ technology was non-existent during the observation, placing him in the least ideal implementation of BYOT. The combination of his concerns and his LoU illustrates a teacher who may use BYOT occasionally to comply with campus leaders’ expectations but not on a regular basis. Information collected from his interviews suggest that his use of technology was minimal and mostly for students to access e-textbook or calculators. Because he was new to teaching math, he was probably more occupied with learning how to teach the content than use of technology. The fact that Mr. Belagio had a new teaching placement combined with his personal concerns would suggest that he had doubts in his ability to implement BYOT in his current teaching situation.

Ms. Alvin’s concerns varied between several stages over the course of the study. Her concerns ranged from unconcerned to personal to collaboration, and her LoU was routine. She had been implementing BYOT for several years and had established a routine way to use it. Based on her classroom observation, her actual use was leading towards an ideal implementation of BYOT. Ms. Alvin’s concerns-based adoption model (CBAM) data indicated a teacher who is moving along through the change process. She was progressing mostly on her own because the campus did not offer continuous professional development or time for collaboration. Her quick progression through the SoC indicated that she was thinking about how others used BYOT; however, her routine LoU would suggest that she was not yet ready to make changes in her own practices. Although, she was unaware of the school’s visions for BYOT, she managed to implement practices in her room that were coincidentally close in alignment with the vision.
Ms. Manning’s concerns ranged from unconcerned to management to refocusing. Her LoU was at the mechanical level. This was her first year teaching and her first year to experience BYOT. Based on classroom observations, her actual use of the innovation, was leading towards the ideal implementation of BYOT. Contrary to Mr. Lane’s profile, Ms. Manning attempted to balance her first year of teaching with implementing BYOT. Her progression across several SoC suggests she had attempted to implement BYOT with some issues and was concerned about refocusing her efforts by thinking of ways to change her implementation and meet her technology goals. Because this was her first year in using BYOT, she struggled with managing the innovation, resulting in her mechanical LoU.

Exit Interviews

At the end of the research at the school, teachers placed themselves on the SoC chart, LoU table, and IC map. Table 21 illustrates each teacher’s perceived concerns, LoU, and actual practices at the end of the semester compared with their actual scores and placements.

Teachers’ actual SoC, based on the online questionnaire, was compared against concerns they felt they had at the end of the semester. The concerns based on the questionnaire and teachers’ self-placements on the concerns chart were consistent with one exception Ms. Ponce. She felt she had concerns related more with management and consequence of the innovation.

Next, the results from of the LoUIP were compared with how teachers placed themselves on the LoU chart. In this section, all placements were consistent with diagnostic scores with the exception of Ms. Ponce and Ms. Manning. The two teachers felt their LoU were more at the routine level (i.e., Level IVA) than at the mechanical level. Both felt they had daily routines in place and had a smooth implementation of BYOT.
Table 21

*Comparison of Actual and Teachers’ Self Perception of SoC, LoU, and IC*

<table>
<thead>
<tr>
<th></th>
<th>Actual Concerns</th>
<th>Perceived Concerns</th>
<th>Actual Levels of Use</th>
<th>Perceived Levels of Use</th>
<th>Perceived IC</th>
<th>Actual IC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mr. Lane</td>
<td>Stage 0</td>
<td>Stage 0/1</td>
<td>Level 3</td>
<td>Level 3</td>
<td>DDCDB</td>
<td>DDDDB</td>
</tr>
<tr>
<td>Ms. Ponce</td>
<td>Stage 1/2</td>
<td>Stage 3/4</td>
<td>Level 3</td>
<td>Level IVA</td>
<td>ABBA</td>
<td>DDDDD</td>
</tr>
<tr>
<td>Ms. Casey</td>
<td>Stage 1</td>
<td>Stage 2</td>
<td>Level IVA</td>
<td>Level IVA</td>
<td>BDDBB</td>
<td>DDDDB</td>
</tr>
<tr>
<td>Mr. Belagio</td>
<td>Stage 2</td>
<td>Stage 2/1</td>
<td>Level 3</td>
<td>Level 3</td>
<td>BBCBA</td>
<td>DDDDD</td>
</tr>
<tr>
<td>Ms. Alvin</td>
<td>Stage 2</td>
<td>Stage 5</td>
<td>Level IVA</td>
<td>Level IV B</td>
<td>BBBBA</td>
<td>BBCBC</td>
</tr>
<tr>
<td>Ms. Manning</td>
<td>Stage 3</td>
<td>Stage 3</td>
<td>Level 3</td>
<td>Level IV A</td>
<td>B/C C B/C BB</td>
<td>BBCBB</td>
</tr>
</tbody>
</table>

Finally, teachers’ placements on the IC map based on the observations were evaluated against teachers’ perceived placements. Disagreements about diagnostic and self-placements occurred for the following teachers: Mr. Lane, Ms. Ponce, and Mr. Belagio. The three teachers felt their actual use of BYOT was closer to the ideal variation of implementation than the least ideal. These discrepancies led to the development of deeper interview questions, which led to the discovery that the teachers had no clear understanding of what the implementation of BYOT needed to look like. The teachers had established a level of mechanical and routine use of BYOT but without knowledge of what the campus leaders had envisioned.

**Summary**

Over the course of the study, a majority of teachers had highest concerns in Stages 0, 1 and 2, which indicates that a majority of teachers had concerns related to self. When data were
analyzed for teachers’ LoU, the group of teachers placed either at the mechanical or routine levels. The four teachers whose level was mechanical were either new to teaching or new to that content area that school year. The two teachers who placed at a routine LoU had taught for 5 years or more. No distinction was found between the content teachers taught and their LoU.

