EFFECTS OF BRING YOUR OWN DEVICE INITIATIVES RELATED TO
INSTRUCTIONAL PLANNING AND THE CLASSROOM
ENVIRONMENT IN TWO TEXAS HIGH SCHOOLS

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This study was an examination of 20 North Texas high school teachers' perceptions about the effects of bring your own device (BYOD) initiatives on instructional planning and classroom environment. The BYOD initiative at two high school campuses was studied through a qualitative approach, i.e. a collective case study. Data were collected through interviews, classroom observations, and reviews of participants' lesson planning documents. The findings indicated teachers had to plan for inequitable technology access, technology support, effective classroom management, and relevant content to support student learning effectively. Teachers participated in professional development focused on planning for student devices, effective use of instructional technology, and classroom management during this type of instruction. Results revealed that, during instruction that included students' devices, teachers believed student engagement and content retention were greater. Observation data also indicated that students were more engaged in the instruction. The interviews and classroom observations indicated that students assumed a more active role in their learning during these lessons, and teachers facilitated and provided more support as needed. Effective planning and classroom management were identified as key components in the success of this type of initiative. Overall, the study supports the necessity for relevant professional development for teachers and campus administrators to ensure the success of BYOD initiatives. Similarly, these two groups should work together to develop the campus framework to support BYOD technology in the classroom.
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by

Shawn J. Miller
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# TABLE OF CONTENTS

ACKNOWLEDGEMENTS ................................................................................................. iii

LIST OF TABLES ........................................................................................................... viii

LIST OF FIGURES ......................................................................................................... ix

Chapter

1. INTRODUCTION ....................................................................................................... 1

   Problem Statement .................................................................................................... 4

   Purpose of Study ...................................................................................................... 6

   Research Questions .................................................................................................. 6

   Significance of the Study ......................................................................................... 6

   Conceptual Framework ............................................................................................ 10

   Definitions ............................................................................................................... 11

   Delimitations ........................................................................................................... 15

   Assumptions ........................................................................................................... 15

   Organization of the Study ....................................................................................... 15

2. REVIEW OF THE LITERATURE ............................................................................... 17

   Constructivism ........................................................................................................ 19

   Mobile Devices ........................................................................................................ 20

      Laptops ................................................................................................................ 20

      iPod and iPod Touch .............................................................................................. 27

      iPad and Tablet .................................................................................................... 31

      Cell Phone and Smart Phone .............................................................................. 34
**LIST OF TABLES**

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Participants’ Content Departments</td>
<td>69</td>
</tr>
<tr>
<td>2.</td>
<td>Summary of Most Identified Considerations</td>
<td>71</td>
</tr>
<tr>
<td>3.</td>
<td>Summary of Instructional Decisions-Student-Owned Devices Included</td>
<td>74</td>
</tr>
<tr>
<td>4.</td>
<td>Summary of Participants’ Experiences</td>
<td>76</td>
</tr>
<tr>
<td>5.</td>
<td>Summary of Participants’ Perceptions</td>
<td>78</td>
</tr>
<tr>
<td>6.</td>
<td>Summary of Teachers’ Observations</td>
<td>80</td>
</tr>
<tr>
<td>7.</td>
<td>Summary of Teachers’ Perceptions</td>
<td>83</td>
</tr>
<tr>
<td>8.</td>
<td>Classroom Observations–Student-Owned Devices Included</td>
<td>85</td>
</tr>
<tr>
<td>9.</td>
<td>Student Participation-Student-Owned Devices Included</td>
<td>86</td>
</tr>
<tr>
<td>10.</td>
<td>Learner-Centered Instruction–Student-Owned Devices Included</td>
<td>87</td>
</tr>
<tr>
<td>11.</td>
<td>Evaluation and Feedback–Student-Owned Devices Included</td>
<td>89</td>
</tr>
<tr>
<td>12.</td>
<td>Management–Student-Owned Devices Included</td>
<td>90</td>
</tr>
<tr>
<td>13.</td>
<td>Summary of Classroom Observations-Student-Owned Devices Not Included</td>
<td>91</td>
</tr>
<tr>
<td>14.</td>
<td>Student Participation–Student-Owned Devices Not Included</td>
<td>92</td>
</tr>
<tr>
<td>15.</td>
<td>Learner-Centered Instruction–Student-Owned Devices Not Included</td>
<td>94</td>
</tr>
<tr>
<td>16.</td>
<td>Evaluation and Feedback–Student-Owned Devices Not Included</td>
<td>95</td>
</tr>
<tr>
<td>17.</td>
<td>Management–Student-Owned Devices Not Included</td>
<td>96</td>
</tr>
<tr>
<td>18.</td>
<td>Review of Lesson Planning Documents–Student Devices Included</td>
<td>97</td>
</tr>
<tr>
<td>19.</td>
<td>Review of Lesson Planning Documents–Student-Owned Devices Not Included</td>
<td>100</td>
</tr>
<tr>
<td>20.</td>
<td>Summary of Data Sources Triangulation</td>
<td>102</td>
</tr>
<tr>
<td>21.</td>
<td>Summary of Participants’ Perceptions–Interviews</td>
<td>108</td>
</tr>
</tbody>
</table>
22. Summary of Classroom Observation–Student-Owned Devices Included..................................112
23. Summary of Classroom Observations–Student-Owned Devices Not Included......................113
24. Summary of Lesson Planning Document Reviews................................................................115
## LIST OF FIGURES

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Model of constructivism</td>
<td>11</td>
</tr>
</tbody>
</table>
CHAPTER 1

INTRODUCTION

Advances in technology and the demand for developing students’ 21st century skills have changed the types of learning experiences students are afforded. Teaching and learning both have an entirely different meaning for many of today’s teachers and students. The how and the where students are learning can be very different from one school district to the next (Bauleke & Hermman, 2010; Broussard, Herbert, Welch, Van Metre, 2014; Shapley, Sheehan, Maloney, & Caranikas-Walker, 2011). Some school districts are using blended learning options to meet the varying needs of their students. Students are provided with a variety of ways to illustrate their knowledge and varying learning styles are addressed more effectively (Broussard et al., 2014; Pape, 2010). In addition to traditional classroom instruction, some teachers are leveraging the capabilities of mobile devices and Web 2.0 tools. They are using online lectures, posting course content, posting homework, phone/video conferencing, texting, and using various social media (Bonk, 2010; Pape, 2010). A demand exists for schools to become more effective and efficient learning communities (Afshari, Bakar, Luan, Samah, & Fooi, 2009; McAnear, 2010; Rutherford, 2004). Technology use has become the focus of a great deal of educational reform. Federal, state, and local funds have been allocated to support the implementation of educational policies and technology integration in school districts (Berrett, Murphy, & Sullivan, 2012; Keengwe, Onchwari, & Wachira, 2008; Keengwe, Schnellert, & Mills, 2012).

Dessoff (2010) reported students, ages 8-18, dedicate on average 7 hours 38 minutes to using some type of personal/mobile technology device each day. With technology playing such a large role in students’ lives, some school districts are creating programs that include greater use of technology in classrooms (Dessoff, 2010). In an effort to create a learning environment more
closely aligned with the learning styles and technology interests of their students, school district leaders are considering a number of innovative changes. In addition to desktop computers in classrooms and multiple computer labs in schools, school leaders are providing student response devices, individual laptops, iPods, iPads, and cellular phones to support instruction. Loertscher (2011) reported some school districts are moving toward total digitalization with textbooks and devices, a number of schools have one-to-one programs that furnish each student with a computing device, and some schools have focused their spending on providing access to networks and cloud-based learning, while requiring students to bring their own devices to school.

Many districts have developed initiatives that focus on the effective use of technology in the classroom. School leaders have concluded that greater technology access does not guarantee improvement in teaching practices (Berrett et al., 2012; Donovan, Green, & Hartley, 2010; Inan & Lowther, 2010). Teachers must understand how to add academic value to the technology they are utilizing (Hlodan, 2010). Similarly, greater student achievement is not guaranteed with increased technology in classrooms. School district leaders are recognizing the critical need to do more than just provide additional computers to classrooms (Dessoff, 2010; Donovan et al., 2010; Keengwe et al., 2008).

School leaders have determined that there must be a change in classroom instruction, and the change must include the effective and relevant use of technology. Keengwe et al. (2008) explained it is essential that “the curriculum drive technology as opposed to technology driving the curriculum” (p. 562). Teachers must have sound knowledge of the curriculum, understand how their students learn, and possess some technology expertise. However, ensuring the teachers implementing technology to advance students’ learning experiences are equipped with the necessary skills will be a challenging task (Berrett et al., 2012; Subramaniam, 2007; Winne,
Demb, Erickson, and Hawkins-Wilding (2004) explained developing teachers’ imaginations and their skills to help them creatively integrate technology into their content areas is critical to the success of an initiative. The authors stated, “Achieving technology fluency at a proficiency level that equates with the ability to design technology enhanced learning experiences is much more challenging than asking faculty to use email, or create web pages supporting threaded discussions” (Demb et al., 2004, p. 399).

Developing this type of fluency requires a great commitment of time and attention by the teachers’ parts and an equal amount of professional development and technical support from the district or institution. School district leaders, campus leaders, and teachers will have to work together to support this type of critical change (Demb et al., 2004; Loertscher, 2011). Fullan (2003) found:

It takes a dedicated, highly competent teaching force working together for the continuous betterment of schools to produce and sustain a vital public school system; you cannot get teachers working like this without leaders at all levels guiding and supporting the process. (p. 5)

Loertscher (2011) agreed school leaders who recognized the greatest success with effective technology integration also experienced effective partnerships between tech directors, teacher librarians, teacher technologists, and classroom teachers.

This change in school leaders’ approaches to providing engaging instruction for students is causing a cultural change in education. This change was part of former President Obama’s plans for education addressed in the reauthorization of the Elementary and Secondary Education Act. The former president had a goal to ensure students are college and career ready in the 21st century (Dessoff, 2010). Former President Obama launched the Educate to Innovate, a digital
learning initiative to improve student achievement in science, technology, engineering, and math. The initiative included a digital media and learning competition to advance the most innovative approaches to learning through social media, games, and mobile devices. Colvin (2013) reported the administration had also initiated programs to install broadband access in rural areas in an effort to encourage telecommunications companies to provide low-cost data plans to low income households, increase access to educational resources produced by the government, and provide parents and students with easier access to education related data. In addition, former President Obama’s administration also identified relevant professional development for teachers in the area of technology integration and use in the classroom (Colvin, 2013). Along with Congress, the former president’s administration authorized the development of the Digital Promise center, to identify new technologies, assess the technologies, and ensure they meet the needs of students. The U. S. Department of Education also provided funding to examine how schools, museums, and libraries could best use technology (Dessoff, 2010). School district administrators and political leaders recognize the critical need for providing students with more beneficial experiences with technology and are attempting to leverage the use of technology devices that are compatible with the skills and interests of students.

Problem Statement

Accountability for student achievement and college and career readiness continues to be a top priority for school leaders. However, many students are graduating without the knowledge and skills they need to be effective in their post-secondary pursuits (Goode, 2010; Valentine & Bernhisel, 2008). Students require individualized learning which requires technology integration (McAnear, 2010). Unfortunately, school administrators have been unsuccessful at effectively
integrating technology into schools (Keengwe, Schnellert, & Mills, 2012; Loertscher, 2011; Shapley et al., 2011).

School leaders have been forced to consider other ways to address access to technology, and meet the learning styles and interests of their students (Fingal, 2012; Hill, 2011: Kennedy, 2012; Norris & Soloway, 2011; Ullman, 2011b). Fortuitously, various mobile computing devices have become affordable for an increasing number of families (D. Johnson, 2012). Subsequently, the numbers of students who are coming to school with their own mobile devices are increasing dramatically (Hill, 2011; Kennedy, 2012; Nelson, 2012; Norris & Soloway, 2011). Schools now have the opportunity to use students’ technology to cover curriculum and develop 21st century skills. Consequently, some school districts are implementing bring your own technology (BYOT) or bring your own device (BYOD) initiatives in which students bring their own device from home to use at school (Hill, 2011; Kennedy, 2012; Nelson, 2012).

While BYOD initiatives provide students with additional devices in the classroom, school leaders must ensure effective planning and instruction is occurring (Dessoff, 2010; Donovan et al., 2010; Keengwe et al., 2008). Consequently, identifying instructional practices for integrating technology in classrooms in a relevant manner has become a top priority for school leaders (Berrett et al., 2012; Donovan et al.; Hlodan, 2010; Inan & Lowther, 2010). Ensuring the teachers possess the necessary skills to plan for instruction, promote students’ learning, and maintain engaging classroom environments is challenging (Berrett et al., 2012; Subramaniam, 2007; Winne, 2006). Demb et al. (2004) indicated providing teachers with professional development that addresses their individual learning needs is a vital factor to the success of an initiative. School leaders require a greater understanding of teachers’ perceptions regarding BYOD initiatives and the effects related to instructional planning and the classroom
environment. Unfortunately, there is not an abundant amount of research that specifically addresses this topic.

Purpose of the Study

Bring your own device (BYOD) initiatives have been introduced in several North Texas school districts to enrich teaching and learning, individualize students’ experiences, advance the students and staff in a 21st century learning environment, and ensure students are college and career ready. The purpose of this study was to examine high school teachers’ perceptions about the effects of bring your own device initiatives on instructional planning and the classroom environment. The BYOD initiatives on two high school campuses in a suburban district were examined through a qualitative research approach, a collective case study. The research questions were designed to provide a better understanding of high school teachers’ experiences with bring your own device initiatives, regardless of whether or not teachers believe campuses should participate in the initiatives.

Research Questions

1. How do secondary teachers participating in a bring your own device initiative believe their instructional planning is affected?
2. How do secondary teachers participating in a bring your own device initiative believe the learning environment is affected by the initiative?

Significance of the Study

Goode (2010) explained students’ formative experiences and social context influence their skills and attitudes toward computing, and establish their technology identity. Goode (2010) found:
A technology identity represents a blend of four areas of an individual’s belief system: beliefs about one’s technology skills, beliefs about opportunities and constraints to use technology, beliefs about the importance of technology, and beliefs about one’s own motivation to learn more about technology. (p. 498)

Students who learn more about technology with users who are knowledgeable about technology, develop a strong technology identity (Goode, 2010).

With school administrators’ instructional leadership responsibilities comes an expectation to ensure teachers provide engaging lessons and activities that incorporate various forms of technology, and all students will have beneficial learning experiences with technology. Learning experiences enriched by technology can support students’ development of 21st century skills and better prepare them for the increasing expectations and demands of the global workplace (Broussard et al., 2014; Peluso, 2012; Shapley et al., 2011). Effective leadership is a critical factor in determining the success of technology integration in schools. Teachers require guidance and support throughout this type initiative (Afshari et al., 2009; R. E. Anderson & Dexter, 2005; Broussard et al., 2014; Daresh, 2006; Hayes, 2006). Afshari et al. (2009) found “leadership is a key component in guiding the teaching—learning process necessary for preparing today’s students with relevant knowledge and skills in today’s society to become a productive citizen of the twenty-first century” (p. 236).

According to Cramer and Hayes (2010), 93% of U.S. teens go online, 73% use social networking sites, 75% own a cell phone, and 66% use text messaging. Hlodan (2010) added 74% of teen-agers owned an iPod or MP3 player and 73% had a desktop or laptop computer. Children under the age of 12 are one of the fastest growing mobile technology users, and 93% of six to nine year olds live in a home with a cell phone. Morgan (2010-2011) reported while research
showed enthusiasm over many computing devices decreased over time, motivation to use handheld computers increased with time. Students spend more than 1,200 hours annually at school, but these technologies are not often used despite the students’ significant connection with technology and their potential to improve learning (Cramer & Hayes, 2010; Donovan et al., 2010).

Some schools continue to depend on an inadequate number of computers in computer labs and library/learning centers, while they prohibit the use of personal devices from school networks (Loertscher, 2011). Rutherford (2004) suggests while K-12 instruction has made progress with technology use, it is not being used effectively in the areas of analytical power and memory capacity, interactive and mobile capacity, and presentation capabilities of print and audiovisual technologies. High school students are graduating without the necessary skills and preparation for either post-secondary education or the workforce (Valentine & Bernhisel, 2008).

Technology is pervasive on college and university campuses. Students use various mobile devices as they make their way to and from classes, access various facilities, and communicate with friends, classmates, and instructors. Some campus facilities provide public computer terminals, and most campuses provide free wireless access for students and staff. Students are expected to manage their course enrollment online, apply for financial aid online, and read general announcements online (Goode, 2010; Jones & Healing, 2010). Goode (2010) adds students must utilize electronic databases, conduct research using electronic resources, complete multi-media assignments, turn in assignments via email, and use specialized content software to acquire deeper academic knowledge. Goode (2010) concluded, “Knowing how to utilize the technological ecosystem of university life is certainly critical for academic success” (p. 498).
College and university leaders are working to provide students with the classroom experiences and resources that will address their needs and interests. With rapid advancements in digital devices, software, and online communities, instructors believe they are obligated to update their instructional practices to take advantage of new teaching and learning opportunities. To ensure the most effective use of resources, department leaders are attempting to gather information regarding advancements in technology and students’ habits (Valentine & Bernhisel, 2010). There has been recent inquiry into high school and college students’ technology use, including the types of devices students use, online resources students access, and the practices that high school students might continue in college (Jones & Healing, 2010; Valentine & Bernhisel, 2010). Erlandson (2011) reported due to the increase in and integration of mobile devices in undergraduate students’ lives, many college and university leaders are experimenting with ways to incorporate mobile devices into the classroom. In addition, many university libraries include mobile technologies to connect undergraduates with library materials, resources, and services. Several universities have invested in programs to provide students with mobile devices either at no cost or at a significantly discounted price (Hlodan, 2010). Mobile devices have the potential to create new opportunities for learning beyond the classroom (Cramer & Hayes, 2010; Hlodan, 2010).

While there have been many studies addressing one to one device initiatives, there has been very little written about or research completed on bring your own device initiatives. In addition, even less has been written about high school campuses specifically participating in this type of initiative. Creswell (2003) explained exploratory studies are most beneficial when “not much has been written about the topic or the population being studied” (p. 30).
Conceptual Framework

Bring your own device (BYOD) initiatives have been introduced in school districts to enrich teaching and learning, individualize students’ experiences, advance students and staff in a 21st century learning environment, and support college and career readiness (Broussard et al., 2014). Students are allowed to bring their personal devices to school and use them with their teachers’ approval. Students are able to access and save information, communicate with other learners, and use tools loaded on their devices. Students are able to take a more active role in leading their learning, while teachers guide and facilitate the learning. They are able use various tools to experiment and develop their knowledge and skills. Students are able to learn by doing and experiencing hands-on activities. The conceptual framework for this collective case study is grounded in constructivism.

Jia (2010) stated, “The first who contributed a lot to the development of constructivism thought and apply it to classes and students’ learning and development are Jean Piaget and Lev Vygotsky (p. 197). Semmar and Al-Thani (2015) reported that Piaget’s theory of constructivism is based on discovery, and an effective learning environment affords students the opportunity construct knowledge that is relevant and meaningful to them. Vygotsky’s theory of constructivism views learning and development as a collaborative activity, and that develop in the context of socialization and education. The teacher’s role in learning is very important. The teachers utilize various strategies to guide students and clarifying their understanding (Semmar & Al-Thani, 2015). Figure 1 is a visual representation of constructivism in this study.
Figure 1. Model of constructivism.

Definitions

21st century skills—Since 2002, the Partnership for 21st Century Skills have been the leading advocacy organization in the United States focusing on infusing 21st century skills into education. The organization developed a framework composed of the following components:

- Core subjects and 21st century themes, such as language arts, mathematics, global awareness, and financial literacy.
- Learning and innovation skills, such as creativity and innovation and critical thinking and problem solving.
- Information, media, and technology skills.
- Life and career skills, such as initiative and self-direction (P. Johnson, 2009)

Blended learning—formal education program in which a student learns:

- At least part through online learning, some element of student control over time, place, path, and/or pace.
- At least in part in a supervised brick and mortar location away from home.
- The modalities along each student’s learning path within a course or subject are connected to provide an integrated learning experience (Christensen Institute, n.d.).

*Bring your own device*—Students bring their own mobile device from home to school for during learning activities (Hill, 2011).

*Clicker*—personal response system, student response system, or classroom response system (PRS/SRS/CRS) that allows individual students to response to questions electronically. The technology allows an instructor to present a question or problem to the class, and receive answers from the students through a response device. A summary of the answers is presented for the teacher and the students to see (Stav, Nielsen, Hansen-Nygard, & Thorseth, 2010).