Several distinctions in the teachers’ actual use of BYOT were identified within the teacher groups. The science teachers, who had either mechanical or routine LoU of BYOT, implemented the innovation in ways that were closer to an ideal variation on the IC map. These two teachers had implemented some components in the IC map at Level B by promoting some innovative thinking, allowing students to explore concepts relevant to the real world, and creating learning experiences that promote student creativity. The reading and math teachers had adopted practices in the classroom that integrated the use of students’ mobile technology; however, they did this in very traditional ways. Teachers used mobile technology by accessing e-textbooks the same way students would read from a printed text. Instructional practices in the math classes included teacher modeling of how to solve a math problem independent of real-world connections and other activities similar to drill and practice. The reading teachers either did not use the technology or used it to access e-textbooks and read in a round robin way with teacher-directed questions. Students answered the questions in whole group exercises or on paper. These practices contributed to a disconnect between the IC Matrix and teachers’ LoU. Teachers had established a mechanical or routine way to use BYOT, but this was not the way envisioned by campus leaders. This has resulted in teachers implementing the innovation in ways that illustrate the least ideal variations on the IC map.
CHAPTER 5
DISCUSSION

The purpose of this study was to assess middle school teachers’ adoption of an innovation, bring your own technology (BYOT). This study was designed to explore teachers’ concerns, use, and actual practices in their adoption of BYOT.

The research questions that guided this study were as follows:

1. What are teachers’ concerns as they implement BYOT?
2. What are teachers’ LoU regarding the implementation of BYOT?
3. What are teachers’ practices as they implement BYOT?

This case study incorporated qualitative methods to assess middle school teachers’ adoption of an innovation, the BYOT initiative. Teachers’ concerns and behaviors related to their implementation of BYOT were analyzed by using the three tools from the concerns-based adoption model (CBAM): Stages of Concern Questionnaire (SoCQ), levels of use interview protocol (LoUIP), and the innovation configuration (IC) map; Hall & Hord, 2006). Twelve teachers took the SoCQ; six of those teachers were interviewed following a modified version of Seidman’s (2006) three-interview series. Additionally, the six teachers were observed in their classrooms to examine their actual practices with BYOT, which provided a snapshot of teachers’ practices as they implemented BYOT in class.

Findings

A majority of the six teachers interviewed had highest concerns related to self (Stages 0, 1, and 2) on the SoCQ. Their lowest concerns were about consequence and collaboration (Stages 4 and 6, respectively). This was also true when comparing SoCQ results of all twelve teachers.
who took the questionnaire, even across the following subgroups: years of teaching experience, years teaching at Private School, content area taught, age, gender, and ethnicity.

When analyzing the levels of use (LoU) placements, four of the six teachers placed at the mechanical level, whereas the other two teachers were at the routine level. The only observable pattern that differentiated the subgroups was years of teaching experience. The majority of teachers who have taught for 5 or more years had a routine LoU. No patterns were observed between the other subgroups of content area taught, age, gender, or ethnicity.

Classroom observations of teachers revealed differences in teachers’ actual uses in regards to content area taught. For example, math and reading teachers were the furthest away from ideal implementation of the innovation on the IC map; however, science teachers were the closest to ideal implementation. No patterns related to teachers’ actual use and years of teaching experience, age, gender, or ethnicity were observed.

Conclusions

Data analysis revealed several unexpected conclusions. The first was the number of teachers with concerns related to self. Teachers with self concerns desired more information about implementation of the innovation, such as the time requirements for preparation, timelines for implementations, and their supervisor’s expectations. Often, teachers with concerns about self are also concerned about their own ability to implement the innovation successfully (Hord, Rutherford, et al., 2006, p. 31). Teachers new to an innovation commonly have concerns about self but do not commonly continue to have concerns about self after several years of implementing an innovation.

G. E. Hall and Hord (2006) indicated that when change leaders plan the innovation carefully with appropriate interventions and support to teachers, then most teachers will move
from self concerns to concerns about task in the first year of implementation. Eight of the twelve teachers who participated in the SoCQ had concerns about self although they had taught at Private School for 3 to 10 years. Private School initiated BYOT in the fall of 2009; therefore, the current study was conducted during their third year of implementation. Past research indicates that by this time, teachers should be past concerns about self and should have concerns closer to those of impact, which often occur after 3 to 5 years of careful implementation (G. E. Hall & Hord, 2006, p. 141). Teachers with concerns about impact are concerned about how the innovation affects students. Teachers with concerns related to impact have established their use of the innovation, continue to assess how this use impacts students, or begin to consider ways to change their use of the innovation to further impact students. The latter two levels of concern, task and impact, were not a prevalent observation in the findings.

A possible explanation for teachers’ self concerns would be the lack of professional development available at the school. Teachers noted that most of their professional learning occurred during in-service days, once or twice a school year. Teachers reported that they attended monthly department meetings, where they mainly discussed student concerns and specific content standards. Although the school’s leaders shared many resources with teachers through e-mail, they have not differentiated professional development as appropriate for individual teacher’s needs. One of the principles that Hord, Rutherford, et al. (2006) offered about concerns is that the type of interventions offered to teachers must target their specific concerns. The teachers in the current study were not in need of additional resources for BYOT but were instead in need of additional information specific to implementation as well as reassurance that they were capable of implementing BYOT successfully.
A second unusual finding was that the LoU were mostly at the mechanical and routine levels. Although, teachers used the innovation with established routines, they did not do so in the way envisioned by change leaders. Without a clear understanding of the vision of the BYOT program, teachers in the study established a routine way to use BYOT in a more teacher-directed manner. Their routines resembled paper-pencil resources and methodologies, which did not align with the NETS set by the International Society for Technology Education (ISTE; 2012a). Change leaders of the school had envisioned that BYOT would bring to life an instructional environment aligned with the NETS. The NETS provide a framework for facilitating more learner-centered, collaborative learning communities between students and teachers through a digitally connected environment. According to ISTE (2008), some intentional actions of teachers who design instructional practices around the NETS include (a) facilitating and inspiring student learning and creativity, (b) designing and developing digital age learning experiences and assessments, and (c) modeling digital age work and learning. Further, some conditions laid out by ISTE (2009) for the successful use of technology for learning are (a) a clearly communicated, shared vision that includes teachers and school leaders, (b) ongoing professional learning, and (c) student-centered learning (ISTE, 2009). These conditions were not observed at Private School. Had the change leaders of Private School been more intentional in sharing a clear vision and communicated the ISTE (2012a) standards, teachers may have been at a LoU more aligned with what change leaders had planned. If the teachers had this information, they might have had a better idea of what they were working toward and could have adjusted their practices as necessary to align with the intention of BYOT.

Additionally, research from the CBAM creators includes a possible explanation for the misalignment between the teachers’ LoU and IC. G.E. Hall and Hord (2006) stated that if
appropriate support or intervention is not provided—specifically for teachers at the mechanical level—teachers will adopt their own variation of implementation that may be easier for them and different from the change leaders’ intentions. Teachers at the mechanical level often need support with day-to-day management of the innovation in order to surpass some challenges and progress to a higher level of implementation. Discussions with teachers revealed that this continuous support was not in place across the 3 years or during the year in which the current study was conducted.

A third unexpected finding was the teachers’ placements on the IC map. The majority of the teachers observed, four out of six, placed at the most basic level of implementation on the IC map. The most basic level includes (a) student work that is independent of real-world connections, (b) teacher-directed learning, (c) a lack in promoting student creativity, and (d) paper-pencil type of materials for learning. On the opposite end of the IC map is the most ideal level, which includes (a) teacher promotion of innovative thinking, (b) exploration of real-world problems, (c) students’ managing and measuring their own learning, (d) collaborating with students and other learning communities, and (e) using a variety of mobile technology. G. E. Hall and Hord (2006) suggested that human nature drives teachers to adopt their own way of implementing an innovation; however, this can be minimized when change leaders communicate what the innovation is supposed to look like with more details (i.e., the IC map).

In the current study, none of the teachers had achieved the ideal level of implementation, although at the time of the study, BYOT was in its third year of implementation and the majority of participants had been at Private School since the start of BYOT. CBAM creators have observed that high levels of change can occur within 3 to 5 years of implementing a program (G. E. Hall & Hord, 2006). Reaching a high level of change over the 3 to 5 years can be facilitated
when the innovation is clearly communicated to those implementing it. Based on this data, more teachers should be closer to implementing at a more ideal level.

Of the participating teachers, three had taught at Private School for 3 or more years, and two of those teachers were implementing the innovation at a very basic level. Ms. Casey had not moved past Level D, the most unacceptable level of implementation, for four of the five components. Additionally, Mr. Belagio had not moved past Level D for all five components of the innovation. Furthermore, the content area taught by the teacher was more indicative of the teacher’s IC than years of implementation. For example, the two science teachers were the only teachers in the study who had reached implementation levels closer to the ideal for the majority of the components. Although one of the science teachers was in her first year of teaching whereas the other was in her third or fourth year at Private School, both teachers promoted some innovative thinking, allowed students to explore concepts relevant to the real world, and had created learning experiences that promoted student creativity.

One possible explanation for teachers placing so far from the ideal implementation of BYOT is their lack of knowledge or understanding of what it should look like ideally. G. E. Hall and Hord (2006) indicated that implementers of an innovation commonly may not have a clear understanding of expectations of an innovation. Consequently, this often leads teachers to implement the innovation in a variety of ways, sometimes not at all how it was intended. In fact, the creators of CBAM stated that this is a common occurrence and created the IC map for this reason. Change facilitators can use the IC map to ensure higher fidelity of implementing the innovation in the way they intended. If change leaders at Private School use the IC map, teachers may move closer to the ideal variation of implementation after several years of putting the innovation into practice. Higher levels of adoption at the ideal level can be accomplished if
the IC map is created with input from teachers. In the current study, the IC map was created with input from only school leaders and me; however, Hord, Stiegelbauer, Hall, and George (2006) have outlined steps for creating an IC map more relevant to all involved in implementing and supporting the innovation. This process incorporates teacher input as a key component for an effectively constructed IC map.

Another possible explanation for teachers’ actual use of the innovation was the lack in communication from school leaders and lack in professional development as noted in teachers’ interviews. When the IC map was created, campus leaders provided input. One emphasized point was that campus leaders wanted BYOT to help them align with the ISTE (2012a) NETS. However, in the exit interviews, teachers expressed no knowledge of what the technology standards entailed; they stated that expectations of them were simply to use technology.

Teachers were unable to describe specifically the degree of implementation expected of them by the campus leaders. This has led teachers to establish their own mechanical and routine LoU, albeit different from the ideal implementation envisioned by the campus leaders. Additionally, teachers shared that little professional development was offered to support them in furthering their use of the innovation. Campus leaders did offer some professional development but usually only at the beginning of the school year. G.E. Hall and Hord (2011, p. 6) have established that learning and professional development is one of the most important components of leading change and moving implementers in deeper LoU and SoC. Hall and Hord (2011) recommend frequent interventions to further implementation levels.

Furthermore, had teachers been involved in creating the IC map, either for this study or at the initial stages of adopting BYOT, perhaps teachers would have had a better understanding of the change leaders’ goals for the innovation. Involving teachers in the creation of the IC map
allows them to help verbalize and illustrate each of the components and variations, leading to a better understanding of how they could phase in each variation over time. The IC map serves as a way for change facilitators to gauge the group’s status in the change process in addition to helping teachers check their own progress at different points in time to increase self-awareness of any adjustments that need to be made.

Limitations and Recommendations for Future Research

This study had several limitations. First, the study had a limited number of participants and unequal representation of subgroups. For example, twelve teachers took the SoCQ, but only six of those teachers had follow-up interviews and observations to assess their concerns and practices concerning BYOT. Of the twelve teachers who participated in the survey, only one represented the Hispanic ethnic group, and the study included only three males compared to nine women. In addition, teachers were observed in the classroom only once. However, a series of observations would have provided a more accurate portrayal of teachers’ actual practices related to BYOT. The study was limited to one private school, which limits generalizability of the research findings. Additionally, because the study took place over the course of a school semester, the relationship with the participants was very brief, possibly affecting their comfort and trust level in sharing information with me. Also, because the data collection period was over one school semester, only a snapshot of teachers’ adoption of BYOT could be provided. A longer data collection period, lasting greater than a minimum of 1 school year, could have included data on staff development to evaluate the effects of professional support on teachers’ concerns, use, and practices. Furthermore, Seidman’s (2006) three-interview series protocol was compromised when the three interviews were stretched out over a school semester. Seidman recommended that the interviews occur within a 3-week window and that each interview last
around 90 minutes. In this study, the three interviews were stretched out over a 15-week period, and the duration of each interview was not nearly as long as recommended by Seidman’s protocol. Finally, some interview time was shortened due to teachers’ school commitments such as setting up programs at the beginning of the school year, coaching, and other work duties. As a result, recommendations for the best time to meet with teachers are highly dependent on the teachers’ schedules and availability and may differ case by case.