*Cloud-based computing*—Allows the user to use software and store data on servers accessed through the web. This option prevents the need for significant storage on the user’s computer (Kuehn, 2010).

*College and career readiness*—High school graduates has the knowledge and skills in English and mathematics necessary to qualify for and succeed in entry-level, credit-bearing postsecondary coursework without the need for remediation. In addition, they have the knowledge and skills needed to qualify for and succeed in the postsecondary job training and/or education necessary for their chosen career (Achieve, Inc., 2017).

*Digital divide*—The disparities in accessing and using digital technology (Goode, 2010).

*Elementary and Secondary Education Act*—The Elementary and Secondary Education Act of 1965 (ESEA) was first passed by Congress as part of Lyndon B. Johnson’s War on Poverty and a Great Society program. The act allocates federal funding for primary and secondary school education and a national curriculum. This act also provided a mechanism for holding schools accountable and increased equality in education nationally (FindLaw, 2017).
Instructional Leadership Development (ILD)–ILD is a 36 hour/5 day training session designed to supplement the instructional leadership administrator certification.

IPad—a line of tablet computers designed and marketed by Apple Inc. The user interface is built around the device’s multi-touch screen, including a virtual keyboard. The iPads have built-in Wi-Fi and some models have cellular connectivity. The iPad can shoot video, take photos, play music, and perform internet functions such as web-browsing and emailing (D. Johnson, 2013; Lamb & Johnson, 2012; Miller, 2012; W. Wong, 2012b).

iPod—a palm size electronic device created primarily to play music and store large numbers of tracks (Bauleke & Hermman, 2010).

iPod Touch–The iPod Touch is: “Apple Inc.’s newest iteration of the original device, the iPod. Its design is radically different from previous models” (Auchincloss & McIntyre, 2008, p. 46). The author explains the device no longer has controls and a separate video display on its operating face. The iPod touch has done away with all physical buttons except the on/off switch. The device’s entire operating face is a touch sensitive video display that can present touch controls depending on the function selected. The new device has a screen that can become a keyboard; there is still a music player and the larger screen allows for text, images, and video. The device also has wireless capabilities and internet access (Auchincloss & McIntyre, 2008).

Mobile learning (m-learning)—any type of learning that takes in learning environments and spaces that take account of the mobility of technology, mobility of learners, and mobility of learning (Rossing et al., 2012)

Professional development and appraisal system (PDAS)—PDAS was the state-approved instrument for appraising teachers and identifying areas that teachers would benefit from training or professional development (Region 13 Education Service Center, 2017).
Podcasting—teachers upload lectures, materials, and presentations to a podcasting service, where students can then download the information to their own iPod or MP3 player (Patten & Valcarcel-Craig, 2007).

Student engagement—focused on activities, consistently applying learning strategies; interacting with each other about their work; problem solving through their activities; and regularly finding information, making sense of it, and communicating it (Fox, 2006).

Technology—the application of knowledge, tools, and skills to solve problems and extend human capabilities. Technology offers new capabilities that lead to significant changes in an organization (Afshari et al., 2009).

Technology identity—A framework to explore how formative experiences and social context influence skills and attitudes toward computing. It represents a blend of four areas of an individual’s belief system: beliefs about one’s technology skills, beliefs about opportunities and constraints to use technology, beliefs about the importance of technology, and beliefs about one’s own motivation to learn more about technology (Goode, 2010).

Web 1.0—Internet applications allow the user to gain information through surfing, browsing, and consuming (Thompson, 2008).

Web 2.0—Internet applications that allows and/or encourages the average internet user to connect, collaborate, and develop and share information online (Thompson, 2008).
Delimitations

I established the delimitations or boundaries. In an effort to gain a better understanding of secondary teachers’ perceptions about participating in a BYOD initiatives, only secondary teachers participating in a BYOD initiative were invited to participate in the study. The sample population is comprised of high school teachers on two campuses in the same district. This district was participating in a BYOD initiative. The participants’ technology skills level, comfort level with student devices, and their level of interest in providing instruction for students utilizing student-owned devices varied to allow me to gain a better understanding of the diverse perspectives regarding BYOD initiatives. A small sample size was used in this study to allow me to interact with the participants for extended periods of time.

Assumptions

The following assumptions were made. The participants were honest during their interviews. The participants had enough experience with instructional planning, assessing levels of student engagement, and monitoring classroom environment that they were able to recognize the effects of utilizing a BYOD initiative. The interview questions reliably measured the teachers’ perceptions of the effects of participating in a BYOD initiative.

Organization of the Study

This study is divided into five chapters. The first chapter includes an introduction, the background of the study, the purpose of the study, a problem statement, the significance of the study, research questions, methodology, definitions, delimitations, assumptions, organization of the study, and a summary. The second chapter includes a review of the literature. In the third chapter, I discuss the research design and the methodology. I present the results and/or the
findings of the study in the fourth chapter. Finally, the fifth chapter is a summary and discussion of the results or findings.
CHAPTER 2
REVIEW OF THE LITERATURE

New technologies are changing how students access information, communicate, and learn inside and outside of the school. In addition, students’ use of technology outside of the classroom is changing their learning styles, strengths, and preferences (Donovan et al., 2010; Shapley et al., 2011). Fullan (2003) indicates “only principals who are equipped to handle a complex, rapidly changing environment can implement the reforms that lead to sustained improvement in student achievement” (p. 16). School administrators are expected to ensure teachers incorporate various forms of technology in their instruction. Many districts include some reference to using technology or affording students the opportunity to work with technology in their vision and/or mission statements. School leaders have identified this as a critical component of providing diverse students with a quality education (Shapley et al., 2011). Afshari et al. (2009) explained instructional technology is considered to be a critical component of educational quality in the new millennium. A number of educators believe if used effectively, computing devices can enhance teaching and learning (Bauer & Kenton, 2005; Flanagan & Jacobsen, 2003).

Guhal and Leonard (2002) focused on the impact that the teacher can have on student motivation through effectively using technology in the classrooms. They found that utilizing computers in the classroom can be motivating for students and increase students’ level of engagement in class activities. DeVoogd (1998) concurred that the effective use of technology in classrooms promotes active student participation. Similarly, schools must capitalize on students’ natural inclination as learners (Shapley et al., 2011).

A critical factor in the effective use of technology is planning instruction that addresses student differences (DeVoogd, 1998; Kalyanpur & Kirmani, 2005). Kalyanpur and Kirmani
(2005) examined the relationship of technology and diversity regarding the implications of the inequity of access and usage for under-represented groups. These groups included low-income, minorities, and students from culturally diverse backgrounds. The results of their study indicated a *digital divide* exists between certain groups. This of course creates a greater challenge for educators. While they may have more technological resources at their disposal, many of their students have not been exposed to some forms of technology in their homes or communities. These students require more direction and support initially. Using technology in a way that is sensitive to socio-economic and cultural differences promotes active participation from all students (Kalyanpur & Kirmani, 2005). Teachers and administrators must provide as many opportunities as possible for all students to experience technology. Classrooms that afford students consistent technology experiences foster a greater use of technology throughout other content areas (Russell, Bebell, & Higgins, 2004). Without beneficial experiences with various forms of technology, students’ opportunities will be limited. In today’s age of high technology, navigating through life without some technology skills would be very challenging (Daresh, 2006).

In this literature review, I examine constructivism, some of the more prevalent types of mobile devices used in the classroom, and the implications for students and teachers using technology to support learning. In addition, I explore some of the Web 2.0 applications that enhance mobile devices’ capabilities. The review also provides research on Bring Your Own Device initiatives that have been implemented in school districts. Finally, I examine considerations for school district leaders and the professional development needs for teachers.
Constructivism

Gall, Gall, and Borg (2007) defined constructivism as “the epistemological doctrine that social reality is constructed, that is constructed differently by different individuals, and that these constructions are transmitted to members of a society by various social agencies and processes” (p. 22). Richardson (2003) shared many theorists place constructivism into three categories: sociological, psychological, and radical constructivism. Glesne (2006) reported most qualitative researchers adhere to social constructivism or a constructivist paradigm. The author explained,

This paradigm maintains that individuals construct their perceptions of the world, that no one perception is “right” or more “real” than another and that these realities must be seen as a whole rather than divided into discrete variables that are analyzed separately.

(Glesne, 2006, p. 7)

Lev Vygotsky’s contribution to constructivism is drawn from his theories regarding language, thought, and how they are affected by society. Vykotsky believed that process of knowing or gaining knowledge is affected by interactions with other people and mediated by the community and culture (Amineh & Asl, 2015). Jean Piaget theory about constructivism focused on two components, one that examine what children could learn at various stages; and a second component that focused on how children develop cognitive abilities. Amineh and Asl (2015) reported, “Piaget asserts that learning does not occur passively; rather it occurs by an active construction of meaning” (p. 10).

The social constructivist perspective focuses on the varied local worlds, numerous realities, and the complexities of specific worlds, views, and actions (Creswell, 2007; Miles & Huberman, 2002). Rapport, reflexivity, and trustworthiness are examined more closely than the scientific values of validity, objectivity, and generalizability in constructivism (Glesne, 2006).
Brooks and Brooks (1999) stated that constructivism is a theory of learning that describes the important role that learners’ mental schemes play in their cognitive growth. Constructivist teachers recognize the importance of students’ points of view. They utilize students’ perspectives to develop lessons and provide differentiated instruction. The authors shared,

Constructivist teachers structure lessons to challenge students’ suppositions. All students, whether they are 6 or 16 or 60, come to the classroom with life experiences that shape their views about how their world work. When educators permit students to construct knowledge that challenges their current suppositions, learning occurs. (Brooks & Brooks, 1999)

Constructivists recognize that students must find relevance in their learning and the curriculum. Students’ interest in learning is greater when they can see the relevance. They structure their lesson in a manner that focuses on the big concepts and provide guidance to help students identify the relevant content (Brooks & Brooks, 1999). Students’ learning is assessed in a variety meaningful ways.

Yilmaz (2008) stated constructivist teaching provides learners with relevant concrete learning experiences that allow them to identify patterns, construct questions, develop their own models, concepts, and strategies. The author stated, “The classroom becomes a micro-society in which learners jointly engage in activity, discourse, and reflection. Teachers facilitate and guide rather than dictate autocratically” (p. 169) Students’ learning process is the focus in a constructivist class, not the student’s product (Yilmaz, 2008).

Mobile Devices

In this section, I will review some of the more prevalent mobile devices being used in classrooms. First, I will review laptops, then iPods, iPod Touches, iPads, and tablets. Finally, I will review cell phones and smart phones.
Laptops

Advances in laptop technology have made it possible for widespread integration and it is now practical and appealing (Cardellino & Leiringer, 2014; Granberg & Witte, 2005). Laptops have greater technical capabilities, are more manageable in size and weight, and have become relatively inexpensive. Both primary and secondary institutions across the world have initiated some type of campus-wide program using laptop or notebook computers (Brown, 2002; Cardellino & Leiringer, 2014; Warschauer, Zheng, Niiya, Cotton, & Farkas, 2014). Student to computer ratio has become a key focus in school districts’ efforts to increase students’ use of computers and access to emerging technologies (Cardellino & Leiringer, 2014; Warschauer et al., 2014).

Some districts have provided laptops in their computer labs, classrooms, science labs, and libraries. Many middle and high school computers are located outside of the classrooms settings, while elementary schools place computers directly in the classrooms at ratios that require the teachers to rotate students on and off the computers (Bebell, Russell, & O’Dwyer, 2004). Fox (2006) reported schools are placing large numbers of portable computer carts (Computers on wheels or COWS) in classrooms in an effort to increase access or create a temporary 1:1 environment. However, there are some districts that have taken a more individualized approach to meeting the need for student access to technology and have provided some of their students with individual laptops to use (Fox, 2006; Owens, Farsaii, Knezek, & Christensen, 2006; Shapley et al., 2011). Keengwe, Schnellert, and Mills (2012) reported an increasing number of states and schools districts purchasing laptops for students and teachers. While school districts may design their 1:1 laptop initiatives with varying academic or instructional focuses, the general purpose is individual students will have access to a laptop. Some initiatives are designed to
include classroom instruction/activities and homework, while others may only include classroom work. In addition, some initiatives are focused on content-specific skills or improvement in standardized testing scores in response to the increasing areas of accountability for school districts (Donovan et al., 2010; Fox, 2006; Shapley, et al., 2011). Instructional use may vary.

Fox (2006) presented data that supports 1:1 laptop initiatives and the benefits to students, teachers, and their learning. Laptop use supports the utilization of effective learning strategies, and enables students to transfer knowledge across disciplines. Fox (2006) also indicated this occurs because students using laptops are highly engaged and focused on activities; consistently applying learning strategies; interacting with each other about their work; problem solving through their activities, and regularly finding information, making sense of it, and communicating it. Research also indicates students engaged in collaborative work and participating in more project-based learning have higher levels of motivation (Crook, Sharma, & Wilson, 2015; Donovan et al., 2010; Dunleavy, Dexter, & Heinecke, 2007; Owen et al., 2006; Shapley et al., 2011; Warschauer et al., 2014). In addition, Demb et al. (2003) reported students found their laptops to be an important part of their academic success. These students appreciated the convenience of laptops, and were able to identify a number of examples of how the computer was useful to their learning. In addition, students participating in 1:1 laptop initiatives considered themselves more proficient in various technology skills than non-laptop students. Increased access to and use of computers was also linked to students’ technology proficiency (Shapley et al., 2011).

Barron, Harmes, and Kemker (2005) found the combination of laptops and software allowed teachers to expand classroom instruction beyond the four walls of the traditional classroom, and learning was more innovative. Engagement levels were also very high, and
students were able to use the laptops to build critical thinking skills and create authentic projects. The teachers attributed these high levels of engagement to the technologically enhanced lessons (Barron et al., 2005). Several studies recognized the positive effects that increased access to technology (via 1:1 laptop programs) had on student engagement (Donovan et al., 2010; Owen et al., 2006; Shapley et al., 2011). Holcomb (2009) reported laptop initiatives were on the rise, and that laptops support improvements in educational settings. In addition, Holcomb explained, “Implementation across the country has been successful in not only increasing student engagement and motivation but also improving student achievement measures” (p. 6).

Many studies have been conducted to address the effects of 1:1 laptop initiatives on student achievement. In a study examining the effects of 1:1 laptop initiative on student achievement in the areas of math and science, Dunleavy and Heinecke (2007) suggested 1:1 laptop instruction positively affects student achievement in science. In addition, the researchers found a gender effect in science achievement with boys in the initiative outperforming girls in the initiative. While there were no significant effects in math achievement recognized, the results indicated 1:1 laptop instruction can increase student achievement under certain conditions. Clariana (2009) indicated students utilizing laptops in an upper mathematics class outsored students who were not using laptops in the same course. Both groups of students accessed the same math software; however, the non-laptop students used desktop computers in the classroom and in the computer lab (Clariana, 2009). The students were allowed to work at their individual pace and assume responsibility for their learning. The teacher’s role shifted significantly toward one-to-one interactions with students, with increased progress monitoring. Shapley et al. (2011) reported an evaluation of a laptop project in Beaufort County, West Virginia found students participating in a program for two years had higher language, reading, and math scores than non-
laptop students. Access to technology positively affected student achievement, but the data did not indicate a significant effect on student achievement in math.

A much stronger relationship has been identified between laptops and achievement in the area of writing. Lowther, Ross, and Morrison (2001, 2003) reported significant effects of laptops on the achievement of sixth and seventh graders in the areas of idea and content organization and style. Rockman, Walker, and Chessler (2000) found students using laptops scored higher than non-laptop students on writing objectives. A study on the effects of laptop use on students writing identified significant improvements (Silvernail & Gritter, 2007).

Mouza, Cavalier, and Nadolny (2008) found laptops can support changes in teaching and learning, and positively affect the academic experiences of traditionally low performing students in career and technology courses. In addition, research showed access to laptop computers enabled teachers to address the individual needs, strengths, and learning styles more effectively of their students (Dunleavy et al., 2007; Owen et al., 2006; Shapley et al., 2011). Instruction and activities were designed to have greater impact on individual students, and clear, focused progress monitoring was facilitated. These teachers were also able to provide the students with academic and technological skills important for living, working, and post-secondary education. In addition, teachers reported a decrease in student discipline and classroom management challenges (Shapley et al., 2011).

In this age of accountability, there is a focus on students’ performance on standardized tests. State officials and school district administrators exert a great deal of effort trying to identify ways to increase scores and effectively measure student gains. Holcomb (2009) suggests there are disconnects between standardized assessments and the benefits of 1:1 initiatives. Some
of the skills inherent in 1:1 initiatives do not align with standardized tests. This creates difficulty in assessing the educational impact of laptop initiatives (Rockman, 2004).

Research indicated 1:1 laptop initiatives implemented with fidelity can positively affect both the students’ and the teachers’ experiences in the classroom. A key component to the implementation a laptop initiative is the teachers selected to provide the instruction (Clausen, Britten, & Ring, 2008). Students’ perceptions of the value of their laptops to their academic success are directly related to their perception of their teachers’ utilization of the technology for teaching. Students are looking to the teachers for quality instruction and a level of engagement that encourages them to produce in the classroom. Content instruction must be supported or enhanced by the laptops (Demb et al., 2004; Keengwe, Schnellert & Mills, 2012). Hembrooke and Gay (2003) concluded there is a need for establishing guidelines for the use of this type of technology if it is going to benefit instruction and enhance student success. The researchers stated laptops used for “high tech doodling can defeat the purpose of using them in the first place” (p. 61). Price and Ricci (2009) concur this type of technology can greatly benefit student learning, if teachers are prepared to make the necessary investment in their professional development and accept technology as a valuable resource. It is not the presence and usage of the laptops that positively affect students’ level of engagement, but it is the way in which the laptops are utilized in the classroom (Beeson, Journell, & Ayers, 2014; Clariana, 2009; Owen et al., 2006; Price & Ricci, 2009; Warschauer et al., 2014).

Clausen et al. (2008) reported schools that had laptop initiatives did not maintain instructional use of the technology available in a manner that would increase collaborative, problem-based, and student-centered instruction. Administrators in those schools indicated students were not using the laptops for the intended purpose detailed in teachers’ plans, and
enthusiasm to implement the initiative was not high in the K-12 environment. Administrators must examine how and why laptops are used in education. School leaders considering implementing an initiative must review existing initiatives for guidance and support (Holcomb, 2009; Owen et al., 2006). This information will impact the design of laptop initiatives and the instructional support and training that teachers and students receive throughout these programs.

While there have been some challenges with 1:1 initiatives, other stakeholders have recognized some advancements. Teachers have become empowered to improve their teaching and instructional practices (Holcomb, 2009). Holcomb reported teachers in Michigan’s Freedom to Learn laptop program reported greater confidence in their ability to meaningfully integrate laptops with curriculum standards in comparison to national norms. Additionally, over 70% of teachers surveyed reported the laptops helped them with effectively meeting their curriculum goals and individualizing instruction to meet students’ needs. Rockman et al. (2000) reported teachers in laptop schools illustrated significant progress toward constructivist teaching and were more apt to encourage student led inquiry and collaboration.

Research indicates that use of laptops in classrooms can reinforce learning, support students’ transferring of knowledge across disciplines, and contribute to gains in student achievement (Fox, 2006; Keengwe, Schnellert, & Mills, 2012). Student engagement and motivation are positively impacted as well. Teachers are able to provide instruction which incorporates the interests and learning styles of students (Barron et al., 2005; Keengwe, Schnellert, & Mills, 2012).

Similarly, researchers have identified some barriers to laptop initiatives. With the cost of this type of initiative, administrators must deal with the issue of equity across campuses and classrooms. All students and teachers should be afforded the opportunity to benefit from these
technology tools (Fox, 2006; Warschauer et al., 2014). Lack of teacher commitment has been discussed in several studies as well (Keengwe, Schnellert, & Mills, 2012). The intentional selection of supportive participants (teachers), effective preparation and training, and consistent instructional and technical support will increase teacher commitment and the integrity of the initiative (Donovan et al., 2010; Dunleavy et al., 2007; Owen et al., 2006). Another important barrier identified was the lack of data to support a positive correlation between one-to-one laptop use and gains on standardized tests. Through effective progress monitoring and measuring students’ achievement by their mastery of state-mandated performance standards, school districts are able to determine if their instructional practices are effective. However, school districts will need to develop measures for accurately assessing student achievement as it is impacted by one-to-one laptop instruction (Rockman, 2004).