Future researchers who explore teachers’ adoption of BYOT should consider a variety of school settings, both public and private. Primary and secondary schools must be considered for future research to evaluate variations in implementation of the innovation with differing student age groups as well. Additionally, future researchers that analyze BYOT and use the CBAM tools should explore specific interventions and support for teachers that would help identify strategies to help them move further in the change process. One way to accomplish this would be by beginning the research study from the very beginning of a BYOT initiative. The information gathered from the SoCQ, LoUIP, and IC map would be used to inform decisions for interventions and support for those implementing the initiative during program implementation. In this research scenario, information gathered from the CBAM tools and implemented interventions would enable change facilitators to impact adoption of an innovation rather than a snapshot of what is occurring in the adoption process, which was the case in this research study.
APPENDIX A

BRANCHING INTERVIEW
Source: From Measuring Implementation in Schools: Levels of Use (p. 18): Figure 3.1 by Gene E. Hall, Deborah J. Dirksen, and Archie A. George: Austin: The University of Texas at Austin.
APPENDIX B

INNOVATION CONFIGURATION MAP CREATED SPECIFICALLY FOR THIS STUDY
The teacher promotes innovative thinking and inventiveness; allows students to explore real-world problems; provides opportunity for students to collaborate in person and through digital environments; opportunities for students to connect with other learning communities outside of school.

The teacher uses digital tools to: personalize learning activities to address each individual students’ learning styles and abilities; allow for learning experiences that promote student learning and creativity.

The teacher plans instructional activities in a way that allows students to use various types of mobile technology such as tablets, notebooks, cell phones, and iPods.

APPENDIX C

INTERVIEW PROTOCOL QUESTIONS BASED ON SEIDMAN’S (2006) THREE-INTERVIEW SERIES
Interview 1: Focused Life History

1. How did you come to teach at Private School?
2. How would you describe what it is like to teach at Private School?
3. What is your relationship like with your colleagues at this school?
4. Do you and your team plan together often?
5. What is your relationship like with your campus administrative team?
6. Describe your daily experience with personal technology use?
7. Tell about your experience with the use of district technology in the classroom?
8. What types of technology are you most familiar with using (i.e. cell phone, iPad, computer, etc.)?
9. What does BYOT look like for you?
10. What does it look like at your campus?
11. What is your personal use of technology?

Interview 2: The Details of the Experience

1. Can you describe a day of teaching before BYOT?
2. Can you describe a day of teaching since the introduction of BYOT?
3. What is easy about BYOT and what is most difficult about it?
4. How would you describe your students’ ability to use technology for personal use?
5. How would you describe your students’ ability to use technology in the classroom?
6. Do you observe any issues related to equity in the students?
7. Do you invite other types of technology? Such as tablets, cell phones, etc.
8. How do you plan for the different types of technology that students bring into the classroom and the actual content that needs to be taught?

9. How do you handle situations when students do not have technology to bring to school?

10. How do you balance the integration of technology at home vs. at school?

Interview 3: Reflection on the Meaning

1. What thoughts do you have regarding your Level of Use/Stage of Concern? Do you agree or disagree with the placement based on the questionnaire?

2. What has helped or hindered you in implementing the BYOT program in your classroom? How has staff on your campus or other district employees influenced your adoption of BYOT?

3. What would be most helpful for you to support you as you move deeper in your understanding and adoption of BYOT?

4. Where do you see yourself, in the future, regarding your use and comfort with BYOT?

5. What does “preparing students for the 21st century” mean to you?
APPENDIX D

RESPONSES TO QUESTIONS FROM THREE-INTERVIEW SERIES WITH QUOTES FROM THE TEACHERS
To gather more information about the teachers’ experiences with BYOT, three interviews with six teachers were conducted. The following are responses teachers shared regarding BYOT organized by question. Each section below is categorized by the interview question that highlights the common concerns or comments teachers shared about BYOT then is followed by actual quotes the teachers shared with me.

“What is your relationship with the campus’ administrative team?” Participating teachers felt they had a good relationship with the administrative team, describing the administrative staff as very open with their communication and supportive.

- Ms. Alvin: Good. They're always there to talk to, open door policy type thing. That's great.”

- Ms. Casey: [The school] has always been super supportive. And I've always felt very supported by the administrative team. And they're the type—she’s got an open door policy. And I think the communication is great. Because we're such a big group, there's constant e-mailing any time there's anything that we need to know. So we're very much aware of what's going on. And so I just feel like it's a very positive relationship.

- Ms. Manning: And they're always super open. They send tons of e-mails and say, “If you need anything just ask.”

- Mr. Lane: I think it's pretty good. . . . But very supportive.

“Do you plan together as a team?” The math teachers revealed that they met as a department once a month and have designated times to observe each other in their classrooms. The science teachers also meet once a month. However, Mr. Lane, the first-year reading teacher, does not meet as often with his department.

- Ms. Alvin: We're starting to do more of that with math for instance, to combine math and science. . . . But I think that we need some more work in that area.

- Mr. Belagio: We share ideas. Another thing we do in the math department is once a month we get into someone else's classroom to see some of the things they're doing on a daily basis.

- Ms. Casey: We meet as a math department on a monthly basis.
• Mr. Lane: But I can plan with her... she also teaches it, so I look to her but we have a bit separate, so we're not really collaborating that much on it.