*iPod and iPod Touch*

With school districts’ access to advancing technologies, campus leaders have been able to consider forms of technology more closely aligned with not only students’ learning styles, but their interests as well. One tool that engaged students and maintains high interest is the iPod (Bauleke & Herrmann, 2010). The iPod is a palm size electronic device created primarily to play music and store large numbers of tracks. Bauleke and Herrmann indicated one third of teens report owning an iPod. Teachers and administrators are recognizing the benefits of using this type of technology. They hold students’ interests and teachers are able to design effective instruction utilizing iPods (Bauleke & Herrmann, 2010). In addition, utilizing iPods in the classrooms has proven to be beneficial for students with diverse needs (Bauleke & Herrmann, 2010; Buffington, 2010; Crompton, Goodhand, & Wells, 2011). Patten and Valcarcel-Craig (2007) found:
iPods have invaded the teaching and learning as digital methods replace traditional methods of delivering information. Podcasting, for example, enables teachers to upload lectures, materials, and presentations to a podcasting service, where students can then download the information to their own iPod or MP3 player. (p. 41)

Teachers are developing podcasts to share information with students, and students are developing their own podcast presentations to share and critique. Additionally, students are able to access content at any time and in any location (Banister, 2010; Buffington, 2010). Kidd (2012) added podcasting is simple, inexpensive, easily accessible, and it is a means for examining learning opportunities through social media. Stav et al. (2010) reported students and teachers found “clicker” or student response system (SRS) capabilities of the iPod and iPod Touch very beneficial. Clickers or SRSs allow the teacher to assess student learning formatively through the collection of learning objective data. Furthermore, research shows this capability has the potential to support participation, collaboration, physical activity, cognitive involvement, and self-assessment (Stav et al., 2010). In addition, iPods are being used in the language labs to record vocabulary, conduct question and answer conversations, check pronunciation, and store language exercises for instant replay (Patten & Valcarcel-Craig, 2007).

Bauleke and Herrmann (2010) reported an English Language Arts teacher used iPods to help his students make connections between lyrics and literature. The teacher wanted to help his students understand the concept of theme in literary works. The students were asked to select songs that were on their iPods, examine the lyrics, and connect them to a piece of literature. The students were also expected to present to their classmates. The teacher found the iPod project caused students to develop a deeper understanding, use their critical thinking skills, develop flexibility, and use technology. Buffington (2010) reported iPod capabilities allow students to pose questions, observe details, and speculate about content. The results of the project were consistent with research findings that stress the importance of active learning, giving students
choices, and using multimedia to achieve emotional impact needed to reach today’s students (Bauleke & Herrmann, 2010; Martineau, 2008).

Patten and Valcarcel-Craig (2007) reported on the results of four action research studies conducted in elementary and middle schools focusing on using iPods with English Language Learners (ELL) to promote reading, writing, listening skills. Four teachers designed the project to use iPods as companion devices to reading the print version of trade books. The four teachers used the iPods differently based on students’ needs. They used journal activities, accelerated reading tests, literature circles, and podcasts depending upon their focus. Results indicated students writing scores improved, frequency of academic vocabulary was higher, depth of discussions was greater, and journal writings had higher frequency of descriptive language, and the students’ writing was more focused. In addition, students scored higher on the accelerated reading test, demonstrated increased interest, better comprehension, and exhibited an increase in the depth in journal writing (Patten & Valcarcel-Craig, 2007). Martineau (2008) added student use of iPods to listen to their reading allowed them to identify their own errors and improve their fluency.

Auchincloss and McIntyre (2008) discussed the benefits of using the iPod Touch during instruction with students. Students are able to work individually with lessons or activities designed to meet their needs at home or at school. Students are able to access class resources to support their learning, and transfer content from a computer to an iPod touch. Research indicated the iPod touch allowed teachers to individualize instructions based on students’ needs for school and home use (Auchincloss & McIntyre, 2008; Banister, 2010; Buffington, 2010; Johns, 2008).

Crompton et al. (2011) reported the use of the iPod Touch allowed students to access information, organize their thoughts, and work collaboratively. Students were highly motivated
and engaged in instruction (Crompton et al., 2011). Dale (2008) identified increased student motivation as an effect of participating in iPod programs as well. An increase in student engagement was reported in several studies focusing on the effects of iPod use (Bauleke & Herrmann, 2010; Dale, 2008; Martineau, 2008).

Murray (2010) examined various implications of using iPods, iPhones, and other mobile devices in the classroom by reviewing the experiences of teachers and students in a range of mobile learning projects. Researchers investigated student use of mobile technologies, both at home and school, and examined changes in teacher pedagogy (Banister, 2010; Dale, 2008; Martineau, 2009; Murray, 2010). Murray (2010) indicated the use of mobile technologies increased the level of high-order thinking and caused the teachers to re-examine their teaching practices. The teachers used more of a consultative approach promoting teamwork. Use of mobile technologies has a potential for change in instruction to a more learner-centered approach (Banister, 2010; Murray, 2010). Murray (2010) reported use of the various mobile devices resulted in improved attendance, greater participation, and increased preparation and organization; students completed more of their class work and homework. Martineau (2009) reported participating in iPod programs resulted in gains in student achievement and attendance rates. Mobilized learning supports personalized learning by stimulating learners to want to learn (Murray, 2010; Martineau, 2009). Dale (2008) added use of the iPod promoted creativity and deeper learning.

With the numerous iPod applications and interest in this type of media, there is great potential to positively affect achievement (Banister, 2010; Kidd, 2012). From teachers developing podcasts to present information to designing content that students can access and manipulate, teachers are able to differentiate their instruction to address diverse needs. Not only
are teachers able to design effective instruction, but also students are able to participate actively in guiding their learning with these applications (Banister, 2010; Buffington, 2010; Johns, 2008). The way teachers teach and present information must reflect the needs of their students. School administrators and teachers must effectively utilize technology to support instruction (Banister, 2010). There must be clear objectives for technology use aligned with learning, and the development of skills in the classroom (Bauleke & Herrmann, 2010; Murray, 2010).

*iPad and Tablet*

Even though the iPad was just introduced in 2010, eighty-four million had been sold by September of 2012 (Colvin, 2013; D. Johnson, 2013). In 2010, the education sector was responsible for 60% of the largest iPad distributions (Gentile, 2012). In 2013, 1.5 million were being used in classrooms, and one in five Americans owned a tablet device (D. Johnson, 2013). Pearson (2015) reported 51% of elementary students and 52% of middle school students surveyed own tablets. However, only 28% of high school students own a tablet. Sixty-six percent of elementary students and 58% of middle school students surveyed regularly use a tablet (Pearson Education, 2015). Many schools are permitting students to bring their own iPads into the classroom (Dogan & Kadir, 2014; Falloon, 2015; Peluso, 2012). Miller (2012) stated 46.8% of all mobile web traffic is accredited to iPad use. A number of colleges and universities are either exploring the possibilities of integrating iPads or tablets into their classroom instruction or they have already begun this type of initiative (Manuguerra & Petocz, 2011; Miller, 2012; Rossing et al., 2012; Sullivan, 2013; Tomlin, 2012; W. Wong, 2012b).

Several companies have developed their version of the tablets, or included similar features of the tablet in other products. The iPad and most tablet devices include features which allow users to read, view, or listen to material; play educational and recreational games;
communicate via email, text, chat, or video/audio conferencing; and create via word processing, camera and video/audio recording features (Falloon, 2015; D. Johnson, 2013; Kim & Jang, 2015; Lamb & Johnson, 2012; Mallette & Barone, 2014; Miller, 2012; W. Wong, 2012b). The iPad’s features enable users to collaborate and share information (Broussard et al., 2014; Falloon, 2015; Kim & Jang, 2015; Lewis, Zhao, & Montclare, 2012; Manuguerra & Petocz, 2011; Murray & Olcese, 2011; Sullivan, 2013; W. Wong, 2012b). Rossing et al. (2012) reported students believed use of the iPad supported collaborative environments in which they were expected to discuss concepts, debate, and share information. In addition, tablets are also small, portable, and easy to use (Crichton, Pegler, & White, 2012; D. Johnson, 2013; Rossing et al., 2012; Tomlin, 2012; W. Wong, 2012b). W. Wong (2012b) indicated the iPad’s touchscreen is another benefit, as it allows students and instructors to manipulate images and applications with their fingers. It is engaging to students and helps them visualize abstract concepts. Research indicated the simplicity of the device, the uniqueness of its user interface, and the familiarity of design all supported students’ excitement for learning (Falloon, 2015; Harmon, 2012; Lewis et al., 2012; Manuguerra & Petocz, 2011; Sullivan, 2013; Tomlin, 2012).

Lamb and Johnson (2012) proposed students must learn to write using a variety of technological tools and applications: writing cooperatively and collaboratively across content areas is essential. They explained the iPad has several apps that can be used to develop students’ writing skills. Sullivan (2013) stated the iPad allows students to monitor their own writing process, actively explore content, and collaborate with others in a creative manner. Students are able to participate in group forums and create blogs, audio podcasts, and group websites.

Harmon (2012) indicated writing journal entries was more engaging for high school English students that used iPads to complete the process. In addition, both the quality and
quantity of writing increased, reading and writing ability improved, and students developed a more accurate view of their reading and writing abilities. The students were able to receive feedback regarding their writing assignments via smartphones and iPads in a timely manner. Similarly, the teacher was able to check writing assignments in that manner (Harmon, 2012). Manuguerra and Petocz (2011) reported similar use and benefits of providing guidance, and assessing work with the iPad in college math classes. Gentile (2012) added that certain features of the iPad also allow teachers to distribute specific material to an individual iPad or a group of iPads to allow for individualizing or differentiating assignments. The versatility and adaptability of the iPad are beneficial to varying learning styles and preferences (Broussard et al., 2014; Falloon, 2015; Rossing et al., 2012).

Researchers have identified some challenges with the use and integration of the iPad and other tablets in classrooms (Lewis et al., 2012; Miller, 2012; Rossing et al., 2012). Loss of instructional time when the technology failed was identified as a challenge for teachers and students. Lewis et al. (2012) reported students’ excitement and interest decreases when they experience any technological difficulty while they are participating in activities. Some students reported increased stress and concern about the possibility of connectivity issues or technology failure while completing assignments or assessments (Manuguerra & Petocz, 2011; Rossing et al., 2012). Rossing et al. reported some students experience difficulty and discontent with learning new technology. Teachers must frequently assess students’ level of knowledge and comfort with technology, allow acclimation time, and use the technology regularly. It is also very important that devices and applications have a user-friendly interface. Instructional tools should match the curriculum content, and students must be provided technical support.
Cell Phone and Smart Phone

Cell phone ownership has increased significantly over the last few years (Ali & Smith, 2014; Berry & Westfall, 2014; Engel & Green, 2011; Lucking, Christmann, & Wighting, 2010; McHale, 2005; Morgan, 2010-2011; Nagel, 2014; Pearson Education, 2015; Walling, 2012). Seventy-five percent of all 12-17 year old students own a cell phone, and 66% of them owned a cell phone before they turned 14. A survey conducted on 2,252 students reported three in 10 students use smartphones or tablets on a weekly basis to complete their assignments (Pearson Education, 2015). Parents are willing to provide their students with cell phones if they are going to be used at school (Hill, 2011; D. Johnson, 2010; Nagel, 2014). Subsequently, most students bring their phones to school with them (Hill, 2011; Lucking et al., 2010; Nagel, 2014). Interestingly, teenagers spend a greater amount of time texting from their phones than talking on them (Rosen, 2010; Valentine & Bernhisel, 2008). Additionally, these devices have become less expensive and school districts are more likely to be able to afford these devices than they would laptop or desktop computers (Morgan, 2010-2011; K. M. Thomas & McGee, 2012).

Some school leaders are recognizing the educational potential for using these personal devices for teaching and learning (Engel & Green, 2011; K. M. Thomas & McGee, 2012; Walling, 2012). Walling (2012) reported these devices allow teachers to monitor student progress and perform additional classroom tasks efficiently. In addition, allowing students to use the technology they are accustomed to will aid in developing the essential skills they need to be successful in the 21st century (Charles, 2012; Engle & Green, 2011). Rosen (2010) stated students should not be asked to live in a world where they are immersed in technology in all aspects of their lives except at school. Their classroom experiences should develop the varying skills they will need to be successful.
Hughes (2010) examined how smart phone capabilities can provide cognitively challenged students with supports to be successful. The smart phone has many of the iPod applications included in its features. Hughes (2010) stated the smartphone “combines a multiplicity of tools into a single, portable, attractive device” (p. 18). Smartphones allow students to access a variety of applications that include multiple communication options, camera/video recorder, music player, social networking device, internet browser, game player, and personal organization tool (Hughes, 2010; Nagel, 2014; K. M. Thomas & McGee, 2012). Additionally, there are several hundred thousand applications that can be added which cover a number of categories (Hughes, 2010; Morgan, 2010-2011; K. M. Thomas & McGee, 2012). K. M. Thomas and McGee (2012) reported the benefit to these applications is that most students own a phone and are already familiar with them. Hughes (2010) reported socialization, writing skills (texting and keyboarding), reading (text to speech), recording capabilities, organizational capabilities, and the add-on applications are all features of the smartphone that could be used to address students’ deficits. Smartphones have the capabilities to facilitate the acquisition and utilization of knowledge (Engel & Green, 2011; Hughes, 2010; Lucking et al., 2010; Nagel, 2014; K. M. Thomas & McGee, 2012).

Baya’a and Daher (2009) conducted a study using mobile phones to teach math to eighth grade students. They found mobile phones assisted students in learning mathematics outdoors, exploring math independently, learning math in real-life situations, visualizing math, using new and advanced technologies to complete diverse math activities, and learning math efficiently and effectively. Walling (2012) reported middle schools students who were allowed to use their cell phones to break down the main points of stanzas correctly answered 80% of test items, while those students who were taught the traditional way answered 40% of test items correctly.
Kiernan and Aizawa (2004) also identified mobile phones as a resource for language learning. Barone and Wright (2009) stressed the critical need to prepare students for new digital literacies. Providing students with an opportunity to develop skills to access and learn from these digital literacies via handheld devices is a way to achieve this goal. Most cell phones and smart phones have the capabilities to facilitate students’ access.

Engel and Green (2011) found cell phones were used primarily for audience response systems, a research tool, and a tool for collecting evidence of student work in a pre-calculus classroom pilot program. They also reported students recognized gains in reflection and assessment, while the students’ level of participation increased. Cell phones can be used for content creation, student-centered learning, collaboration, authentic learning, and differentiation of instruction (Cosier, Gomez, McKee, & Maghzi, 2015; Sterner, 2015; K. M. Thomas & McGee, 2012). The anytime/anywhere capabilities of cell phones allows teachers to provide instruction and support as needed, and they are able to assess students’ progress as needed (Charles, 2012; Nagel, 2014; K. M. Thomas & McGee, 2012). Research indicated the use of these devices can be motivating to students and teachers (Morgan, 2010-2011; Rosen, 2010; K. M. Thomas & McGee, 2012). Morgan (2010-2011) reported motivation for these devices increased over time. Research also indicates smart phones and cell phones have the potential to increase student engagement (Charles, 2012; Engel & Green, 2011; D. Johnson, 2010; Rosen, 2010; Walling, 2012).

Hill (2011) reported some schools have banned cell phone use during the school day. Seventy percent of schools around the United States do not allow students to use their cell phones during the school day (Morgan, 2010-2011; K. M. Thomas & McGee, 2012). Concerns about creating distractions in class to students cheating on their school work have been offered as

In many districts, the bans included confiscation procedures and fees for violators. However, the bans do not work. Sixty-five percent of cell phone owning students that attend schools which ban cell phone brings their phones to school; and 58% use them at school, in spite of the ban (Hill, 2011). While the potential threats to students bringing these devices to school are founded, schools must establish clear acceptable use policies and provide digital citizenship instruction for students (Charles, 2012; Engel & Green, 2011; K. M. Thomas & McGee, 2012). Charles (2012) recommended allowing students to participate in the development of acceptable use policies as a way to promote student ownership and possibly increase student adherence to the policies. Obringer and Coffey (2007) added as the capabilities of these types of technology increases, school district must ensure their policies are reflective of the technology advancements.

Hill (2011) stated teachers who view cell phones and smart phones as only distractions could be afraid of the change that the devices will bring to the classroom. These teachers may struggle with identifying authentic applications for mobile learning in their classrooms, and using it for more inquiry, project-based learning in their classroom. Charles (2012) suggested teachers need to develop lessons/activities that would allow students to use their phones through structured, closely monitored, explicit instruction. Most teachers would require professional
development to utilize the devices effectively to support instruction in this manner (Engel & Green, 2011; Keengwe, Schnellert, & Jonas, 2012; K. M. Thomas & McGee, 2012). Critics of student cell phone use at school also believe this will perpetuate the digital divide that exists between students (Engel & Green, 2011; K. M. Thomas & McGee, 2012). However, researchers suggest currently most students have a smartphone (Engel & Green, 2011; K. M. Thomas & McGee, 2012). In addition, 41% of students from households earning less than $30,000 per year use their phones to go online, while only 70% of students in this category own their own computer at home (Hill, 2011). K. M. Thomas and McGee (2012) offered two possible solutions to the issue of student access. They suggested schools could have classroom sets of cell phones or assign each student a cell phone at the beginning of each year in light of the inexpensive nature of cell phones.

Cell phones and smartphones are capable of engaging, enabling, and empowering students (Keengwe, Schnellert, & Jonas, 2012; Nagel, 2014). These mobile devices can be used for a number of activities that support instruction in the classroom (Ali & Smith, 2014; Begum, 2011; Nagel, 2014; Pearson Education, 2015). These devices come with some limitations as well. Begum (2011) reported cell phone screen sizes limit the content that can be accessed, students are sometimes uncomfortable with the size of the keyboards, some documents cannot be saved due to storage space, and teachers expressed discomfort with managing students on their phones. These limitations require teachers and school leaders to consider alternate plans to ensure student access (Ali & Smith, 2014; Begum, 2011).

Web 2.0 Applications and Tools

With the advent of Web 2.0 tools and applications, teachers and school staff are able to accommodate students’ learning styles and interests more effectively. Web 2.0 applications have
become ubiquitous in students’ personal lives through a variety tools (Hao & Lee, 2015; M. J. Johnson, 2009). Thompson (2008) stated the following:

The term Web 2.0 refers to the next generation of internet applications that allow (even encourage) the average internet user to collaborate and share information online. It signals a major change in internet use, since in the computer world 2.0 indicates an upgrade to an original program. (p. 19)

D. A. Thomas and Li (2008) reported the limitations of Web 1.0 called for the change in online technology use in education from Web 1.0 to Web 2.0. Web 2.0 is a shift in focus from information warehousing, where consumers were passive consumers, to web sites promoting and facilitating their users’ participation (Duplicham, 2009; Hao & Lee, 2015; Hansfield, Dean, & Cielocha, 2009; Hedberg & Brudvik, 2008; D. A. Thomas & Li, 2008). Web 1.0 allowed users to gain information through surfing, browsing, and consuming. Web 2.0 supports users connecting, collaborating, as well as sharing and developing content (C. Anderson, 2012). Consumers are able to produce information, and producers are able to consume information (Duplicham, 2009; Hansfield et al., 2009; Hao & Lee, 2015; Hedberg & Brudvik, 2008; P. Johnson, 2009; Kadjer & Bull, 2003; D. A. Thomas & Li, 2008). Thompson (2008) added a distinct feature of Web 2.0 is the increasing significance of the individual user. The user can create and upload content to internet with ease (Bull, Hammond, & Ferster, 2008; Hao & Lee, 2015).

There are a number of Web 2.0 tools and applications that can be accessed for teaching and learning. Berger (2010) discussed the applications that can be used in the classroom for class brainstorming, peer questioning, developing question stems, and creating mindmaps. In addition, applications exist that can be used to initiate conversing, facilitate conversations, and support small group discussions and dialogue (Berger, 2010; Duplicham, 2009; Ferguson, Faulkner, Hao & Lee, 2015; Whitelock, & Sheehy, 2015). M. J. Johnson (2009) reported the nature of student work has transformed from student-teacher interaction to student-community interaction. Web
2.0 applications also include some effective resources for charting information, searching, webbing, developing pre-reading aids, and supporting engagement and exploration activities (Berger, 2010; Duplicham, 2009; Ferguson et al., 2015). C. Anderson (2012) indicated the student to teacher feedback capabilities of Web 2.0 applications provides data needed to understand student learning, assess students’ progress, and better inform instruction.

Web 2.0 applications allow students to take an active role in guiding their learning (Duplicham, 2009; Ferguson et al., 2015; Groff & Haas, 2008; Handsfield et al., 2009; Hao & Lee, 2015; M. J. Johnson, 2009; Steele, 2007). Instant messaging on various mobile devices has allowed students to research information and respond in a meaningful manner (C. Anderson, 2012). M. J. Johnson (2009) reported Web 2.0 applications have taken over in students’ personal lives through a variety of tools. For students who needed to find information, there are applications for notes, reflection, main idea/details, and examples (Berger, 2010; Diacopoulos, 2015; Ferguson et al., 2015). Duplicham (2009) indicated students must know how to write, problem-solve, and develop educated opinions.

With Web 2.0 tools, students can post, edit, and share their findings. They are able to incorporate links to videos, photographs, podcasts, and other online resources for others (teachers and classmates) to view and offer feedback (Berger, 2010; Diacopoulos, 2015; Ferguson et al., 2015; Hao & Lee, 2015). C. Anderson (2012) indicated feedback provides data needed to understand student learning, assess students’ progress, and better inform instruction. Web 2.0 applications have the potential to improve students’ abilities to express themselves and illustrate their learning in a manner that is engaging and motivating (C. Anderson, 2012; Diacopoulos, 2015; Ferguson et al., 2015; Hao & Lee, 2015; Kadjer & Bull, 2003).
Web 2.0 applications offer teachers and staff a number of engaging instructional tools to support all students (C. Anderson, 2012; Bull et al., 2008; Diacopoulos, 2015; Groff & Haas, 2008; Hao & Lee, 2015). Teachers are able to design instruction and learning that is relevant for students (Diacopoulos, 2015; Duplicham, 2009; Groff & Haas, 2008; Handsfield et al., 2009; Hao & Lee, 2015; M. J. Johnson, 2009; Steele, 2007). Supports can be personalized to address the specific needs of students’ learning styles and differences.

Steele (2007) reported access to a variety of learning methods increases the likelihood that new content will be more meaningful and attainable for students. M. J. Johnson (2009) found “educators who champion the classroom application of Web 2.0 tools highlight the ways in which Web 2.0 has changed the Internet from a one-way medium to a multi-directional conversation” (p. 26). Diacopoulos (2015) explained Web 2.0 applications allow teachers to interact with students in a manner much more learner-centered. Teachers are able to design instruction that allows students to collaborate, produce, and interact with content in an authentic manner (Diacopoulos, 2015; Ferguson et al., 2015). Magnuson (2013) reported Web 2.0 technologies enriched learning through providing sharing and collaborating opportunities, organizing and categorizing information activities, promoting creativity and enjoyment, enhancing class discussions, and fostering technology knowledge.

Bring Your Own Device

Initially, school districts provided their campuses with computer labs with desktop computers, then desktops computers in the classrooms. Laptop carts or COWS (computers on wheels) followed, with one-to-one initiatives coming after that. Recent cuts in education funding have caused school district leaders to begin to consider alternate means for creating access to technology (Broussard et al., 2014; Fingal, 2012; Hill, 2011; Kennedy, 2012; Norris & Soloway,
Hill (2011) reported “since 2008, more than thirty-four states and the District of Columbia have cut funding for statewide K-12 public education, even though at the same time, the need for those services rose because of increased enrollment” (p. 23). School leaders have been forced to examine other ways to address access to technology and meet the learning styles and interests of their students (Cardoza & Tunks, 2014; Fingal, 2012; Hill, 2011; Kennedy, 2012; Leven & Schrum, 2013; Norris & Soloway; 2011; Ullman, 2011a). D. Johnson (2012) reported school districts are recognizing that they may never have the resources to provide each student with an individual computing device.

Various mobile computing devices have become affordable for an increasing number of families (D. Johnson, 2012). Subsequently, the numbers of students that are coming to school with their own mobile devices are increasing dramatically (Burns-Sardone, 2014; Hill, 2011; Kennedy, 2012; Leven & Schrum, 2013; Nagel, 2014; Nelson, 2012; Norris & Soloway, 2011). Hill (2011) reported some school districts are leveraging the pervasiveness of students having their own mobile devices to address the issue of student access to technology. District leaders are finding the majority of their students have a device that they can bring to school. In addition, this accessibility spans all income levels (Burns-Sardone, 2014; Hill, 2011; Knuckles, Lueck, & Haughney, 2012; Nagel, 2014; Nelson, 2012; Ullman, 2011a). Nelson (2012) stated students have the devices and the access. Even though students have grown up with these devices, some schools have created learning environments that are opposite of what their students are accustomed to experiencing (Puente, 2012). Cardoza and Tunks (2014) shared “students entering today’s classrooms want to learn with today’s tools, work in collaborative groups, and lead their own learning” (p. 293). Schools must leverage this opportunity to cover curriculum, and use their technology to develop their 21st century skills. Consequently, some school districts are
implementing bring your own technology (BYOT) or bring your own device (BYOD) programs in which students bring their own device from home to use at school (Burns-Sardone, 2014; Hill, 2011; Kennedy, 2012; Kiger & Herro, 2015; Nelson, 2012).

BYOD or mobile learning device programs afford schools the opportunity to integrate technology at a smaller cost ratio per student (Hill, 2011; Nelson, 2012). School districts save money because students bring their own devices and pay for their own data plans. Districts are also not faced with the challenges of bandwidth, networks, or technology maintenance (Hill, 2011; Nelson, 2012; Ullman, 2011a). For students who cannot afford a device, the district can provide them with a device (D. Johnson, 2012). While the cost incentive is important, school district leaders are quickly recognizing the greater impact on student learning (D. Johnson, 2012; Knuckles et al., 2012; Nelson, 2012).

BYOD programs offer several other benefits to school districts as well. The ratio of students to computers is reduced, and students are able to have more beneficial experiences with technology (Bolkan, 2014; Hill, 2011; Kiger & Herro, 2015; Leven & Schrum, 2013; Nelson, 2012; Sucre, 2012). The use of mobile devices allows teachers to extend the school day beyond the school. Students are able to go to any place at any time to gather information, and access organizations or individuals. Their technology becomes seamless to information, and their learning is connected to their technology (Hill, 2011; Kennedy, 2012; Leven & Schrum, 2013; Nelson, 2012). Hill (2011) explained teachers can assist students with evaluating and synthesizing the information. This type of collaboration allows students to use information more effectively. Students are responsible for gathering information outside of the classroom and sharing it in class for discussion. Researchers indicate this type of occurrence creates a flipped classroom (Hill, 2011; Kennedy, 2012; Knuckles et al., 2012; Leven & Schrum, 2013). Hill
(2011) suggested “the classroom moves from an ‘I teach’ to an ‘I learn’ model, where the teacher actually ends up learning as much as the student does” (p. 24). Ullman (2011a) added students are afforded the opportunity to lead their own learning.

Smart phones, cell phones, tablets and other mobile devices are equipped with a variety of useful tools and capabilities (Kennedy, 2012; Nagel, 2014; Sucre, 2012). Devices can be used as student response systems to allow teachers to assess students formatively (Sucre, 2012). Students reported using the devices for note-taking, research, and word processing. In some cases, students used their devices for video and audio production, for personal applications, and for communicating and collaborating with one another (Nagel, 2014; Ray, 2013). Kennedy (2012) reported smart phones and the mobile applications that operate them allow students to have constant and quick access to many resources online. With access to a secure network and/or personal data plans, students can work on their assignments at any time or location on campus (Puente, 2012).

Research indicated students were more creative and engaged when using their devices (Bolkan, 2014; Knuckles et al., 2012; Ray, 2013; Ullman, 2011a). Sucre (2012) agreed students using their devices, due to their high interest in them, could increase academic engagement. Schools leaders reported students were more motivated as well. Also, students expressed greater interest in sharing their work with other students (Hill, 2011). In addition, leveraging students’ ownership of mobile devices to support instruction, allows students to access tools that they are extremely familiar with and enjoy using (Knuckles et al., 2012; Nagel, 2014; Ullman, 2011a). Ullman (2011a) reported students recognized a 30% improvement on the previously covered curriculum when they used their devices. Using students’ technology to support instruction has the potential to connect students’ lives with the content they learn (Bolkan, 2014; Sucre, 2012).
While there are several benefits to BYOD programs, research indicates there are some challenges schools face as well. Some educators reported concerns about the potential for creating distractions in class, students using their devices to cheat, and tech support issues (Galindo, 2012; Hill, 2011; Kay & Lauricella, 2014; Kennedy, 2012; Nelson 2012). Quillen (2011) reported many districts are developing more relevant acceptable use guidelines for technology use and addressing students’ violations of the guidelines as they would other discipline issues.

Fingal (2012) reported BYOD programs also create anxiety amongst teacher regarding how to use students’ technology in meaningful ways. Therefore, there is a critical need for professional development to prepare teachers to integrate students’ technology and manage BYOD programs in their classrooms (Bolkan, 2014; Burns-Sardone, 2014; Harris, 2012; D. Johnson, 2012; Kay & Lauricella, 2014; Nelson, 2012). In addition, some teachers will have to learn to think differently and to be guides and mentors instead of sources for all of the information. Students should be encouraged to pose questions and access information so they can guide their own learning. The classroom should become a collaborative environment where students learn to produce information in authentic ways (Bolkan, 2014; Galindo, 2012; D. Johnson, 2012; Nelson, 2012).

In schools that rely solely on their mobile device programs or a variety of devices, learning can be interrupted because of the difficulty coordinating different types of devices (Fingal, 2012; Hill, 2011; Nelson 2012; Ullman, 2011b). With students using varying devices, it is sometimes impossible to get the devices to talk to each other. Classroom activities that require students’ technology to interact can present some challenges and slow the learning process (Hill,
Nelson (2012) reported some teachers believe technology cannot be integrated unless students have the same devices.

Lagarde and Johnson (2014) reported equity and access in BYOD initiatives can become a challenge for school leaders as well. Some students do not have devices or internet access outside of the school and this prevents them from taking advantage of the same opportunities as their classmates (Pearson Education, 2015; Warschauer et al., 2014). Schools may leverage their media centers to help address this issue for students. Extending hours in the media centers (before, during, and after school), giving priority to students with limited or no access when checking out devices, ensuring students have the skills to use devices through classes and individual support, and extending digital literacy efforts to include families to promote digital communities are ways schools can provide greater access to students without personal devices or internet access (Lagarde & Johnson, 2014).

An additional challenge becomes helping those teachers recognize the potential for learning in allowing students to utilize the devices they already have with them (Nelson, 2012). One solution to this obstacle could be cloud computing (Hill, 2011; Knuckles et al., 2012; Ullman, 2011b). Hill (2011) reported cloud computing allows teachers to create assignments and activities, and allow students to access the material at any time from any location. Additionally, some districts have recognized the benefits of using Web 2.0 applications in addressing the challenges presented by students’ varying devices. These applications are device neutral and can be used on any device (Ullman, 2011a).

Firewalls and filters present another challenge with BYOD programs. Students and teachers experience difficulty accessing the resources they need due to the firewalls and filters that school districts employ. Cell phones and smart devices have multimedia capabilities such as
cameras, recording devices, video devices, and the internet. Unfortunately, while firewalls and filters are necessary, they limit the capabilities of mobile devices (Hill, 2011). However, the more tech savvy students will find ways to get around most firewalls and filters. School leaders must be prepared to enforce their established policies regarding prohibited sites. Schools district leaders must continue to provide strong digital citizenship education and prepare students to be both well informed consumers of information and responsible producers of information (Burns-Sardone, 2014; Hill, 2011; “Living,” 2014; Nelson, 2012; Ray, 2013; Ullman, 2011a).

There have been several studies that focused on the increasing number of school districts participating in BYOD initiatives (Burns-Sardone, 2014; Nagel, 2014; Ullman, 2011a; W. Wong, 2012a). These studies have identified several benefits to BYOD initiatives. Greater access to technology for students, the development of critical 21st century skills, the opportunity to use their own devices, more engaging instruction, and financial savings for school districts have all been identified as benefits to BYOD initiatives (Burns-Sardone, 2014; Leven & Schrum, 2013; Nagel, 2014; Ullman, 2011a; W. Wong, 2012a). Bolkan (2014) added learning beyond the school day, the development of critical thinking and problem solving skills, and collaboration and teamwork skills were also benefits of BYOD initiatives. Unfortunately, there has been very little research completed on the effects of Bring Your Own Device initiatives on student learning outcomes.

Considerations for School District Leaders

School district leaders need to examine their approach to introducing new technology into classrooms as well. Simply providing the technology will not suffice. District technology leaders must ensure they have a strong infrastructure which includes a robust wireless network and greater bandwidth (Cardellino & Leiringer, 2014; Crichton, Pegler, & White, 2012; Warschauer
et al., 2014; W. Wong, 2012a). Gentile (2012) reported districts would also need to address security measures for content and access and ensure support personnel are equipped to address the additional campus technology needs.

Districts leaders must recognize the limitations of technology, identify the type of learning experiences students require, and ensure there is a guaranteed and viable curriculum in place (Colvin, 2013; Murray & Olcese, 2011; Peluso, 2012). School district leaders must be prepared to evaluate technology integration programs and ensure there is relevance and applicability to the manner in which students are engaging and learning with these technologies outside the school walls (Peluso, 2012). Peluso (2012) proposed school districts ensure their curriculums were designed to integrate various forms of technology due to the ever-changing interests of students and the continuous advancements in technology. Colvin (2013) advised, for this type of endeavor to be successful, researchers in technology must re-examine evidence and practice, entrepreneurs must be more innovative, and government officials must rethink seat time, accountability, and competency.

Teachers will require professional development and training to design engaging lessons and activities that will leverage the potential of the technology in the classroom (Beeson et al., 2014; Broussard et al., 2014; Colvin, 2013; Crichton et al., 2012; Peluso, 2012; Rossing et al., 2012; W. Wong, 2012a). Crichton et al. (2012) indicated “teachers need to be treated as learners and their learning must be honored and personalized and supported” (p. 29). A number of professional development programs for pre-service and in-service educators have begun to address the need for developing teachers and school staff that understand how technology can be incorporated into instruction (Peluso, 2012).
In addition, students’ access to the various resources and information require a different type of classroom management (Colvin, 2012; Rossing et al., 2012). Teachers need to ensure they design learning activities that utilize the technology in a relevant manner to maintain student engagement (Beeson et al., 2014; Broussard et al., 2014; Crichton et al., 2012; Kim & Jang, 2015; Rossing et al., 2012). Lamb and Johnson (2012) recommended teachers collaborate with librarians/media specialists to develop more engaging learning opportunities. District leaders have to ensure teachers are provided with professional development opportunities which effectively address the needs of students and teachers. Wahlstrom and York-Barr (2011) reported, “Professional learning that increases educator effectiveness and results for all students require skillful leaders who develop capacity, advocate, and create support systems for professional learning” (p. 23).

Summary

In this review of literature, I examined constructivism as a theoretical framework for this study. Constructivism focuses on how learner attribute meaning and construct knowledge. The literature stated that knowledge is viewed as temporary, constructed internally, developmental, and mediated socially and culturally. I examined advancements in technology and students’ interests have changed the way they communicate and interact with information both at school and at home. The literature suggested this change and the cost related to equipping schools with the appropriate technology has challenged school district leaders to provide instruction in a manner that addresses students’ needs and interests more efficiently and effectively. The literature showed instructional technology has been recognized as an important component in providing a quality education for students. In addition, I shared studies that illustrated the positive effects instructional technology has on student engagement and the classroom
environment. The literature indicated planning was a critical factor in effectively utilizing technology to address students’ needs.

I examined constructivism, the conceptual framework for the study. The ubiquitous mobile devices being used in the classroom, and how they impacted students and teachers to support learning. The literature suggested advancements in mobile devices have made the integration of this type of technology a more viable option for providing students with engaging instruction. The review included a number of studies that supported the use of various mobile devices in the classroom. Those studies contained data that illustrated the benefits of mobile devices to students, teachers, and their learning. The literature specified the use of mobile devices afforded students the opportunity to interact with curriculum content, their classmates, and their teachers in a manner that was more engaging and more relevant to them. The literature suggested teachers were examining their instructional practices, and this resulted in more rigorous instruction in their classroom. Additionally, teachers were able to instruct and assess students in ways more individualized to the students learning styles.

In the literature, I also identified some challenges with the integration of mobile devices in the classroom. Loss of instructional time due to technology failures, students’ level of comfort with technology, and teachers’ level of expertise with various types of devices were identified as barriers. The literature indicated some students required technical support and time to develop their skills to use technology in the classroom. Additionally, some researchers indicated some teachers and administrators were concerned the devices would become distractions to students, and they would not use them appropriately. Subsequently, the literature suggested teachers would need professional development to use devices effectively to support instruction.
I also examined Web 2.0 applications and how they improve mobile devices’ capabilities. The literature showed Web 2.0 applications have afforded school staff the opportunity to accommodate students’ learning styles and interests effectively. According to the literature, many applications can be used for teaching and learning. The literature suggested Web 2.0 applications promoted active student participation in their learning and facilitated collaboration and greater interaction with curriculum content. Additionally, these applications have become pervasive in students’ personal lives.

Additionally, the review addressed research on Bring Your Own Device initiatives implemented in school districts. According to the literature, school district leaders have been forced to consider other options for providing students access to technology due to budget constraints. The literature indicated mobile devices have become more affordable, and an increasing number of students are coming to school with their own devices. Consequently, some school districts are leveraging students’ technology access and implementing BYOD initiatives.

The literature reported BYOD programs presented additional benefits to school districts and students: reduced student-to-device ratios, more beneficial experiences with technology for students, extended day learning, and greater opportunities for student collaboration. The literature indicated students utilized their devices to support their learning in a variety of ways. According to the literature, students experienced increased creativity, motivation, and engagement when their devices were included in the learning.

The literature presented some challenges associated with BYOD initiatives as well. Some teachers reported students becoming easily distracted, using their devices inappropriately, and requiring technology support. Additionally, teachers experienced anxiety regarding how to use students’ devices effectively. The issue of equity and access can become a challenge as well as
not all students have a device. The literature reported some teachers do not recognize the benefits of including student devices in learning.

Finally, I examined considerations for school districts leaders. The literature indicated school district leaders would need to introduce these types of initiatives in a responsible manner. In addition to ensuring teachers were prepared to support the initiatives, district leaders also needed to make certain their infrastructures were able to support them. The literature suggested district leaders must be aware of the limitations of technology and effectively maintain their curriculums. Researchers reported teachers would need professional development to support student devices being included in the learning effectively.
CHAPTER 3
RESEARCH METHODOLOGY

Background of Study

According to researchers, a number of high school students are graduating without the knowledge and skills they need to be college and career ready (Goode, 2010; Valentine & Bernhisel, 2008). These students lack the critical technological experiences that support success in many post-secondary pursuits. Consequently, many school district leaders have developed initiatives to focus on the effective use of technology in the classroom. Learning experiences enriched by technology can support students’ development of 21st century skills and better prepare them for the increasing expectations and demands of the global workplace (Peluso, 2012; Shapley et al., 2011).

Administrators in school districts have identified the need to ensure the effective use of technology in the classroom as well as increasing student access (Dessoff, 2010; Donovan et al., 2010; Keengwe et al., 2008). School district leaders understand it is imperative for teachers to possess the knowledge and skills to add academic value to the technology they are utilizing (Hlodan, 2010). Identifying effective instructional practices for integrating technology into classrooms has become a top priority for school leaders. Due to budgetary constraints, they are also considering alternative ways to address student access to technology, and how to meet the learning styles and interests of their students (Fingal, 2012; Hill, 2011; Kennedy, 2012; Norris & Soloway; 2011; Ullman, 2011a).

Additionally, school district leaders recognize they may never be able to address the challenge of providing each student with an individual computing device (D. Johnson, 2012). However, because of the affordability of mobile computing devices, an increasing number of
students are bringing their own mobile devices to school (Hill, 2011; D. Johnson, 2012; Kennedy, 2012; Nelson, 2012; Norris & Soloway, 2011). Hill (2011) reported some school districts are leveraging the pervasiveness of students having their own mobile devices to address the issue of student access to technology. Educators have the opportunity to use students’ technology to address curriculum and develop their 21st century skills. Consequently, some school district leaders are implementing bring your own technology (BYOT) or bring your own device (BYOD) programs in which students bring their own device to use at school (Hill, 2011; Kennedy, 2012; Nelson, 2012).

The research methodology and procedures used in the study are discussed in this chapter. This qualitative study examined high school teachers’ perceptions about the effects of BYOD initiatives on instructional planning and engagement. I examined BYOD initiatives on two high school campuses in a North Texas school district through a qualitative research approach, a collective case study. Included in the review of research methods and procedures are descriptions of (a) the design of the study, (b) research questions, (c) sample selection, (d) procedures for data collection, and (e) data analysis.