“Can you describe a day of teaching before BYOT?” When teachers were asked to describe a day before BYOT, they mostly talked about three things. They felt that instruction was more teacher-directed and more work for teachers and that students struggled with organization. Before BYOT, they felt that teachers had to do more work in making copies and organizing instructional materials. They also expressed that students struggled to keep up with assignments, textbooks, and other materials before BYOT. Some of the comments teachers made are:

• Ms. Casey: I just feel it was just kind of like the old method. Here I am, the math teacher, you're gonna [sic] just show 'em [sic] step by step by step. ... I would do most of the explaining. And then when I would work the problems out to show them, to explain it to them, my back was always turned to them. And sometimes the kids could see the board, sometimes they couldn't.

• Ms. Manning: I feel like it would be pretty much the same for my students. But I feel like it would also be more work for me in a way. Because I can have them look up things on their computers. Whereas if they didn't have their computers, I would have to provide all that information. They can use their periodic table in their textbook, instead of me printing out a bunch of copies and then wasting paper if they write on them or if they throw them away.

• Ms. Ponce: My goodness. It would [be] 6:00 in the morning, coming to school, making photocopies. ... And then I hand out—most of the time that I spend in class was by me walking around and handing out papers. And then looking and making sure that the kids are on task. And it was also wasted by kids not bringing pencils or supplies or whatever. And then and that was always frustrating.

• Mr. Belagio: There's most of organizations and it's a lot of, “I forgot my book in my locker, I don't know where my book is.” “That's my book; no it's not.” “Did you put your name in it?” “No.” [laughter] Just a lot—not chaos—but just a lot more things dealing with organization. Keeping up with things. So before, where now they have laptops every day. That's something they don't forget.

• Ms. Ponce: And it was also wasted by kids not bringing pencils or supplies or whatever. And then and that was always frustrating. ... Yeah. And it's actually pretty fast, too, since the kids, you give them an assignment a week prior to the lesson. And they have it half of it, and then they can pull it up, and within 2 minutes it's there. When you have all these papers from all different classes, the kids have to
find them in their backpacks. And that takes forever. Some of them lose their papers. That's why I don't like giving handouts 'cause kids lose them.

- Mr. Lane: But for them it was a lot of times they forget their books, they don't have it, they had to borrow books.

“Can you describe a day now with BYOT?” The most common reoccurring theme that arose from questions about BYOT was that teachers have to monitor students to ensure that they visited only appropriate websites on their technology and remained on task. The teachers felt that they now have to take extra steps to ensure they can see students’ computer monitors when they work on their laptops. Below are some things teachers shared:

- Mr. Belagio: Back then with the books, they interacted pretty much the same. It's just now it's probably more effort on my part to make sure that they are staying focused when I pass when I do have their screens up. So it's not like I could just sit and do work at my desk when there is some independent study time or working on problems before we come back together. So it's—I have to look and make sure they are doing what they're supposed to be. We do turn the desks around, so you have to monitor.

- Ms. Manning: And a part of me doesn't like to have them paired when they're sharing computers, because then I know that they're just gonna [sic] get sidetracked, especially if I'm not standing over their shoulders. But it's tough, and you just gotta [sic] roll with the punches on what we're doing that day with the computers.

“How would you describe your students’ ability to use technology for personal use?”

Four of the six teachers rated students a 10 out of 10 on their ability to use technology for personal use. Two of the six teachers rated students a 9 out of 10. They shared the following:

- Ms. Casey: Even with the phones and stuff like that. They know exactly—like if I have trouble with technology in my classroom. I don't need to wait and call on the tech person. They will always come and help me. And they're great about—they don't make me feel stupid. They just come up and show me.

- Mr. Belagio: They know so much about it. A lot of them are ahead of the curve. And in some cases they do know more than I do. This is how you can do this a whole lot faster. Okay. Thanks for showing me.
“How would you describe your students’ ability to use technology in the classroom?”

One teacher rated the students between a 6 and 7 out of 10. She talked about students’ not knowing how to use productivity tools for the classroom. One teacher said,

Because they're getting better at it I feel, but there are still some things that they don't know. Like some of them still don't know how to use a flash drive. And maybe it's not common for kids to know how to e-mail attachments to themselves, or maybe it's just the e-mail program that we use that's difficult. They don't know how to do that either. But I think they're steadily growing with more assignments that are given to them. I just really believe that they need a basic computer class to teach them about how to use Microsoft Word, and PowerPoint, and Excel.

One teacher rated the students between an 8 and 9 out of 10. This teacher said, “I’m not gonna [sic] give them a perfect 10, ‘cause they can learn more, too. But these kids really—they’re very adept users.”

Two teachers rated the students a 9 out of 10. One teacher mentioned that she gave them a 9 because she wanted to leave room for being responsible technology users. She said, “Just leaving room for knowing appropriate times, where to be on and when to be on. Leaving some room for that. But they’re pretty good about it.” Finally, the teacher who rated students between a 9 and 10 out of 10 said the following about their use: “Unless it's a program that they've never used before or some kind of website they've never used before, it's usually a 9, 10. They're really computer savvy [laughter]. More than me actually sometimes.”

“Do you see issues with equity between students?” The majority of teachers felt there have been no major issues regarding equity between students. All students have a laptop that they either bring from home or have received on loan from the campus. Overall, the teachers felt students work well together and are willing to help each other if someone does not have a laptop, or their laptop is being repaired or out of battery.

• Ms. Alvin: No. I think they realize at least here, 'cause it's already such a diverse school with religious backgrounds, ethnicity, economical, everything. It's so diverse
that I think they're just used to seeing—it's no big deal, so-and-so has this type, and I have that. But I do see where that could be a problem.

- Mr. Belagio: I haven't seen that here. I know everyone requires one—everyone’s required to have one. But I haven't heard or seen anything with people telling that your brand is this brand and mine is this one. But I guess it's the environment and we treat everyone with respect and be nice to everyone. So I haven't seen it in here at all.

- Ms. Casey: Never. I've never ever heard or seen or anyone even said anything to me that so-and-so has made them feel bad about their computer. In fact, they're really good about if someone's computer is in the shop, that they'll share. Someone will say—I'll say, “Can someone share with so-and-so?” And you'd be surprised at the number of hands that go up. “I'll share, I'll share.” They're really about that.