Design of Study

I utilized a qualitative research approach, specifically a collective case study to explore the research questions. Creswell (2007) explained “qualitative researchers use an emerging qualitative approach to inquiry, the collection of data in a natural setting sensitive to the people and places under study, and data analysis that is inductive and establishes patterns or themes” (p. 37). Recent studies have identified some common characteristics of qualitative research: a natural setting, researcher as the key instrument, multiple sources of data, inductive data analysis, participants’ meaning, emergent design, theoretical lens, interpretive inquiry, and a holistic account (Creswell, 2007). Denzin and Lincoln (1998) suggested qualitative research is a

Qualitative research is used to explore an issue and establish a detailed understanding of the issue. This understanding is achieved through communicating directly with participants; interacting with them in their homes, workplace, or any natural setting; and allowing them to share their experiences unburdened (Creswell, 2007; Denzin & Lincoln, 1998; Glesne, 2006). Denzin and Lincoln (2011) added “qualitative researchers study things in their natural settings, attempting to make sense of them, or interpret, phenomena in terms of the meaning people bring to them” (p. 3). Qualitative research is sometimes identified as interpretive research, the study of immediate and local meanings of social actions for the actors involved in them. Qualitative research focuses on the study of cases instead of populations and samples (Gall et al., 2007).

Qualitative research involves the studied use and collection of empirical materials including case study, personal experiences, introspection, life stories, and interviews. It also includes observational, historical, interactional, and visual texts (Denzin & Lincoln, 2011). These empirical materials can be used to describe all aspects of participants’ lives. The researcher is the main research instrument or tool through observing, questioning, and interacting with research participants (Gall et al., 2007; Glesne, 2006). The researcher approaches the site and the participants open to the perspectives and issues that may be encountered. Denzin and Lincoln
(2011) stated the researcher employs a wide range of interpretative practices with the goal of obtaining a greater understanding of the subject matter.

Gall et al. (2007) maintained the case study is one of the most widely utilized approaches to qualitative inquiry. It can be used to study most topics or types of phenomenon with all of the data collection and analytic methods used by qualitative researchers (Creswell, 2007; Denzin & Lincoln, 2011). Stake (1995, 2006) reported a case is a bounded system or object of study. The case or object of study has confines, frequently bounded by time and place. Case studies are completed to provide information on a phenomenon, which is a process, event, person, or item of interest to the researcher. A case is a particular instance of a phenomenon, and in a case study the unit of analysis is the aspect of the phenomenon that will be studied across one or more cases. The focus is the aspect, or aspects, of the case on which data collection and analysis will center (Gall et al., 2007).

Creswell (2007) indicated case study research is “a methodology, a type of design in qualitative research, or an object of study, as well as a product of the inquiry” (p. 73). Huberman and Miles (2002) offered a case study is a research strategy centered on understanding the dynamics that exist in an individual setting. They may include single or multiple cases and multiple levels (Yin, 1984).

Glesne (2006) identified three types of case studies: intrinsic, instrumental, and collective. The intrinsic case study contributes to greater understanding of that particular case. The instrumental case study refers to an incident of a particular case being studied to provide insight into an issue or to redraw a generalization. Finally, a case study that examines multiple cases is a collective case study (Glesne, 2006). Case studies usually combine data collection
methods such as archives, interviews, questionnaires, and observations (Denzin & Lincoln, 2011; Gall et al., 2007; Huberman & Miles, 2002).

Denzin and Lincoln (2011) shared that a case study enhances understanding by pursuing scholarly research questions. Credibility is achieved by triangulating the descriptions and interpretations throughout the study. In a case study, the researcher focuses on experiential knowledge of the case and pays close attention to the influence of its social, political, and other contexts. For most audiences, maximizing understanding of the case requires meticulous attention to its activities. Case studies can be utilized to achieve various goals including providing a description of a phenomenon, developing possible explanations of a phenomenon, and evaluating a phenomenon (Gall et al., 2007; Huberman & Miles, 2002). In a case study in which the goal is to provide description, the researcher endeavors to illustrate a phenomenon and conceptualize it. A good depiction provides what is referred to as a thick description. Thick descriptions are very complete, literal descriptions of a cultural phenomenon (Gall et al., 2007).

In developing explanations of a phenomenon, the researchers identify patterns. Patterns indicate that a variation observed in a case study is related to another observed variation. In evaluating a phenomenon, the researcher conducts a case study and makes evaluative judgments. In the current study, I relate high school teachers’ perceptions about the effects of BYOD initiative on their instructional planning and the learning environment in their classrooms based on their experiences.

Using the collective case study, I provide a thick description of the high school teachers’ experiences with the BYOD initiatives on two high school campuses in a suburban school district. Thick descriptions are very complete, literal descriptions of a cultural phenomenon (Gall et al., 2007). Creswell (2007) supported the importance of thick descriptions. The author shared,
“the narrative presents detail, context, emotion, and the webs of social relationship . . . and evokes emotionality and self-feelings . . . the voices, feelings, actions, and meanings of interacting individuals are heard” (Creswell, 2007, p. 194). These descriptions will be used to understand teachers’ perceptions better regarding the effects that BYOD initiatives have on their instructional planning and the learning environment. Constructs and themes are identified to establish organization of the data and a relationship to other research findings regarding BYOD initiatives. In addition, patterns were identified to illustrate any effects based on teachers’ perceptions. Gall et al. (2007) stated “a construct is a concept that is inferred from observed phenomena and that it can be used to explain those phenomena; while themes are salient, characteristics features of a case” (p. 452). In some case studies, the objective is to provide explanations of the phenomena being studied. These explanations are referred to as patterns (Gall et al., 2007).

Denzin and Lincoln (1998) reported case study researchers attempt to identify commonalities and particulars about a case, although the final results typically present some unique characteristics or features. In the current study, I examined cases on two high school campuses to identify constructs, themes, and characteristics or features specific to each case and those common across the cases. Research indicates qualitative data should be examined inductively from particulars to more general perspectives, whether they are identified as themes, dimensions, codes, or categories (Creswell, 2007; Denzin & Lincoln, 1998). Miles and Huberman (2002) stated case studies usually combine data from several sources. Data were collected through interviews, classroom observations, and lesson planning documents. The study utilized a qualitative research approach, specifically a collective case study to explore the research questions.
Research Questions

1. How do secondary teachers participating in a bring your own device initiative believe their instructional planning is affected?

2. How do secondary teachers participating in a bring your own device initiative believe the learning environment is affected by the initiative?

Sample Selection

The target population of the study was core and non-core content teachers at two North Texas suburban high schools that have implemented a bring your own device (BYOD) initiative within the last four years. The sample was comprised of 20 teachers from two public high schools in a suburban school district. Both core and non-core content areas had the opportunity to participate on each campus. Twenty core teachers out of 260 core and non-core content area teachers chose to participate in the study. The campus enrollments are 1,700 and 2,200 students. The high schools’ demographics are reflective of the communities where they are located, and vary from school to school. Institutional Review Board (IRB) approval was obtained prior to beginning the study. Appendix A is a copy of the IRB approval. In addition, permission to interview the teachers, observe the teachers’ classrooms, and review the teachers’ lesson planning documents was obtained from the district and campus leadership and is included in the study. Appendix B includes copies of the district and campus leadership approvals.

The two high schools are located in a fast growing suburban school district in North Texas. The district emphasizes technology in the classroom and as a communications tool for parents. The district covers 41 square miles, serving portions of six communities. The district consists of 19 schools, including two high schools, one alternative high school, three junior high schools (Grades 7 and 8), three intermediate schools (Grades 5 and 6), and 10 elementary
The district has an enrollment of approximately 13,000 students. The demographics are: African American—14.5%, White—57%, Hispanic—19.8%, Native American—1%, and Asian/Pacific Islander—7.6% (*The Texas Tribune*, 2017). Twenty core teachers out of 260 core and non-core content area teachers participating in the BYOD initiative chose to participate in the study.

**Data Collection**

Creswell (2007) reported even though new forms of qualitative data frequently arise in the literature, all forms could be grouped into four basic types of information: observations (nonparticipant to participant), interviews (close-ended to open-ended), documents (private to public), and audiovisual materials (photographs, CDs, and videotapes). Case study data collection includes a wide variety of procedures to allow researchers to develop an in-depth description or picture of the case. Yin (2003) identified the following six forms of data collection: documents, archival records, interviews, direct observations, participant observation, and physical artifacts. Data collection for the current study included an interview with core content teachers, classroom observations, and reviews of the teachers’ lesson planning documents. Copies of the interview protocol, observation protocol and lesson plan document are in Appendixes C, D, and E, respectively.

Lincoln and Guba (1985) used the terms credibility, transferability, dependability, and confirmability as equivalents for internal validity, external validity, reliability, and objectivity to establish validity or trustworthiness. To operationalize these terms, the researchers recommended prolonged engagement in the field and triangulation of data sources, methods, and researchers to establish credibility (Lincoln & Guba, 1985). The use of multiple data collection methods contributes to the trustworthiness of the data, and this practice is referred to as triangulation.
The goal of triangulation is not simply to collect different kinds of data, but to relate them and establish validity in each (Creswell, 2007; Gall et al., 2007; Glesne, 2006). One of the authors stated, “This process involves corroborating evidence from different sources to shed light on theme or perspective” (Creswell, 2007, p. 208). Classroom observations data was compared to participant interviews responses regarding instruction that included student use of their devices in class. In addition, participants’ lesson planning documents were compared to both the participants’ classroom observation data and the participants’ interview responses. The use and comparison of these data collection methods is to identify themes, constructs, and patterns.

The participants included teachers who elected to participate in the study from the two high school campuses. Twenty participants were interviewed with the same six standardized open-ended questions and sub questions.

1. How do secondary teachers participating in a bring your own device initiative believe their instructional planning is affected?

1.1 How does planning for instruction that includes the use of student-owned devices differ from planning for instruction or lessons that do not include the use of student-owned devices?

1.2 What instructional decisions must teachers consider as they plan their instruction?

1.3 Did you participate in professional development or training with a focus on instruction that includes the use of student-owned devices? If so, how did professional development or training better inform your instructional planning for the use of student-owned devices in class?
2 How do secondary teachers participating in a bring your own device initiative believe the learning environment is affected by the initiative?

2.1 Does student engagement during instruction or lessons that include the use of student-owned devices differ from student engagement during instruction or lessons that do not include the use of student-owned devices? If so, how does student engagement differ?

2.2 What types of behaviors do students exhibit during instruction that includes the use of student-owned devices?

2.3 What type of support or guidance does the teacher provide during instruction or lessons that include the use of student-owned devices?

This format involves a predetermined sequence and wording of the same set of questions asked to the participants (Gall et al., 2007). While bias is not eliminated, it is minimized utilizing this format. Key informant interviews were used to gather the information. Gall et al. (2007) reported “in a key informant interview, the interviewer collects data from individuals who have special knowledge or perceptions that would not otherwise be available to the researcher” (p. 243). The key informants will be the 20 participants. Each interview was audio-taped for transcription and analysis. Creswell (2007) reported obtaining quality field notes by utilizing quality recording and transcribing the recording ensures reliability. An interview protocol was used to record participants’ responses and the interviewer notes. An interview or observation protocol is a predesigned form used to record information collected during an interview or observation (Creswell, 2007). The protocol allows the researcher to take notes and organize his or her thoughts during the interview or observation. The interview protocol included three questions regarding instructional planning and three questions regarding the classroom environment. These
Interview questions were developed based on the two research questions. The research questions were developed based on the literature on student use of mobile devices. Upon completion of the transcription of the interviews, member checking was utilized to ensure accuracy and completeness. Member checking allows participants to review their interview statements for accuracy and completeness (Creswell, 2007; Gall et al., 2007). Creswell (2007) indicated “member checking solicits participants’ view of the credibility of the findings and interpretations” (p. 208). Research indicates member checking is an essential technique for establishing credibility. The researcher should seek to establish confirmability rather than objectivity in establishing the data’s value (Lincoln & Guba, 1985).

Two classroom observations were completed on each of the participants as well as an examination of the lesson planning document for class periods observed. There was one observation on a class period in which students’ technology was used, and there was an observation on a class period in which students’ technology was not used. Protocols were used for the observations to consistently record observations. Classroom observations were completed in 20 core content teachers’ classrooms. These 20 core content teachers volunteered to participate in the study. The observations were reactive observations. Reactive observations occur in real-life settings and the participants are aware they are being observed (Gall et al., 2007). Creswell (2007) explained an observation can range from having a participant observer to a non-participant observer. The observer gathers field notes and can participate at various levels. There was a non-participant observer in this study. An observation protocol was utilized to document what was occurring in the classrooms, take notes, and organize the interviewer’s thoughts.
The observation protocol was based upon the first four domains of the Professional Development Appraisal System (PDAS). PDAS was, at the time of the study, the state-approved instrument for appraising teachers and identifying areas that teachers would benefit from training or professional development in the state of Texas during the 2014-2015 school year. PDAS training is a requirement for administrators and appraisers that use the state commissioner of education’s recommended appraisal system. It is a 20 hours/2.5 days training session.

This teacher evaluation system was created by the Texas Education Agency following the passage of Senate Bill 1 in 1995 (Region 13 Education Service Center, 2017). The goal of the PDAS is to advance the level of the professional practice of teaching in Texas. The evaluation criteria incorporate the learner-centered proficiencies and promote continuous professional development. Key components of the process include a minimum of one 45-minute observation and the completion of the Teacher Self-Report form. PDAS includes 51 criteria within eight domains reflecting the Proficiencies for Learner-Centered Instruction adopted in 1997 by the State Board for Educator Certification (SBEC). The domains are: (1) active, successful student participation in the learning process, (2) learner-centered instruction, (3) evaluation and feedback on student progress, (4) management of student discipline, instructional strategies, and time/materials, (5) professional communication, (6) professional development, (7) compliance with policies, operating procedures and requirements, and (8) improvement of all students’ academic performance. PDAS requires that new teachers and teachers new to a district receive an orientation. In addition, the PDAS Teacher Manual is to be given to all teachers (Region 13 Education Service Center, 2017).

Instructional Leadership Training (ILT) was a prerequisite for successful participation in PDAS training and is required prior to PDAS appraiser certification (Regional 13 Education
Service Center, 2017). ILT was a 36 hour/5 day training session designed to supplement the instructional leadership administrator certification. Administrators and appraisers must complete ILT prior to PDAS in accordance with adopted Commissioner’s rules (Region 13 Education Service Center, 2017). The observer completed PDAS and ILT training. Documentation for this training is included in the Appendix F.

Gall et al. (2007) reported qualitative researchers frequently study written communication such as documents and records that are created in natural situations. Documents are created for personal use, while records are created for official use (Creswell, 2007; Gall et al., 2007). Documents include personal letters, diaries, drafts of articles, and lesson plans. Records include items such as legal contracts, tax statements, and newspaper articles. Qualitative researchers use documents and records representative of the phenomenon that they intend to study or research (Gall et al., 2007). These items are analyzed to better inform the researcher’s understanding of the phenomenon, and develop interpretations and hypotheses. This study included a review of the participants’ lesson planning documents for the class period being observed. The participants were required to utilize the district’s standardized lesson plan for each of their lessons. The district’s lesson plan has some clearly defined components designed to support effective instruction and student achievement. The lesson plan has elements of The Fundamental 5 by Sean Cain and Mike Laird. The identify practices that support effective instruction. The lesson planning documents were examined to identify themes, constructs, and patterns.

Reporting of each data collection method included thick descriptions. Thick descriptions are very complete, literal descriptions of a phenomenon (Gall et al., 2007). Creswell (2007) indicated “thick descriptions allow readers to make decisions regarding transferability because the writer describes in detail the participants or setting under study” (p. 208). These detailed
descriptions enable readers to transfer information to other settings and determine whether or not findings can be transferred due to common characteristics. Guba and Lincoln (1985) also supported the need for thick descriptions to support transferability and to establish validity.

Data Analysis

This qualitative study utilized an interpretational analysis to examine the case study data. Gall et al. (2007) indicated “interpretational analysis is the process of examining case study data closely in order to find constructs, themes, and patterns that can be used to describe and explain the phenomenon being studied” (p. 466). The analysis included the identification of themes, constructs, patterns, and the categorizing and coding of data. The data or text from the data was broken into segments. Gall et al. (2007) indicated “a segment is a section of the text that contains one item of information and that it is comprehensible even if read outside the context in which it is embedded” (p. 466). Segments can be varying lengths, and they are identified by indicating the number lines in which the segments begin and end. Developing categories is one of the most important steps in interpretational data analysis. Gall et al. (2007) specified “a category is a construct that refers to a certain type of phenomena mentioned in a database. (A construct is a concept that is inferred from observed phenomena, for example: self-esteem, cooperation, memory.)” (p. 466). Segments were coded based on the categories that evolved.

I used blind coding in the current study. *Blind coding* or the individual responsible for coding and analyzing the data working without the constraints of programmatic expectations or questions supports the reliability of the data (Creswell, 2007). As the researcher in this study, I had no stake in any of the district’s goals or expectations regarding their BYOD initiatives.

The constant comparative method was used throughout the analysis of the data. The constant comparative method is a research design for multiple data sources similar to analytical
induction; the formal analysis begins early in the study and is nearly complete by the end of the data collection (Bogdan & Biklen, 2007). Creswell (2007) indicated the constant comparative method is “the process of taking information from data collection and comparing it to emerging categories” (p. 64). Segments are compared within and across categories throughout the data collection process. The process allows the researcher to determine meaning of each category, develop distinctions between categories, and determine which categories to examine (Gall et al., 2007).

Limitations

The methodology of this study may be limited by the following factors. The sample population were teachers involved in a BYOD initiative who volunteered to participate in the study. All responses may not be honest for a variety reasons. Participants’ understanding of the interview questions cannot be assessed. Bias could be present because the researcher was the only individual completing the teacher interviews, the reviews of lesson planning documents, and the classroom observations.

Summary

This chapter provided a review of the background of the study, the methodology, the design of the study, and the procedures of the study. This chapter also included the limitations and a summary of the chapter. This qualitative study was designed to explore high school teachers’ perceptions of the effects of their district bring your own device initiatives related to instructional planning, lesson design, student engagement, and the classroom environment. The target population for the study was core and non-core high school teachers participating in BYOD initiative in two North Texas suburban high schools. A purposeful sampling method, specifically maximum variation sampling, was used in order to ensure a sample that meets the
criteria for participating in bring your own device initiative was used. The data for the study were collected through interviews, classroom observations, and lesson planning documents.
CHAPTER 4

PRESENTATION AND ANALYSIS OF DATA

School leaders have been challenged to identify alternate options for providing access to technology, and addressing students’ learning styles and interests (Fingal, 2012; Hill, 2011; Kennedy, 2012; Norris & Soloway, 2011; Ullman, 2011a). Fortunately, mobile computing devices have become affordable for a greater number of students and families (D. Johnson, 2012). Consequently, many students are bringing mobile computing devices to school (Hill, 2011; Kennedy, 2012; Nelson, 2012; Norris & Soloway, 2011). Schools have the opportunity to use students’ technology to cover curriculum and develop 21st century skills. Subsequently, some school districts are implementing Bring Your Own Technology (BYOT) or Bring Your Own Device (BYOD) initiatives to use students’ technology to address curriculum and develop students’ 21st century skills (Hill, 2011; Kennedy, 2012; Nelson, 2012).

In this chapter, I present findings of the study designed to examine 20 high school teachers’ perceptions about the effects of Bring Your Own Device initiatives on instructional planning and classroom the environment in two North Texas high school campuses. These 20 teachers volunteered to participate in the study. As shown in Table 1, the participants were 19 core teachers and one foreign language teacher.

Table 1

*Participants’ Content Departments*

<table>
<thead>
<tr>
<th>Content Area</th>
<th>Math</th>
<th>Science</th>
<th>English</th>
<th>History</th>
<th>Spanish</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participants</td>
<td>6, 17</td>
<td>19, 20</td>
<td>1, 8, 11, 13, 16</td>
<td>2, 3, 4, 5, 7, 9, 10, 12, 14, 15</td>
<td>1</td>
</tr>
</tbody>
</table>
The BYOD initiatives on the campuses were examined through a qualitative research approach, a collective case study. The research questions were designed to provide a better understanding of high school teachers’ experiences with bring your own device initiatives, regardless of whether or not teachers believe campuses should participate in the initiatives.

1. How do secondary teachers participating in a bring your own device initiative believe their instructional planning is affected?

2. How do secondary teachers participating in a bring your own device initiative believe the learning environment is affected by the initiative?

In Chapter 4, I present the participants’ perceptions regarding how instructional planning and the learning environment are affected by the BYOD initiative collected through six interview questions. I also present classroom observations of instruction which included student devices, and instruction that did not include student devices. Lastly, the chapter contains my review of the participants’ lesson planning documents for instruction that included student devices and instruction that did not include student devices.

Interview Questions

Six interview questions were utilized to develop a better understanding of participants’ perceptions regarding participating in a BYOD initiative in their district. Three questions focused on instructional planning, and three questions focused on the learning environment. The interview questions were open-ended and closed.

Research Question 1

How do secondary teachers participating in a bring your own device initiative believe their instructional planning is affected?
Sub-question 1.1. How does planning for instruction that includes the use of student-owned devices differ from planning for instruction or lessons that do not include the use of student-owned devices?

This interview question provided a wide range of considerations that the teachers examined as they planned their instruction. Table 2 highlights the considerations that the greatest number of participants identified.

Table 2

*Summary of Most Identified Considerations*

<table>
<thead>
<tr>
<th>Considerations in Planning</th>
<th>Participants</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Planning for inequity in students’ access to devices</td>
<td>1, 2, 3, 4, 10, 14, 15, 20</td>
<td>40%</td>
</tr>
<tr>
<td>Planning for students’ devices failing</td>
<td>1, 4, 10, 18</td>
<td>20%</td>
</tr>
<tr>
<td>Instructional technology accessible across all devices and platforms</td>
<td>5, 6, 8, 10, 12, 20</td>
<td>25%</td>
</tr>
<tr>
<td>Participants accessing applications and websites prior to lessons to ensure viability</td>
<td>6, 8, 9, 12</td>
<td>20%</td>
</tr>
</tbody>
</table>

Participants 1, 2, 3, 4, 10, 14, 15, and 20 reported one of the greatest differences to planning for lessons or instruction including student-owned devices as opposed to planning for lessons or instruction not including the use of student owned devices was the consideration for students not having a device in class. Participants 1, 4, 10, and 18 indicated they had to consider instances in which student technology failed or did not work. Teachers had to plan an alternate assignment or activity for the lesson in the event that students did not have a device or if technology failed. Additionally, Participants 3, 10, and 15 had to determine whether or not students would be allowed to share a device. Participant 1 reported:
The teacher has to take into consideration what to do if the devices don’t work or if the students don’t have their devices with them. I think that has to be a consideration anytime you plan with technology (Participant 1).

Participants 5, 6, 8, 10, 12, and 20 indicated they had to ensure their technology inclusive lessons were mobile device friendly across all devices and platforms. Participants 6, 8, 9, and 12 shared this required teachers to try applications and websites themselves prior to the lesson to ensure they were working and that all devices had access. Participant 20 elaborated:

The thing that most affects planning when developing a lesson to use student devices is accessibility to the devices. First, it is unlikely that all students will have a device—95% will but you will need a contingency plan for those that do not. Secondly, there are a wide variety of devices that students use and they do not all work well on all systems. Some websites for researching do not work well or at all on some operating systems and different things like flash or embedded videos do not always work. Thirdly, the WiFi support will be overwhelmed by the sheer number of people utilizing it when everyone has their device online. (Participant 20)

Teachers reported several aspects of planning for student-owned devices required a great deal of consideration. Initially, according to Participant 19, they must determine if technology is needed for the lesson or if it will enrich student learning. Participant 17 shared that teachers must consider alternate methods of information gathering, student response, and the management of student work. Additionally, Participants 7 and 17 said they must plan for different types of student assessments. Participant 8 stated teachers must also determine which applications and websites best fit their teaching style and their classes. Teachers had to ensure that including technology did not slow their classes down. Participant 3 reported:

Teachers had to remain aligned with their team members who were not using student-owned devices. Participant 3 shared:

When planning, I also have to take into account what other teachers in my department are teaching and how I will make sure my students learn the same material by the same deadlines (Participant 3).
Participant 11 reported planning for lessons with student-owned devices can be overwhelming and requires more time because of the vast amount of instructional technology resources at their disposal. Participant 11 elaborated:

I find planning for lessons that incorporate student-owned devices a bit overwhelming and much more time consuming. There are so many great options out there for so many different focuses that without trying them out first, I don’t know which to have the students use. Without the devices, the planning is streamlined and the creativity is mine. However, a spontaneous “Will someone please define/Google this for me?” takes no prep. (Participant 11)

Teachers stated that a benefit to the numerous instructional technology resources available to them was the opportunity to support student learning more effectively. According to Participants 7, 11, and 13, students are able to take an active role in their learning, and the technology allows for student-specific activities. Participant 16 reported instruction which includes student-owned devices is more exploration based and promotes students sharing ideas. Students have a better understanding of the content, and they are more invested in their learning, according to Participant 16.

Sub-question 1.2. What instructional decisions must teachers consider as they plan their instruction?

This interview question offered the researcher a better understanding of the participants’ instructional decision-making during planning for these lessons. Table 3 lists the instructional decisions most identified by the participants.

Participants 1 and 7 reported they must determine how they will deliver instruction during the lesson. Subsequently, they have to decide how student-owned devices can enhance or support the delivery of instruction. Participants 1, 2, 3, 11, and 20 use it to reinforce instruction or assess students’ progress toward mastery of the content. Participant 2 reported:
I think you’re asking how BYOD inclusion affects instruction planning. I guess we must ask ourselves what role technology plays in this lesson—how does it make the lesson stronger or more effective, rather than just more fun (Participant 2).

Table 3 highlights the most common instructional decisions teachers reported that they had to address during their planning.

Table 3

*Summary of Instructional Decisions-Student-Owner Devices Included*

<table>
<thead>
<tr>
<th>Instructional Decisions</th>
<th>Participants</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Potential for devices to enhance or support instruction</td>
<td>1, 2, 3, 11, 20</td>
<td>20%</td>
</tr>
<tr>
<td>Time allotted supports effective instruction and student learning</td>
<td>3, 8, 16, 17, 20</td>
<td>20%</td>
</tr>
<tr>
<td>Amount of supervision required to ensure students remain focused on the content</td>
<td>7, 12, 13, 14</td>
<td>25%</td>
</tr>
<tr>
<td>Plan for devices failing, inequity in student access, or technology infrastructure failing</td>
<td>9, 10, 15, 17, 19, 20</td>
<td>30%</td>
</tr>
</tbody>
</table>

Participant 1 and 7 conveyed there are numerous instructional technology resources for teachers to access, so they must decide which applications, sites, and other resources will be included in their lessons. Time is also a consideration for teachers as they plan. Participants 3, 8, 16, 17, and 20 shared they must determine if there will be enough time for effective instruction and student learning. Participant 16 reported:

I must purposefully craft time for exploration and allow for the topic of conversation/exploration to veer slightly from my plan. I must learn how to connect whatever the students find to whatever I planned to discuss (Participant 16).

Teachers stated the students in their classes determine many of the decisions they make during their planning. Participant 3 said teachers must consider the grade level or maturity level
of their students. Participants 7, 12, 13, and 14 shared that some students may require closer supervision to remain on task and focused on the assignment or activity.

Participant 4, 16, and 19 said they want to ensure they have planned for maintaining a high level of student engagement. Participant 4 reported that planning appropriate extension activities helps to maintain student engagement. Additionally, this allows the teacher to support struggling students. Participants 6, 9, and 10 consider the amount of instructional support students will need during instruction as well. Participants 18 and 19 believe teachers should be flexible, but they must have some clearly defined procedures for students. Participant 18 shared:

Teachers first need to be ok with a little organized chaos. It may seem that some kids are not working but in reality they are working much harder. Teachers need to have strong procedures in place—how to log on, when to log on, when to pick up or put down devices. (Participant 18)

Teachers reported that challenges with technology were also a consideration during their planning. Participants 9, 10, 15, 17, 19, and 20 reported they have to have a contingency plan if students’ devices are not working, students do not have a device, or if sites or the district Wi-Fi are down. Participant 9 stated:

Teachers should always have a backup plan in case technology fails, and the devices are not working. The teacher should also make sure the lesson is planned out in a way to guarantee they are clear on the assignment/project/reading. Can they work in pairs if a student does not own a device? (Participant 9)

Teachers had to decide if students would be able to work in pairs or collaborate when there were issues with student devices. Participants 5, 9, and 17 said they had to ensure students would benefit from the instruction if they did not work separately. Participant 8 suggested teachers also had to take into account their own knowledge of the different devices and the instructional technology resources.
Sub-question 1.3. Did you participate in professional development or training with a focus on instruction that includes the use of student-owned devices? If so, how did professional development or training better inform your instructional planning for the use of student-owned devices in class?

This question offered some insight into the participants’ professional development experiences that focused on including students’ devices. Responses were varied but there were some common themes. Table 4 lists the most common participant responses.

Table 4

<table>
<thead>
<tr>
<th>Focus of Professional Development</th>
<th>Participants</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Planning, instructional technology, classroom management</td>
<td>4, 6, 9, 10, 13, 14, 15, 67, 17</td>
<td>45%</td>
</tr>
<tr>
<td>Applications and websites to integrate student devices</td>
<td>1, 2, 5, 12</td>
<td>20%</td>
</tr>
<tr>
<td>Instructional resources without guidance on effective use of the resources</td>
<td>3, 11, 18</td>
<td>15%</td>
</tr>
</tbody>
</table>

According to Participant 7 and 8, there were several teachers who had not participated in professional development or trainings designed for including student-owned devices. The trainings were focused on students using school-owned devices. A number of teachers participated in professional development or training that focused on instruction including student-owned devices and options for using student-owned devices. Forty-five percent of the participants said trainings provided teachers with guidance on planning, classroom management, and instructional technology. Participant 10 reported:

Yes, I did participate in professional development that included student-owned devices. The training allowed me to experience the instruction from the student’s point of view, so I could experience some of the same things the student might encounter. This allowed me
to have some answers to more of the common issues or questions that the students may have, and it provided me with the knowledge to help them. This training also taught me how to assess student knowledge in a more engaging fashion that would display student knowledge at the same time. This training also showed how the programs allowed for differentiation within the program itself. (Participant 10)

One teacher reported that participating in these types of trainings inspired them to explore and research other ideas for student-owned technology in the classroom. (Participant 16)

Participants 1, 2, 5, and 12 shared several of the trainings that teachers participated in focused on specific applications or programs to integrate technology into the classroom. Participant 5 reported attending a training focused on discouraging cheating and monitoring students’ activity online. Participants 3, 11, and 18 attended other trainings which focused on resources to use, but they did not provide guidance on how to use them effectively.

The teachers participated in several professional development opportunities and trainings that focused on instructional planning. Participant 10 reported participating in trainings that were designed to support effective differentiation and student assessment. Participant 17 indicated that teachers had participated in a training focused on collaborating with colleagues to generate ideas and modifying strategies to meet their teaching styles. Participant 20 attended a training designed to help teachers use students’ devices as learning tools. The teacher learned some lessons are better suited for student devices than others. In these types of lessons, the students worked at their own pace and the teacher served as a facilitator.

Research Question 2

How do secondary teachers participating in a bring your own device initiative believe the learning environment is affected by the initiative?
Sub-question 2.1. Does student engagement during instruction or lessons that include the use of student-owned devices differ from student engagement during instruction or lessons that do not include the use of student-owned devices? If so, how does student engagement differ?

This question provided me with a clear understanding of the participants’ perceptions regarding student engagement during these types of lessons. Table 5 lists the participants’ most common responses to this question.

Table 5

**Summary of Participants’ Perceptions**

<table>
<thead>
<tr>
<th>Student Engagement</th>
<th>Participants</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Higher level of engagement more likely to pursue enrichment activities</td>
<td>4, 10, 11, 13, 15, 17</td>
<td>30%</td>
</tr>
<tr>
<td>Distracted by devices and less focused on the content</td>
<td>5, 6, 7, 17</td>
<td>20%</td>
</tr>
<tr>
<td>Effective planning and defined guidelines increase engagement</td>
<td>2, 9, 12, 18, 19</td>
<td>25%</td>
</tr>
</tbody>
</table>

Participants 4, 10, 11, 13, 15, and 17 reported that students are more engaged during instruction or lessons that include student owned devices. Additionally, they shared that students were more likely to pursue enrichment during those lessons.

Yes, student engagement during the instruction using student owned devices is dramatically higher. Today’s students are dependent upon their electronic devices, thus meaningful instruction must meet that need. When allowing students to be actively engaged with electronic devices, I have had a majority of my students participate in activities. However, paper/pencil activities or worksheets, a majority of students are often off task because they are on their electronic devices. (Participant 10)

Participant 8 and 14 reported that students who are engaged get more out of the lesson.

Participant 20 reported student engagement appears to be the same in either of the lessons with some students. The teacher shared some students appear to be engaged during non-device
lessons, but they are secretly using their devices. During lessons that included devices students appear to be engaged, but they are using their devices for playing games and social media.

Participants 3 and 20 agreed it is difficult to determine which students are truly engaged.

Participants 9, 12, and 19 reported student engagement was positively affected when the lessons were planned effectively and clearly defined guidelines were established. Participant 12 shared:

Student engagement differs with the use of technology if the lesson planned is exciting, novel, or different from what they normally do. The students can become disengaged if the lesson design is weak and students have too much down time to play on the devices. It is similar to any lesson that does not use technology. If a lesson is designed well, it will engage the students with or without technology. (Participant 12)

Participant 4 and 18 reported while including student-owned devices positively affects student engagement, there should be a balance between instruction including student devices and instruction not including student devices. Participant 4 reported:

I believe that students like to use technology in the classroom and do stay engaged. They will stare at a screen directly in front of them for a longer period of time than they will stare at me at the board. I find that using the technology too often, though, can sometimes have the opposite effect. If I use the same programs or apps too much, the students tire of it. The students respond better to varied activities. The activities can vary within the technology or it can vary between using technology and not using it. (Participant 4)

Participants 2 and 18 shared while student devices support instruction, student engagement depended upon the teacher’s instruction.

Conversely, several teachers reported that students are less engaged in the lesson, but they are more engaged in their devices and their features. Students generally use their devices for personal activities during the lessons. Participants 5, 6, 7, and 17 reported their devices easily distract the students and they become less focused on the lesson. Participant 6 reported:

I think that depends on the lesson. Students are naturally engaged by the use of their technology, especially if they are learning something new such as using a new app. I am
cautious, however, in where I choose to use technology as I want the students engaged by the material, not by the technology. The technology should be a tool only. (Participant 6)

Participants 6 and 14 stated that students who are more focused on their devices tend to struggle with the content. Participant 17 offered that classroom management is essential. The teacher must have procedures and guidelines for the use of student devices during instruction. Students must understand when they can use their devices and when they must transition back to the teacher’s instruction. As students’ devices become a greater part of instruction, students’ transition time between their devices and the teacher’s direct instruction decreases.

Sub-question 2.2. What types of behaviors do students exhibit during instruction that includes the use of student-owned devices?

The participants discussed several student behaviors exhibited in their classrooms. They provided some insight into the type of learning environments they support during these lessons. Table 6 includes the behaviors that the participants identified.

Table 6

Summary of Teachers’ Observations

<table>
<thead>
<tr>
<th>Student Behaviors</th>
<th>Participants</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participation in lesson</td>
<td>6, 10, 11, 12</td>
<td>20%</td>
</tr>
<tr>
<td>Greater focus during lessons</td>
<td>1, 14, 15</td>
<td>15%</td>
</tr>
<tr>
<td>Increased understanding of content</td>
<td>8, 9, 16</td>
<td>15%</td>
</tr>
<tr>
<td>Required clear expectations</td>
<td>3, 13, 18</td>
<td>15%</td>
</tr>
<tr>
<td>Responds positively to effective classroom management</td>
<td>12, 17, 18</td>
<td>15%</td>
</tr>
</tbody>
</table>
Participants 6, 10, 11, and 12 reported most students participate in lessons that include the use of student-owned devices. Participants 1, 14, and 15 added students were more focused during these types of lessons. Participant 10 reported:

The behaviors that students exhibit during instruction when using student-owned devices are: increased task participation, increased class discussion, student justification of answers, monitoring of their own learning, they have increased knowledge, and application of information. Students often become the teachers when they use their devices to research information not known in the classroom or to answer a question the teacher poses. Very few students, if any, choose not to participate in the activities that involve electronics. (Participant 10)

Teachers indicated while students are off-task at times, they are usually more attentive and their participation is greater. Participants 8, 9, and 16 shared the students have a better understanding of the content during these lessons. Participants 2 and 4 indicated when students used technology in ways that were interesting to them, they were more engaged. Participant 10 reported students become the teacher during lessons that include student-owned devices. Participant 5 offered that students remain focused and on task more when school devices were used than when student-owned devices were used. Participant 5 elaborated:

They seem drawn to their established habits of phone use rather than what the teacher directs them to do. It seems that when my students used school provided chrome books, they could stay focused on the lesson better than when using their own. They don’t have the self-discipline to ignore notifications from Instagram, Twitter, texts, etc. (Participant 5)

Conversely, Participant 15 reported students were more focused with their own technology because it’s easier to transition between activities. They have access to their technology at any time, and this is more closely aligned to their real-life experiences.

Participants 1 and 14 said the behavior varied depending upon the student. Participant 7 reported students become off-task and focused on other assignments. Participant 20 shared that students are off-task at times, but they call less attention to themselves when they have their
devices. Participants 3, 13, and 18 reported during instruction which includes student-owned devices, providing clear expectations for students is critical. Participant 19 reported no difference in the students’ behavior during instruction that included student-owned devices.

Participants 12, 17, and 18 reported classroom management is a key factor in ensuring lessons which include student-owned devices are successful. Participants 13 and 17 shared consistent monitoring and consequences were an important part of classroom management. Although, Participant 13 indicated that flexibility was very important as well:

The one thing the teacher must maintain is a vigilance over the use of the devices to keep student focused on the task at hand. A certain degree of latitude can be given to allow the use of the device as a reward. The devices can be a great tool for allowing students to research information, organize ideas, and keep up with important dates (tests, paper, etc.) in a single location (Participant 13).

Sub-question 2.3. What type of support or guidance does the teacher provide during instruction or lessons that include the use of student-owned devices?

This question provided the researcher with an understanding of teachers’ responsibilities during these lessons. Table 7 lists the types of supports teachers indicated they provided for students. The supports that were identified by the most participants were included in the table.

Participant 10, 12, 13, and 18 reported during instruction or lessons that included student-owned devices, the teacher facilitated and provided some direct instruction. Participants 15 and 20 added that facilitating is possible if the lesson is well planned. Participant 20 reported students are able to work independently or collaboratively. Participants 7, 9, 11, 12, 13, 15, 17, and 20 indicated they keep students on task, monitor their progress, and provide support as needed.
Table 7

Summary of Teachers’ Perceptions

<table>
<thead>
<tr>
<th>Teacher Behaviors</th>
<th>Participants</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facilitating and providing some direct instruction</td>
<td>10, 12, 13, 18</td>
<td>20%</td>
</tr>
<tr>
<td>Allow students to lead the learning</td>
<td>11, 13, 15</td>
<td>15%</td>
</tr>
<tr>
<td>Ensure students remain on task, monitor students’ program, and provide support as needed</td>
<td>7, 9, 11, 12, 13, 15, 17, 20</td>
<td>40%</td>
</tr>
<tr>
<td>Provide technology support based knowledge of students’ devices</td>
<td>1, 2, 4, 5, 6, 8</td>
<td>25%</td>
</tr>
</tbody>
</table>

Participant 20 reported:

The teacher acts as a coach or guide if the lesson is written correctly. Ideally, the students are working independently or collaboratively with one another to arrive at conclusions or determine information and the teacher helps keep them on task and helps when they struggle. (Participant 20)

Participants 17 and 19 indicated they were able to provide immediate feedback as students completed their assignments.

Participant 16 reported they must include higher level questioning and opportunities for students to give feedback to ensure relevant use of their devices. Participant 1 and 3 stated teachers must provide clear instructions and ensure students understand their expectations and the classroom management plan. Participant 1 shared it is also very important to provide extensions or additional assignments for students who complete their work early. Participants 1, 2, 4, 5, 6, and 8 reported the teacher must be familiar with the students’ device and be able to provide technology support as needed. Participant 4 shared students required instruction on digital citizenship. The teacher had to teach them appropriate and acceptable use of their devices in class.
Participants 11, 13, and 15 reported lessons that included student-owned devices allowed students to be the teacher. They were able to teach their teachers about the technology. Additionally, Participants 6 and 10 indicated students were also able to teach other students during these lessons. Participant 10 added it initiated beneficial dialog with the students:

The teacher becomes more of a facilitator of knowledge because with the student enthusiasm the students become more actively engaged and they teach each other. Students instruct other students on the use of the technology, and content. It opens dialog with students that is not possible with paper/pencil tasks or lecture content delivery. (Participant 10)

Participant 12 reported the instruction and guidance was the same for lessons including student-owned devices.