- Ms. Ponce: I do have students that do have hand me downs. I do have students that have computers that are very old. And it's not an issue.

“What do you do if you have issues with internet or with the students’ mobile technology?” When the teachers encounter issues with technology, they all have a backup plan that may involve changing materials used for the lesson. If individual students have problems with their own technology, then they ask students to share. Some common issues students have with their technology include broken laptops or battery issues.

- Ms. Alvin: Then they either share with a partner, their lab partner, or they come to the library and work on it there.

- Mr. Belagio: But if they have an issue with the laptop, they have the loaners in our technology department. But if something breaks, and they're all out, they have to share with a partner. Or good thing with the e-books, with each section there are worksheets assigned to it. So we could save a copy and print it out for them. Or like I said, share with their neighbor. Or I could just post it on the board.

- Ms. Casey: If I can't access the e-book, then I will go to my AirLiner. And I will use that as an explanation. And then also I've told them before, if we can't use the e-book, then I just put some problems on the board and have them just copy the problems off of the board.

- Ms. Manning: So if they don't have a laptop, I just have them share with someone.

- Ms. Ponce: If a student does not have a laptop, I usually have them share with another student. And for the students whose laptop broke and they had to send it off, they usually borrow one from the school, or they use their sibling's.
“What does BYOT mean to you?” For many of the teachers, BYOT meant that students could bring various types of technology to school and incorporate it into their learning.

- Ms. Alvin: So BYOT would include then their phones, or their iPods, or mp3 players, their apps sometimes for neat little science projects and things. So they can use that. And bring the laptops in order to complete assignments and to learn in a different way. So I guess that's what it means.

- Mr. Belagio: Cell phones, laptops, calculators, all of those... the graphic calculators, it's all technology.

- Ms. Casey: They would have access to their e-books and to anything else that a teacher would want them to do online. I don't know what else—for me personally I wouldn't know what else it would be for.

- Ms. Manning: I think it means that we give students a different way to access their educational materials. And I think it's great because that opens up so many doors to giving them different ways of learning and different ways of input for the different topics that we talk about, especially in science.

- Ms. Ponce: Bring whatever you have and use it; utilize it as much as you can, for any purpose whatsoever.

“What does BYOT look like at your campus?” When asked about what BYOT looked like across campus, the teachers expressed that it varied depending on content area.

- Ms. Alvin: I think different people use it in such different ways, especially depending on the subject.

- Mr. Belagio: It's pretty much normally in the math department the things we're doing...she uses the graphic calculators and ties into the SMART Board. I know the language department does a lot of cool things with those. They've done presentations in that department... they do vocabulary, things of that nature. It's just not something that translates over—not just yet.”

“Do you invite other types of technology besides laptops? How do you plan for the different types of technology that students bring into the classroom and the actual content that needs to be taught?” Overall, the majority of teachers did not deliberately make plans to use other types of mobile technology, such as cell phones or tablets, in the classroom. Often,
teachers allowed students to use their cell phones, tablets, or e-readers if the students asked to use them.

- Ms. Alvin: Yes. And generally they'll ask permission beforehand for using it because they know that I can't really see their screen. But I'm walking around anyway. And they'll still have to, like, if they have a tablet, they have to prop it up on the—so that way I can still see their screen. But usually before they use their phone they'll ask permission. . . . But especially when the laptops are broken. Or if they want to find something fast without having to start up their computer. And they ask ahead of time, then I'll say yes. If they're using it, they didn't ask, then there's a problem. 'Cause generally it might be because they're trying to go somewhere else. But generally yeah, it's when their other technology is broken, they'll wanna [sic] use their phone. Or if they want it just faster without having to—like, if we're running out of time and they don't wanna [sic] start up their computer right before we leave. “Oh, can I check something real fast?” And so I'll say yes. Or they'll ask to play certain games. If they finish their work earlier or something, and there's an educational game or something that they wanna [sic] play, then that's generally fine.

- Mr. Lane: Sometimes with iPods as far as where they're doing independent assignments they wanna [sic] listen to it, and then searching dictionaries for looking up words.

Only one teacher allows the students to read on other mobile devices; however, she never allowed the use of cell phones.

Ms. Manning: Some of my kids when they're doing with their work or when they're done with their tests will use a Kindle or a Nook to read their book on, which is fine with me. Sometimes my kids will have iPads to just read things on, which is fine. I just don't like cellphone usage in my class. And at the beginning of the year, I told them my cellphone policy is that I don't wanna [sic] hear it and I don't wanna [sic] see it. Because I know that you're allowed to have them on you, but I don't want that as a kind of distraction. I don't want any sort of texting going on.

“How has your use of BYOT evolved since you first started using the innovation?” Three of the teachers quickly learned that they needed to closely monitor students with mobile devices and have since adjusted in the way they allow students to use this technology in order to do so.

- Ms. Alvin: Whenever we would go over notes and things, at first I would let them be on the laptops. But then we changed—I changed it because they were distracted too much on them. And then now, I make them all turn around whenever they're working on an assignment that's online, the second half of class. So that way I can see all their screens. And I try and walk around, but just in case I'm caught up at my desk, I can still see everybody's screen. But it's becoming more difficult actually these days
because they have iPhones and they have internet on their phones. Or they have the tablets. So if they have tablets, I make them prop it up on the little stand. But they know to ask teacher's permission before surfing the internet on their iPhone or smartphone.

- Mr. Belagio: It was just an adjustment going from textbooks to the laptops as far as things they could get into and have access to. So it makes you stay on your toes a lot more as far as making sure you gotta [sic] walk around and observe what they're doing.

- Ms. Ponce: I became more cautious. . . . there were instances where I noticed that my children were chatting online—I don't know what program they're using, but they're chatting on something together. . . . I've noticed that I have to really walk around to make sure that they're not on social media sites.