Classroom Observations

Two classroom observations were completed for each of the participants. One observation occurred during a class period in which students’ technology was used, and one observation occurred during a class period in which students’ technology was not used. Observation protocols were used to record each observation. The observation protocol was based upon the first four domains of the Professional Development Appraisal System (PDAS). These domains were used only to document the observation, not to analysis or appraise the teachers’ instruction. I documented areas within each domain based on sufficient quality and quantity. I am PDAS trained and my observations could be calibrated by another PDAS certified observer. The domains are active, successful student participation in the learning process; learner-centered instruction; evaluation and feedback on student progress; and management of student discipline. The first four domains were used to document what was happening in the classroom. They were not used to appraise the teachers’ instruction. The following are observation notes from instruction including student-owned devices and instruction in which student-owned devices
were not included in the instruction. Table 8 lists the student and teacher behaviors observed. Additionally, the number of classrooms in which the behaviors were observed is included. Only behaviors that were observed in 5 or more classrooms are listed.

Table 8

*Classroom Observations—Student-Owned Devices Included*

<table>
<thead>
<tr>
<th>Classroom Observations</th>
<th># of Classrooms</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Student Behaviors</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Engaged in learning</td>
<td>19</td>
<td>95%</td>
</tr>
<tr>
<td>Self-directed</td>
<td>12</td>
<td>60%</td>
</tr>
<tr>
<td>Problem solving/critical thinking</td>
<td>16</td>
<td>80%</td>
</tr>
<tr>
<td>Made connections in their learning</td>
<td>20</td>
<td>100%</td>
</tr>
<tr>
<td>Successful in their learning</td>
<td>16</td>
<td>80%</td>
</tr>
<tr>
<td><strong>Teacher Behaviors</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Learner-centered</td>
<td>11</td>
<td>55%</td>
</tr>
<tr>
<td>Varied instructional and motivational strategies</td>
<td>9</td>
<td>45%</td>
</tr>
<tr>
<td>Importance and value emphasized</td>
<td>15</td>
<td>75%</td>
</tr>
<tr>
<td>Utilized appropriate questioning</td>
<td>11</td>
<td>55%</td>
</tr>
<tr>
<td>Appropriate pacing and sequencing</td>
<td>8</td>
<td>40%</td>
</tr>
<tr>
<td>Appropriate assessment</td>
<td>12</td>
<td>60%</td>
</tr>
<tr>
<td>Monitored and assessed</td>
<td>16</td>
<td>80%</td>
</tr>
<tr>
<td>Assessment and instructions aligned</td>
<td>17</td>
<td>85%</td>
</tr>
<tr>
<td>Learning reinforced and feedback provided</td>
<td>20</td>
<td>100%</td>
</tr>
<tr>
<td>Re-learning and re-evaluation</td>
<td>9</td>
<td>45%</td>
</tr>
<tr>
<td>Constructive feedback</td>
<td>14</td>
<td>70%</td>
</tr>
<tr>
<td>Reinforced desired behaviors</td>
<td>17</td>
<td>85%</td>
</tr>
<tr>
<td>Equitable teacher-student interactions</td>
<td>19</td>
<td>95%</td>
</tr>
<tr>
<td>Equitable and varied characteristics</td>
<td>9</td>
<td>45%</td>
</tr>
<tr>
<td>Managed time effectively</td>
<td>19</td>
<td>95%</td>
</tr>
</tbody>
</table>
Domain I Student Participation—Student-Owned Devices Included

Table 9 shows student participation during observations in the classrooms of the various participants with student-owned devices being used. Students were engaged in the learning. Students were talking about the lessons and activities. Students were asking and answering questions throughout the observations. They were self-directed during presentations using technology. Students were involved in problem solving and critical thinking. Students made connections and were successful in their learning. Some students’ connections in their learning were not apparent in Participant 3’s classroom; additionally, some students were distracted from instruction.

Table 9

<table>
<thead>
<tr>
<th>Student Participation</th>
<th>Participant</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engaged in learning</td>
<td>1, 2, 4-20</td>
<td>95%</td>
</tr>
<tr>
<td>Asking and answering questions</td>
<td>1, 2, 3, 4</td>
<td>20%</td>
</tr>
<tr>
<td>Self-directed during presentations using technology</td>
<td>1, 3, 5, 7, 11-15, 18, 19, 20</td>
<td>60%</td>
</tr>
<tr>
<td>Involved in problem solving and critical thinking</td>
<td>2, 4, 7-11, 13-19</td>
<td>80%</td>
</tr>
<tr>
<td>Made connections in their learning</td>
<td>1-20</td>
<td>100%</td>
</tr>
<tr>
<td>Successful in their learning</td>
<td>5, 6, 7-20</td>
<td>80%</td>
</tr>
<tr>
<td>Connections in their learning were not apparent</td>
<td>3</td>
<td>5%</td>
</tr>
<tr>
<td>Distracted from instruction</td>
<td>3</td>
<td>5%</td>
</tr>
</tbody>
</table>

Domain II Learner-Centered Instruction—Student-Owned Devices Included

Table 10 shows learner-centered instruction during observations in the classrooms of the various participants with student-owned devices being used. In Participant 3’s classroom, some students experienced difficulty keeping up with the lesson. In 45% of the classrooms, the
teachers varied motivational and instructional strategies. Participant 3 utilized limited instructional strategies and motivational strategies. Participants 1 and 5 were moving out amongst the students’ desks and work stations.

Table 10

*Learner-Centered Instruction—Student-Owned Devices Included*

<table>
<thead>
<tr>
<th>Behaviors Observed</th>
<th>Participants</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lesson was learner centered</td>
<td>1, 3, 4, 7, 9, 10-15, 17-20</td>
<td>75%</td>
</tr>
<tr>
<td>Teacher explained the lesson goal/objective</td>
<td>1-20</td>
<td>100%</td>
</tr>
<tr>
<td>Teachers varied motivational and instructional strategies</td>
<td>6, 7 8, 9, 12, 17-20</td>
<td>45%</td>
</tr>
<tr>
<td>Teachers emphasized the value and importance of the lesson content</td>
<td>1, 2, 4, 6-12, 14-18</td>
<td>75%</td>
</tr>
<tr>
<td>Students utilized critical thinking and problem solving</td>
<td>2, 4, 7-19</td>
<td>75%</td>
</tr>
<tr>
<td>Teacher utilized appropriate questioning and inquiry</td>
<td>7-11, 13-18</td>
<td>55%</td>
</tr>
<tr>
<td>Teacher used appropriate pacing and sequencing</td>
<td>9, 13, 15-20</td>
<td>40%</td>
</tr>
</tbody>
</table>

In 75% of the classrooms, the teachers emphasized the value and importance of the lesson content throughout the observations. Participant 3 did not emphasize the importance and value of the lesson. Also in 75% of the classrooms, students were observed utilizing critical thinking and problem solving. Participants 1 and 4 utilized open-ended questions to check for understanding and monitor students’ progress. Real life examples were included in Participant 1’s instructions and students were actively participating in the activities and the class
discussions. Participants 2, 4, and 5 illustrated knowledge of various devices and applications. 40% of the participants used appropriate pacing and sequencing. In Participant 4’s classroom, the pacing of the lesson was slower, the teacher provided re-teach/review opportunities as needed, and students were comfortable sharing ideas.

Domain III Evaluation and Feedback—Student-Owned Devices Included

The participants included appropriate assessment in their lessons in 60% of the classrooms. In 75% of the classrooms, the teachers monitored and assessed students’ progress. The teachers reinforced students’ learning during the lesson and provided feedback in all of the classrooms. In nine of the 20 classrooms, participants included opportunities for re-learning and re-evaluation. Teachers provided constructive feedback. Participant 2 was engaged with the students and interactive. In Participant 5’s classroom, the students worked through the activities with little interaction with the teacher. Table 11 shows the evaluation and feedback behaviors by the participants observed the most in this domain.
Table 11

_Evaluation and Feedback—Student-Owned Devices Included_

<table>
<thead>
<tr>
<th>Evaluation and Feedback</th>
<th>Participants</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teachers included appropriate assessment in their lessons</td>
<td>1, 4, 6-12, 17, 18, 19</td>
<td>60%</td>
</tr>
<tr>
<td>Teachers monitored and assessed students’ progress</td>
<td>2-9, 11, 12, 13-18</td>
<td>80%</td>
</tr>
<tr>
<td>Assessments and instruction were aligned</td>
<td>1-7, 9-14, 16-18, 20</td>
<td>85%</td>
</tr>
<tr>
<td>Teachers reinforced students’ learning during the lesson and provided feedback</td>
<td>1-20</td>
<td>100%</td>
</tr>
<tr>
<td>Teachers included opportunities for re-learning and re-evaluation</td>
<td>1, 4, 6, 8-11, 15, 20</td>
<td>45%</td>
</tr>
<tr>
<td>Teachers provided constructive feedback</td>
<td>1-4, 8-11, 13, 14, 16, 17, 19, 20</td>
<td>70%</td>
</tr>
</tbody>
</table>

_Domain IV Management—Student-Owned Devices Included_

The majority of the participants (17 or 20) provided clear directions and expectations regarding students’ behavior prior to and during instruction. Participant 3 did not provide clear expectations for behavior. The participants had to redirect students’ disruptive behavior in 70% of the classrooms. In 50% of the participants’ classrooms, students were self-directed and self-disciplined. Teachers reinforced desired behaviors in 85% of the classrooms.

Equitable teacher-student interaction existed throughout the observation in 19 of the 20 classrooms. Equitable and varied characteristic based on the students’ needs was observed in 50% of the classrooms. In Participants 1 and 4’s classrooms, students required different types of support. Teachers managed time and materials effectively in 95% of the classrooms. Participant 1 used a timer to ensure effective use of instructional time and Participant 5 sought feedback.
from the students about the lesson content. Table 12 shows the management behaviors by participants and percentage that were observed the most in this domain.

Table 12

**Management—Student-Owned Devices Included**

<table>
<thead>
<tr>
<th>Behavior Observed</th>
<th>Participants</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teachers provided clear directions and expectations regarding students’ behavior prior to and during instruction</td>
<td>1, 2, 5-19</td>
<td>85%</td>
</tr>
<tr>
<td>Teacher had to redirect students’ disruptive behavior</td>
<td>3, 4, 6-14, 17, 19, 20</td>
<td>75%</td>
</tr>
<tr>
<td>Students were self-directed and self-disciplined</td>
<td>7-15, 18, 19</td>
<td>55%</td>
</tr>
<tr>
<td>Teachers reinforced desired behaviors</td>
<td>1, 2, 6-20</td>
<td>85%</td>
</tr>
<tr>
<td>Equitable teacher-student interaction</td>
<td>1-15, 17, 18, 19, 20</td>
<td>95%</td>
</tr>
<tr>
<td>Exhibited equitable and varied characteristic based on the students’ needs</td>
<td>1, 2, 4, 7-11, 18</td>
<td>45%</td>
</tr>
<tr>
<td>Teachers managed time and materials effectively</td>
<td>1, 2, 3, 4, 5, 7-20</td>
<td>95%</td>
</tr>
</tbody>
</table>

Table 13 lists the student and teacher behaviors observed during lessons in which student devices were not included. Additionally, the number of classrooms in which the behaviors were observed is included. Only behaviors observed in five or more classrooms are listed.
Table 13

**Summary of Classroom Observations—Student-Owned Devices Not Included**

<table>
<thead>
<tr>
<th>Class Observations</th>
<th># of Classrooms</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Student Behaviors</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Engaged in learning</td>
<td>14</td>
<td>70%</td>
</tr>
<tr>
<td>Self-directed</td>
<td>5</td>
<td>25%</td>
</tr>
<tr>
<td>Critical thinking and problem-solving</td>
<td>13</td>
<td>65%</td>
</tr>
<tr>
<td>Made connections in their learning</td>
<td>6</td>
<td>30%</td>
</tr>
<tr>
<td>Successful in their learning</td>
<td>14</td>
<td>70%</td>
</tr>
<tr>
<td><strong>Teacher Behaviors</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Learner-centered</td>
<td>20</td>
<td>100%</td>
</tr>
<tr>
<td>Learning goal/objective communicated</td>
<td>20</td>
<td>100%</td>
</tr>
<tr>
<td>Varied instructional strategies</td>
<td>13</td>
<td>65%</td>
</tr>
<tr>
<td>Varied motivational strategies</td>
<td>14</td>
<td>70%</td>
</tr>
<tr>
<td>Importance and value emphasized</td>
<td>6</td>
<td>30%</td>
</tr>
<tr>
<td>Utilized appropriate questioning</td>
<td>13</td>
<td>65%</td>
</tr>
<tr>
<td>Appropriate pacing and sequencing</td>
<td>11</td>
<td>55%</td>
</tr>
<tr>
<td>Appropriate assessments</td>
<td>14</td>
<td>70%</td>
</tr>
<tr>
<td>Monitored and assessed</td>
<td>16</td>
<td>80%</td>
</tr>
<tr>
<td>Assessment and instructions aligned</td>
<td>17</td>
<td>85%</td>
</tr>
<tr>
<td>Re-learning and re-evaluation</td>
<td>16</td>
<td>80%</td>
</tr>
<tr>
<td>Constructive feedback</td>
<td>17</td>
<td>85%</td>
</tr>
<tr>
<td>Clear directions and expectations</td>
<td>17</td>
<td>85%</td>
</tr>
<tr>
<td>Redirected students’ disruptive behavior</td>
<td>12</td>
<td>60%</td>
</tr>
<tr>
<td>Reinforced desired behaviors</td>
<td>14</td>
<td>70%</td>
</tr>
<tr>
<td>Equitable teacher-student interactions</td>
<td>18</td>
<td>90%</td>
</tr>
<tr>
<td>Equitable and varied characteristics</td>
<td>19</td>
<td>95%</td>
</tr>
<tr>
<td>Managed time effectively</td>
<td>15</td>
<td>75%</td>
</tr>
</tbody>
</table>

**Domain I Student Participation—Student-Owned Devices Not Included**

Students were engaged and successful in their learning in 85% of the classrooms. Some students were easily distracted at times. Students were able to make connections in their learning
in 80% of the classrooms. Participant 4 supported the students with making connections in their learning. Students were self-directed at times during the lessons in five classrooms. Students were not self-directed in other classes such as Participant 5’s classroom. In Participants 1, 2, and 7’s classrooms, students were sharing their thoughts and ideas throughout the observation. In Participants 2, 4, 9, and 10 there was student talk and interactions with the teacher. In 65% of the classrooms, the lesson required students to use their critical thinking and problem solving skills.

Table 14 shows the student participation items observed the most in this domain.

Table 14

*Student Participation—Student-Owned Devices Not Included*

<table>
<thead>
<tr>
<th>Behavior Observed</th>
<th>Participants</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students were engaged and successful in their learning</td>
<td>1-10, 12, 14-18, 20</td>
<td>85%</td>
</tr>
<tr>
<td>Students were able to make connections in their learning</td>
<td>1-10, 12-17</td>
<td>80%</td>
</tr>
<tr>
<td>Students were self-directed at times during the lesson</td>
<td>1, 3, 6, 17, 18</td>
<td>25%</td>
</tr>
<tr>
<td>The lesson required students to use their critical thinking and problem solving skills</td>
<td>2, 4, 5, 6, 8-10, 13, 15-18, 20</td>
<td>65%</td>
</tr>
</tbody>
</table>

*Domain II Learner-Centered Instruction—Student-Owned Devices Not Included*

The teachers’ instruction was learner-centered in the participants’ classrooms. All participants explained the learning goal/objective with their students. Participant 2 provided clear and concise instructions and provided additional support and clarification with the instructions. Participant 3 provided examples to assist students with making connections. In 75% of the classrooms, the participants emphasized the value and importance of the lesson’s content. Sixty percent of the participants’ lessons were paced and sequenced appropriately. The pacing was
slow in Participant 6’s classroom. The lesson included varied instructional strategies to ensure students’ success in 60% of the classrooms. Participants 3, 5, 7-11, and 13-19 included varied motivational strategies in their instruction. Participants 1 and 4 included open-ended and closed questions in their lessons. Some teachers included only open-ended questions in their lesson. One teacher did not include questioning in the lesson. Participant 4 instructed from various areas amongst the students. Students were engaged in discussions with one another in Participant 1’s class. Participant 2’s students were posing questions throughout the lesson. Students used their critical thinking/problem solving skills in half of the participants’ classrooms. There was clear communication between the students and Participant 5. Table 15 lists the types of learner-centered instruction provided for students.

*Domain III Evaluation and Feedback—Student-Owned Devices Not Included*

The teachers monitored and assessed students’ progress toward the learning goal/objective in 80% of the classrooms. I observed instruction and assessments were aligned in most of the classrooms. Seventy percent of the teachers included appropriate assessments in their lessons. Table 15 shows the behavior that supported learner-centered instruction in the classrooms.
Table 15

Learner-Centered Instruction—Student-Owned Devices Not Included

<table>
<thead>
<tr>
<th>Behaviors Observed</th>
<th>Participants</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teachers’ instruction was learner-centered</td>
<td>1-20</td>
<td>100%</td>
</tr>
<tr>
<td>Teachers explained the learning goal/objective with the students</td>
<td>1-20</td>
<td>100%</td>
</tr>
<tr>
<td>Teachers emphasized the value and importance of the lesson’s content</td>
<td>2, 3, 6-11, 13, 15-20</td>
<td>75%</td>
</tr>
<tr>
<td>Lessons were paced and sequenced appropriately</td>
<td>1, 4, 9-13, 15-17, 19,20</td>
<td>60%</td>
</tr>
<tr>
<td>Lessons included varied instructional strategies</td>
<td>3, 4, 5, 7, 10, 12, 13, 15-20</td>
<td>65%</td>
</tr>
<tr>
<td>Teachers included appropriate questioning in the lesson</td>
<td>1, 3, 7, 10-13, 15-20</td>
<td>65%</td>
</tr>
<tr>
<td>Student used critical thinking/problem solving skills</td>
<td>2, 4, 5, 8, 9, 12, 14, 17, 18, 20</td>
<td>50%</td>
</tr>
</tbody>
</table>

Participant 8 provided re-learning and re-teach opportunities based on students’ needs.

Students were able to illustrate their understanding of the content in Participant 4’s classroom.

The teachers provided constructive feedback to students in a majority of the classrooms. The teachers consistently recognized/reinforced students’ learning in 70% of the classrooms.

Participants 2 and 4 included positive comments and encouragement to students.

Participant 2 actively monitored the students during the lesson. Several teachers moved around the room from one table to the next supporting students as needed. Table 16 shows the evaluations and feedback behavior that were observed the most in classrooms.
Table 16

**Evaluation and Feedback—Student-Owned Devices Not Included**

<table>
<thead>
<tr>
<th>Behaviors Observed</th>
<th>Participants</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teachers monitored and assessed students’ progress toward the learning goal/objective</td>
<td>1, 3-8, 10-12, 14-19</td>
<td>80%</td>
</tr>
<tr>
<td>Teachers’ instruction and assessments were aligned</td>
<td>1, 2, 3, 5, 7-16, 18-20</td>
<td>85%</td>
</tr>
<tr>
<td>Teachers included appropriate assessments in their lessons</td>
<td>1, 2, 3, 4, 7, 9-11, 13-17, 20</td>
<td>60%</td>
</tr>
<tr>
<td>Re-learning and re-teach opportunities were provided based on students’ needs</td>
<td>1, 3, 5-11, 13-16, 18-20</td>
<td>80%</td>
</tr>
<tr>
<td>Teachers provided constructive feedback to students</td>
<td>1-9, 11-12, 15-20</td>
<td>85%</td>
</tr>
</tbody>
</table>

**Domain IV Management—Student-Owned Devices Not Included**

The teacher clearly defined classroom expectations and discipline procedures in 85% of the classrooms. Participant 20’s expectations regarding behavior were not high. Participant 6 did not have defined classroom expectations nor discipline procedures. The teachers reinforced desired behavior throughout the observation in 70% of the classrooms. Disruptive behavior was redirected in a consistent manner in over half of the classrooms. Some students had to be redirected multiple times in Participant 6’s classroom. Some disruptive behavior in Participant 5’s classroom was neither redirected nor addressed during the observation. In Participants 3, 5, 9 and 17’s classrooms, some students were self-directed and self-disciplined during the observation. A majority of the teachers exhibited equitable and varied characteristics in their interaction with students. In Participant 1’s classroom students were engaged in discussions with one another. There were equitable teacher and student interactions in 90% of the classrooms. In
75% of the classrooms, the teachers managed time and materials effectively. Table 17 shows the most commonly used management behaviors and the classrooms where they were observed.