One teacher explained that her use continues to evolve. She was now attempting to learn a new program that would allow her to connect virtually with students who are at home. She shared the following about the program:

Ms. Casey: Helping my class and me learn how to do an online class from home, where they can actually see me do the teaching. And I can explain it to them. And so we did a practice session just last week with one of my classes, with my Block A class. And I could see the students as they logged on. So she could bring it—they had a camera on their computer. We could actually see one another.

Two of the teachers shared they use BYOT to take notes in class:

- Mr. Belagio: Mostly it was for notes. Notes and homework.

- Ms. Manning: I guess students started asking about ways that they could use the technology, for example just to take notes in class. And that was how I gradually started to get comfortable with it, is students just doing simple tasks on it, like writing notes and whatnot.

“If you were welcoming a new staff member to the school, how would describe BYOT to them?” The majority of teachers described BYOT as exciting and a way to engage students.

Two of the teachers said they would tell the new staff member about the challenges of managing the technology.

- Ms. Alvin: It is a neat, innovative way to get kids in today's world to be excited about learning in different modes. They have information accessible to them that wasn't
readily accessible in other modes. Maybe a stack of encyclopedias. It's just completely different from the old days.

• Mr. Belagio: I would say it's a really, really good thing. Really good. It's an exciting time 'cause the kids are so used to it. They know how to do a whole lot of things that sometimes we don't know how to do.

• Ms. Casey: The kids get a lot more engaged in the learning process when they're using their computers. And I think it's because it's just something that you're just used to. And it's just something that they get excited about. Much more so than a textbook.

• Ms. Manning: It's just great to be able to show kids things that you can't show them in the classroom. And so even though I would love to take all of my eighth graders outside to see a half pipe and apply the concepts of kinetic, potential and thermal energy out there, it's not feasible 'cause we don't have one.

The two teachers who shared about the management piece of BYOT explained the following:

• Ms. Manning: Definitely need to be aware of the fact that there's a great range of the type of technology that students have. Some students will have a mini book like this. Or some students will have a full on laptop PC. Others will have Macs. Their software can be so different. There's such a huge range. Some kids will have only a starter version of Microsoft Word, so it won't be able to open up everything. Some students now have Windows 10. And my computer died last semester, my old PC that I had for 4 years that I had I think Windows 8 on. And now I have a Mac, so it's—I don't know how to use the Windows 10. [laughter] It's really confusing to me.

• Mr. Lane: I think I would have liked to know the problems more, some of the issues with it. I think when I came in it was like, “oh they all have computers and it's great.” But then you get in and you do have some difficulties with it and adjusting. . . . Just that knowledge how much time it's going to take to kind of get things settled at the beginning would have been nice.

“What would you say are the expectations for BYOT for the staff?” Receiving detailed answers regarding what expectations were for teachers and their use of BYOT was a struggle. Most of their responses were about monitoring students and the expectations for usage. Below are the statements the teachers shared:

• Mr. Belagio: To remind us to make sure the students are turned so you can see the screen. If they're not turned, make sure you're walking around, make sure that you're aware of what they're doing.
• Ms. Ponce: Chatting. Pretty much chatting, cheating, not really listening. Although you can listen, and most students do listen, they are—they can minimize programs very quickly. Very quickly. And so yeah, so that's what I would say.

This is what teachers shared about the technology usage specifically:

• Ms. Alvin: Well, each teacher is in some way, shape or form, supposed to integrate technology even if their textbook is not online. And that students are to be engaged in all different areas, but as well with the technology. . . . technology offices, they'll e-mail us stuff every once in a while. We can look at it and use it if we want. But there's no set structured monitoring or anyone really checking per se.

• Mr. Belagio: They expect us to use it quite frequently. But they understand each class period is not gonna [sic] be using it the whole class period. And they don't expect us to be on the whole period.

• Ms. Manning: Well, for me first coming into it, I don't know if there were any expectations that were completely set out for me. We knew the basic things that we had to do. We had to post agendas on Edline, we have to update our grades every week, we have to have our Edline pages constantly updated with notes and with classwork, homework, tests and quizzes, etc. So that was one basic thing that we had to have.

• Ms. Ponce: What they wanna [sic] see? Well (a), that we use it. That we do use technology. It is here for us. And from the meeting yesterday, be careful.

“Where do you see yourself in the future regarding your use of BYOT?” The majority of teachers talked about their desire to continue learning about technology and ways to use it in the classroom. Three of the teachers shared specific things they wanted to learn about such as Skype, blogs, and incorporating more into their websites. Below are some of the comments the teachers shared:

• Ms. Casey: I know that I will be open to learning something more, how to use the computer. Because there's so much on the computer. Something that's a little bit more fun for them. That's kind of the way I see it.

• Ms. Manning: Gain more ideas of what I can do with the technology. And I'm hoping that through our next couple grad classes and the next semester, I'm hoping that I get to see what other teachers are doing with it. To figure out how teachers are able to manage their classrooms successfully, and be able to use that technology in a way that is helpful in their content area.

• Ms. Ponce: I'm hoping I'll be an expert.
Ms. Alvin: Using Skype and all of that, the blogs. I see that's where I'm headed in the next year or so.

Mr. Lane: And being able to implement more. I like idea of blogs. . . . it's something that I felt would be really cool. Just forums and discussion.

Mr. Belagio: Putting assignments on our website and just leaving notes and e-mails there just to be interactive.

“What has helped you in your use of BYOT?” The common theme in teachers’ responses to this question was about the support and help they had available at school, either from their peers, the technology director, or the students.

Ms. Alvin: Any idea you have, they're always there if you need help. Very available. So that's what I would say as far as help goes.

Mr. Belagio: [The technology director] is always traveling across the country doing the different workshops. And he comes back and gives us the updates. And each in-service when we come back, they're really good about giving us a couple hours to show us new things and to practice with it in the computer lab. And everyone around is—different teachers go up to different conferences, they'll come back and share in the faculty meetings. So everyone is just really willing to share the information that they have.

Ms. Casey: The support that I received from the people here. Because I could not have done it without the encouragement, without their support, without their help. And I have to say, and also the students. . . . They're excited about being able to help. I'll say so and so, come help me, show me how to do this. And they'll come and go, they'll show me, they'll tell me what to do. And the same way with the teachers here.

Ms. Manning: [The fact that] there's always support is really helpful, that there's always one person I can definitely go to and ask about the technology.

“What has been some of the barriers in your implementation of BYOT?” Teachers shared several different responses regarding the barriers they have experienced. Two teachers mentioned barriers related to managing the technology from day-to-day, and two teachers mentioned the monitoring of students. One of the new teachers said that simply being a new teacher was a major barrier. Below are what the teachers shared:
• Ms. Manning: Day-to-day frustrations of the fact that this doesn't work or the online textbook takes forever. And again, the comparisons between what I've had before and what's here now kind of hinder me in a way.

• Ms. Ponce: Definitely the wires. . . . Sometimes forget their chargers at home. Or sometimes some students, and they play games in class. And so their laptop is being taken up. And so when they come to my class, you need to have a laptop.

• Mr. Belagio: Probably the biggest challenge is if you do have a bigger class, just trying to get 'em [sic] all—it does take long—just turn their desk around so you can see everything that's going on on their screen. . . . But you really having to keep an eye on what they're doing. So that's just been the biggest adjustment that I have to make.

• Mr. Lane: Besides just being new at teaching, I don't think there's been too much that has hindered.

“How has the staff you work with influenced your adoption of BYOT?” A majority of teachers felt that their colleagues had the greatest influence on their own adoption of BYOT.

Below are statements that the teachers shared:

• Mr. Belagio: Everyone's really had a positive attitude about it. No one's really been negative, saying, “I don't know why we're doing this.” Everyone's really been upbeat and encouraging each other. This can really work and this feels good to be a part of a staff. And you can say, “Hey we were the first ones to do this.” Yes there were some bugs and some hiccups, but we were the first ones to do this.

• Ms. Casey: I have to say the people—the teachers. There are some teachers here, let's say the middle school teachers in my department.

• Ms. Ponce: I definitely get motivated by them. Most definitely. Every teacher wants to be the best of the best. That's just, it's an innate thing. [laughter] So for me it's getting motivated by the others.

Only one teacher felt the organization’s leaders had influenced her adoption through the professional development offered once a year. She said:

Ms. Alvin: They do have an in-service at the beginning of the year. And generally there's something on there with technology as well that we can choose from.

“What would be the most helpful for you to support you as you move deeper into your understanding and adoption of BYOT?” Teachers provided a variety of responses to this question without an overarching theme. The teachers felt that they needed (a) to collaborate with
others, (b) more technology, (c) people to show them how to do things, or (d) time. Below are the comments the teacher shared:

- Ms. Alvin: I can research different ways and see what people are doing at different schools and collaborate during in-service time.

- Mr. Belagio: iPads . . . so that we could be connected remotely to the projector. We could walk around simply clicking things and getting things to pop up.

- Ms. Casey: People . . . who are willing to sit down with me and actually show me how to do something. Because if somebody will do that, if they show it to me, I can do it.–

- Mr. Lane: I think it's time. I think it's just all the commitments. Soccer takes up a lot of time. And then planning a whole course now that you've never taught before. And time is probably the biggest help.

One point that was brought up several times by more than one teacher was the monitoring of students.

“What does it mean to prepare students for the 21st century to you?” All teachers who answered this question, five of the six, felt that preparing students for the 21st century must incorporate preparing students to use technology.

- Ms. Alvin: I think, yeah, just meeting them at their level. But then trying to promote higher order thinking. And while doing that, incorporating technology. Because that's what they're gonna [sic] be using. Real problem solving and being able to use the tools to their advantage. But I don't want them to lose other things though, like their imagination and their ability to think and process on their own, other than just going to answers.com.

- Mr. Belagio: Just to think outside the box, not just be defined to a classroom. . . . There's more than one way to skin a cat. Just 'cause you don't see it my way, it doesn't mean that you're wrong. But it's different processes to get to an end.

- Ms. Casey: That's hard. That really is hard. I think it's hard for me to say that because I don't know a lot about technology. But I do feel like it has to do with technology, that kids have got to be—have got to know how to use technology in so many ways in order to make it in the 21st century. Because it seems like every job no matter what it is, is gonna [sic] require you to have a good solid knowledge of technology.
• Ms. Ponce: Technology. [laughter] Pretty much. And how it affects every single part of our life, every aspect of the social—of the society, of opinions. Globalization is the way our own culture and mentality is being affected by other groups. And technology especially. And now where most of the jobs are being outsourced because it's cheaper elsewhere. They haven't prepared for that. They have to be better than everybody else in order to be successful in life. And that's why I think it's also incredibly important that they know how to deal and how to think originally, and how to use technology safely.

• Mr. Lane: I guess we live in a world where you have to be digitally savvy and competent to succeed. I think a lot of communication now is Internet, it's e-mail, Skyping, video conferencing, all that stuff. So being familiarized with that stuff before they maybe enter the job market is very important. And also getting them ahead of the curve a little bit with new technology. Because it changes so rapidly. What we're using now, by the time these kids graduate from college, it's gone, it's completely new.
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1. From Measuring Implementation in Schools: The Stages of Concern Questionnaire:  
p. 79-82. Stages of Concern Questionnaire (SoCQ 075), Appendix A and in electronic format as SEDL's Stages of Concern Questionnaire (SoCQ) Online at http://www.sedi.org/pubs/catalog/items/cbams21.html on the SEDL website  

2. From Measuring Implementation in Schools: Levels of Use:  
p. 18: Figure 3.1. Branching Chart  

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REFERENCES


http://bigthink.com/ideas/39666

http://campustechnology.com/articles/2006/02/special-double-feature-academic-mp3s-is-it-time-yet.aspx

http://science.opposingviews.com/ipad-12698.html


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Diefenbach, T. (2009). Are case studies more than sophisticated storytelling?: Methodological problems of qualitative empirical research mainly based on semi-structured interviews. *Quality and Quantity, 43*(6), 875-894. doi:10.1007/s11135-008-9164-0