Table 17

**Management—Student-Owned Devices Not Included**

<table>
<thead>
<tr>
<th>Behaviors Observed</th>
<th>Participants</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teacher clearly defined classroom expectations and discipline procedures</td>
<td>1, 2, 4, 5, 7-19</td>
<td>65%</td>
</tr>
<tr>
<td>Teacher reinforced desired behavior throughout the observation</td>
<td>1, 2, 3, 4, 7-10, 13, 15-17, 19, 20</td>
<td>70%</td>
</tr>
<tr>
<td>Disruptive behavior was redirected in a consistent manner</td>
<td>2, 3, 6, 7, 9-14, 18-19</td>
<td>60%</td>
</tr>
<tr>
<td>Teachers exhibited equitable and varied characteristics in their interaction with students</td>
<td>1-10, 12-20</td>
<td>95%</td>
</tr>
<tr>
<td>Equitable teacher and student interactions</td>
<td>1, 2, 3, 4, 7-20</td>
<td>90%</td>
</tr>
</tbody>
</table>

**Lesson Planning Documents**

The participants’ lesson planning documents were reviewed for each of the lessons observed. Each participant had a lesson planning document for the lesson that included student devices and the lesson that did not include student devices. The participants used their district’s standardized lesson planning document to plan their instruction. The lesson planning document included five sections. The sections were frame the lesson, explore the concepts, talk about the learning, elaborate and apply, and recognize, reinforce, and evaluate.

Table 18 lists the identified components of each section of the lesson plans for instruction that included students’ devices. Additionally, the number of lesson plans in which the
components were observed is included. Only components observed in five or more lesson plans are listed.

Table 18

Review of Lesson Planning Documents—Student Devices Included

<table>
<thead>
<tr>
<th>Lesson Components</th>
<th># of Lesson Plans Component Included In</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lesson Frame</td>
<td>20</td>
<td>100%</td>
</tr>
<tr>
<td>Lesson introductions, guided practice, independent practice</td>
<td>20</td>
<td>100%</td>
</tr>
<tr>
<td>Alternate activities to address lack of device access</td>
<td>12</td>
<td>60%</td>
</tr>
<tr>
<td>Pre-planned questions</td>
<td>20</td>
<td>100%</td>
</tr>
<tr>
<td>Plans for monitoring/supporting use of devices</td>
<td>7</td>
<td>35%</td>
</tr>
<tr>
<td>Specific plans for including student devices</td>
<td>6</td>
<td>30%</td>
</tr>
<tr>
<td>Plans for recognizing/reinforcing students’ participation and progress</td>
<td>20</td>
<td>100%</td>
</tr>
<tr>
<td>Plans for effective use of instructional time</td>
<td>5</td>
<td>25%</td>
</tr>
<tr>
<td>Lesson closure</td>
<td>20</td>
<td>100%</td>
</tr>
</tbody>
</table>

Frame the Lesson–Student-Owned Devices Included

The teachers included “We will” and “I will” statements to frame the learning for students in all 20 of the classrooms. These statements are to assist in engaging students in the learning. These statements provided students with a clear understanding of what the teachers planned for the class to do or learn during the lesson and what the teachers planned for each student to do by the end of the lesson.
**Explore the Concepts–Student-Owned Devices Included**

In each of the 20 classrooms, the teachers planned to introduce the lesson or activity to the students, include topics for class discussions, and for guided practice, individual and/or small group activities for the lesson. Participants 7 and 13 planned how the content would be presented and how students would interact with the content using their devices. Participants 11 and 13 included plans for using the devices to support instruction and assess students’ progress. Participants 9, 15, and 16 included detailed plans with clear instructions or directions for the students. In 11 of the 20 classrooms, the teachers planned alternate activities for students who either did not have a device or students whose devices were not working properly. Participant 3 also planned for students to share devices if necessary. Extra time was included for the sharing of devices. Participants 6, 12, and 20 planned for sites and applications that did not work appropriately, while Participants 8 and 17 planned for appropriate pacing and timing of the lessons.

**Talk About the Learning–Student-Owned Devices Included**

All 20 of the teachers included seed questions or specific content-focused questions to initiate small group discussions during instruction. The questions were open-ended in nature to encourage higher level thinking. Each of the participants also planned time for students to participate in focused small group purposeful talk based on the planned seed questions.

**Elaborate and Apply–Student-Owned Devices Included**

Each of the 20 teachers included activities for independent practice and individual student work. Participants 1, 16, 19, and 20 planned activities to use student devices to support instruction and for extension in the learning. Participant 17 planned for various types of information gathering, student responses/formative assessments, collecting student work using
the devices. Participants 3 and 20 planned activities to ensure that the required standards or skills were addressed appropriately. Seven of the teachers planned for monitoring student work on their devices. Participants 18 and 19 planned to review clearly defined procedures and expectations and Participant 6 made note of the amount of freedom/level of support/supervision students would require during the lesson. Participants 7, 8 and 11 had identified the sites, apps, and resources students would be using during the lesson, while Participant 4, 9, and 10 made notes to assist with troubleshooting and technology support for students. Participants 8 and 10 also planned for supporting students with different devices with differing capabilities.

*Recognize, Reinforce, and Evaluate—Student-Owned Devices Included*

All 20 participants planned for recognizing and reinforcing students’ participation, progress toward the lesson frame, and their contributions to the learning. They included various formative assessments throughout the lessons as well. As well, the 20 participants identified class discussions, questioning, and exit tickets as formative assessments they would utilize.

Table 19 lists the identified components of each section of the lesson plans for instruction that did not include students’ devices. The number of lesson plans in which the components were observed is included. Only components observed in five or more lesson plans are listed.
Table 19

Review of Lesson Planning Documents—Students-Owned Devices Not Included

<table>
<thead>
<tr>
<th>Lesson Components</th>
<th># of Lesson Plans Components Included In</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lesson frame</td>
<td>20</td>
<td>100%</td>
</tr>
<tr>
<td>Lesson introductions, guided practice, independent practice</td>
<td>20</td>
<td>100%</td>
</tr>
<tr>
<td>Pre-planned questions</td>
<td>20</td>
<td>100%</td>
</tr>
<tr>
<td>Plans for recognizing/reinforcing students’ participation and progress</td>
<td>20</td>
<td>100%</td>
</tr>
<tr>
<td>Plans for effective use of instructional time</td>
<td>20</td>
<td>100%</td>
</tr>
<tr>
<td>Lesson closure</td>
<td>20</td>
<td>100%</td>
</tr>
</tbody>
</table>

Frame the Lesson—Student-Owned Devices Not Included

Teachers included “We will” and “I will” statements to frame the learning for students in all 20 classrooms. These statements were designed to assist with student engagement in the learning. They provided students with an understanding of what the teachers planned for the class to do or learn during the lesson, and what the teachers planned for each student to do by the end of the lesson.

Explore the Concepts—Student-Owned Devices Not Included

The teachers planned to introduce the lesson or activity to the students in all 20 classrooms. They included topics for class discussions. Each of the teachers planned for guided practice, individual and/or small group activities for the lesson. None of 20 teachers referenced any additional instructional tools or resources to assist student with exploring content individually or collectively.
Talk About the Learning–Student-Owned Devices Not Included

All 20 teachers included seed questions or specific content-focused questions to initiate small group discussions during instruction. The questions were open-ended in nature to encourage higher level thinking. The teachers planned time for students to participate in focused small group purposeful talk based on the planned seed questions. None of the teachers referenced any additional instructional tools to support students’ discussion about the lesson’s content.

Elaborate and Apply–Student-Owned Devices Not Included

The teachers in all 20 classrooms included activities for independent practice and individual student work. The teachers identified the resources and materials students would use to support instruction. The teachers developed several of the items. Teachers considered and planned for effective use of instructional time in all 20 classrooms.

Recognize, Reinforce, and Evaluate–Student-Owned Devices Not Included

The 20 participants planned for recognizing and reinforcing students’ participation, progress toward the lesson frame, and their contributions to the learning. They included various formative assessments throughout the lessons as well. Teachers in all 20 classrooms identified class discussions, questioning, and exit tickets as the formative assessments they would utilize.

After identifying themes that existed in the data sources, I triangulated the data to identify themes that existed across the data sources. The purpose of triangulation is to examine data from different sources and relate the data to establish validity. (Creswell, 2007; Gall et al., 2007; Glesne, 2006). The process allowed me to support my findings with information from each of the data sources. Table 20 shows the themes and patterns related to lesson planning and classroom environment that were identified across the interviews, observations, and lesson plan reviews.
Table 20

<table>
<thead>
<tr>
<th>Data Sources</th>
<th>Lesson Planning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interviews</td>
<td>Class Environment</td>
</tr>
<tr>
<td></td>
<td>Themes/Patterns</td>
</tr>
<tr>
<td>Interviews</td>
<td>Devices support instruction</td>
</tr>
<tr>
<td></td>
<td>Plan for students’ access</td>
</tr>
<tr>
<td></td>
<td>Alternate activities</td>
</tr>
<tr>
<td></td>
<td>Apps and websites access</td>
</tr>
<tr>
<td></td>
<td>Knowledge of student devices</td>
</tr>
<tr>
<td></td>
<td>Instructional technology skills set</td>
</tr>
<tr>
<td></td>
<td>Relevant lesson content</td>
</tr>
<tr>
<td></td>
<td>Digital citizenship</td>
</tr>
<tr>
<td>Observations</td>
<td>Instructional time used effectively</td>
</tr>
<tr>
<td></td>
<td>Teachers supporting students</td>
</tr>
<tr>
<td></td>
<td>Teachers assessing students</td>
</tr>
<tr>
<td></td>
<td>Varied strategies</td>
</tr>
<tr>
<td></td>
<td>Providing technology support</td>
</tr>
<tr>
<td></td>
<td>Varied activities</td>
</tr>
<tr>
<td></td>
<td>Addressing student behavior</td>
</tr>
<tr>
<td></td>
<td>Appropriate pacing/sequencing</td>
</tr>
<tr>
<td></td>
<td>Varied level of interactions</td>
</tr>
<tr>
<td></td>
<td>Learner-centered</td>
</tr>
<tr>
<td></td>
<td>Students distracted at times</td>
</tr>
<tr>
<td></td>
<td>Students making connections</td>
</tr>
<tr>
<td></td>
<td>Self-directed/Problem solving</td>
</tr>
<tr>
<td></td>
<td>Students engaged</td>
</tr>
<tr>
<td>Lesson Plan Review</td>
<td>Lesson frames</td>
</tr>
<tr>
<td></td>
<td>Monitoring/Management</td>
</tr>
<tr>
<td></td>
<td>Recognizing/reinforcing students</td>
</tr>
<tr>
<td></td>
<td>Cooperative learning</td>
</tr>
<tr>
<td></td>
<td>Lesson introductions, independent practice, guided practice</td>
</tr>
<tr>
<td></td>
<td>Alternate activities</td>
</tr>
<tr>
<td></td>
<td>Pre-planned questions</td>
</tr>
<tr>
<td></td>
<td>Guidelines for device use</td>
</tr>
<tr>
<td></td>
<td>Plan for supporting use of devices</td>
</tr>
</tbody>
</table>

Summary

In this chapter, I presented the data collected during the study. The data were collected through six interview questions for each of the 20 participants, two classroom observations for each participant, and two lesson planning document reviews for each participant. I examined the data to identify constructs, themes, and patterns. The data were categorized, coded, and compared across each case to describe or explain the teachers’ experiences with their BYOD
initiative. Chapter 5 provides a summary of the study, a discussion of the findings, surprises, and conclusions.
CHAPTER 5
SUMMARY, FINDINGS, RESEARCHER OBSERVATIONS, AND CONCLUSIONS

This chapter includes an overview of the problem, the purpose statement, research questions, a review of the methodology, and a summary of the findings. In this chapter, I examine the findings related to the literature and the surprises the study presented. Finally, conclusions, implications for action, recommendations for future research are discussed.

Overview of the Problem

The study focus was on the challenges that school administrators face regarding effectively supporting student achievement and ensuring college and career readiness for all students. Specifically, students are graduating high school without the critical skills necessary to be successful with their post-secondary plans (Goode, 2010; Valentine & Bernhisel, 2008). McAnear (2010) indicated learning should be specific to students’ individual needs and technology should be integrated in their learning. School administrators have not recognized success with integrating technology into schools (Keengwe, Schnellert, & Mills, 2012; Loertscher, 2011; Shapley et al., 2011).

School administrators have been charged with examining alternate options for ensuring students’ access to technology, and effectively addressing their learning styles and interests (Fingal, 2012; Hill, 2011; Kennedy, 2012; Norris & Soloway; 2011; Ullman, 2011a). Incidentally, D. Johnson (2012) stated mobile computing devices have become more affordable for students and families. Consequently, increasing numbers of students are bringing their mobile devices to school (Hill, 2011; Kennedy, 2012; Nelson, 2012; Norris & Soloway, 2011). This has provided schools with an opportunity to leverage students’ devices to address curriculum content and support the development of 21st century skills. Subsequently, a number of school districts
are implementing bring your own device (BYOD) initiatives, and allowing students to bring their
devices to school to support their learning (Hill, 2011; Kennedy, 2012; Nelson, 2012).

Even though these types of initiatives provide students with additional devices to use in
their classes, school administrators are responsible for ensuring teachers plan effectively and
their instruction meets students’ needs (Dessoff, 2010; Donovan et al., 2010; Keengwe,
Onchwari, & Wachira, 2008). Ensuring the teachers have the skills necessary for effective
planning and maintaining classroom environments conducive to learning presents school
administrators with some challenges (Berrett et al., 2012; Subramaniam, 2007; Winne, 2006).
Demb et al. (2004) indicated professional development and training that addresses teachers’
learning needs is critical to the success of BYOD initiatives. School administrators must have a
clear understanding of teachers’ perceptions regarding these types of initiatives and the effects
on instructional planning and the classroom environment. Unfortunately, there is not a great deal
of research that specifically addresses this subject.

Purpose of the Study

BYOD initiatives have been introduced in several North Texas school districts to enrich
teaching and learning, individualize students’ experiences, advance the students and staff in a
21st century learning environment, and ensure students are college and career ready. The
purpose of this study was to examine high school teachers’ perceptions about the effects of
BYOD initiatives on instructional planning and the classroom environment. The BYOD
initiatives on two high school campuses in a suburban district were examined through a
qualitative research approach, a collective case study. The research questions were designed to
provide a better understanding of high school teachers’ experiences with BYOD initiatives,
regardless of whether or not teachers believe campuses should participate in the initiatives.
Research Questions

1. How do secondary teachers participating in a bring your own device initiative believe their instructional planning is affected?

2. How do secondary teachers participating in a bring your own device initiative believe the learning environment is affected by the initiative?

Review of Methodology

A qualitative research approach was used in the study to examine the research questions. Creswell (2007) identified several common characteristics of qualitative research: a natural setting, researcher as the key instrument, multiple sources of data, inductive data analysis, participants’ meaning, emergent design, theoretical lens, interpretive inquiry, and a holistic account.

The study was a collective case study. A case study is a research strategy that centers on understanding the dynamics that exist in an individual setting (Huberman & Miles, 2002). Glesne (2006) stated a case study that examines multiple cases is a collective case study. Case studies typically combine data collection methods including archives, interviews, questionnaires, and observations (Denzin & Lincoln, 2011; Gall et al., 2007; Huberman & Miles, 2002).

The data were collected through six interview questions, two classroom observations, and two reviews of the participants’ lesson planning documents. Three interview questions were based on each of the two research questions. I completed two observations in each of the 20 participants’ classrooms. There was one observation on a class period in which students’ technology was included, and there was an observation on a class period in which students’ technology is not included. Each participant’s lesson planning documents were reviewed for both of the observations.
An interpretational analysis was used to examine the data. This type of analysis examines data to identify constructs, themes, and patterns to describe or explain the phenomena being studied (Gall et al., 2007). A collective case analysis was included in the second part of the analysis. The analysis included the identification of themes, constructs, patterns, and the categorizing and coding of data. I used the constant comparative method to analyze the data. The constant comparative method is the process of reviewing information from the data collection and comparing it to developing categories (Creswell, 2007). Comparisons are made within and across categories during the data collection process. Gall et al. (2007) stated this allows the researcher to clearly identify categories, decide which categories to examine, and determine meaning of the categories.

Summary of the Findings

The findings were based on the data collected through interviews with each of the 20 participants, classroom observations, and lesson planning document reviews. I completed an observation of a lesson including student devices and a lesson not including student devices. Similarly, I completed a lesson planning document review for each of the lessons observed.

Interviews

The interviews provided greater insight into the participants’ perceptions regarding their experiences with BYOD initiatives. Table 21 summarizes participants’ planning considerations, professional development experiences, and their perceptions about their classroom environments during instructions that included students’ devices. These areas were the focus of the six interview questions.
### Summary of Participants’ Perceptions—Interviews

<table>
<thead>
<tr>
<th>Lesson Planning Considerations</th>
<th>Professional Development Experiences</th>
<th>Classroom Environment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Devices support instruction</td>
<td>Training focused on including student devices</td>
<td>Greater student engagement</td>
</tr>
<tr>
<td>Plan for student’s access</td>
<td>Guidance on planning, effective use of instructional technology, classroom management</td>
<td>Greater content retention, Teachers facilitate learning</td>
</tr>
<tr>
<td>Alternate activities</td>
<td>Planning for differentiation and assessment</td>
<td>Self-directed students, Student led learning</td>
</tr>
<tr>
<td>Apps and websites access</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Knowledge of student devices</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher proficiency with instructional technology</td>
<td></td>
<td>Some students distracted</td>
</tr>
<tr>
<td>Relevant lesson content</td>
<td></td>
<td>Classroom management is critical</td>
</tr>
<tr>
<td>Digital citizenship</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Teachers indicated one of the greatest differences in planning for instruction that included student-owned devices was whether or not students had a device to use in class. Additionally, they reported that consideration had to be given to the possibility that students’ devices would fail or not work. These instances required teachers to plan alternate activities that did not require a device, but would cover the content effectively. Teachers also had to consider whether or not students sharing a device would be appropriate for the lesson. They had to ensure the lesson including students’ devices were mobile device friendly across all devices and platforms. This required teachers to use the applications and websites prior to the lessons. Correspondingly, teachers had to possess a general knowledge of a variety of devices to best support their students.

Teachers indicated additional considerations included determining if student devices would be beneficial for the lessons, how the devices would be used to support the learning and
student assessment, and what types of technology best fit their teaching style and the students’ needs. Additionally, they had to ensure that including students’ devices would not slow the pace of instruction; they would remain aligned with their content team members. One teacher shared planning for instruction that included students’ devices was overwhelming and required a great deal of time due to the vast amount of instructional technology available to teachers. In contrast, teachers reported that having numerous instructional technology resources allowed them to support students’ individual needs better.

Most teachers’ considerations and decisions focused on students’ needs. Teachers reported they had to take into accounts students’ grade/maturity level, students’ interests, and their technology skills. The lessons were designed to support student engagement and student achievement. Additionally, teachers had to assess their own technology skills and determine if they would be able to support students adequately if they experienced challenges with their technology.

Most teachers had participated in professional development or trainings that focused on instruction including student-owned devices. The trainings offered teachers guidance on planning, collaborating, classroom management, and the effective use of instructional technology. Additionally, teachers received training on integrating technology into their classes to support differentiation and student assessment. Teachers reported recognizing which lessons were best suited for student devices was very important.

Furthermore, teachers shared students were more engaged in instruction that included their devices, and they retained more content. Additionally, students were more apt to engage in the enrichment or extension activities. The teachers reported that effective planning and structure increased student engagement. Teachers also felt a balance between instruction that included
student devices and instruction that did not include devices was important to the effectiveness of these initiatives. Conversely, some teachers reported students’ devices were distracting to students at times. They shared it was very difficult to determine how engaged some students were during instruction. At times, students were more engaged in their devices’ capabilities than they were in the instruction. Consequently, these students experienced some challenges with the content. The teachers reiterated the importance of effective classroom management, and procedures and guidelines for the use of student devices. These critical components support students becoming responsible users of their technology in class.

Teachers also reported during lessons that included their devices, students focused on the content more, and they had a better understanding of the content. They shared that while students were off task at times, their attentiveness and participation was greater. Some teachers qualified that the students’ level of engagement depended on their level of interest in the lesson content. During lessons that interested students, they would assume some of the teaching responsibilities with their peers. One teacher added students were more attentive when using their own devices because they were able to transition between various activities. The teacher shared this type of behavior is more closely aligned with their real life experiences. Some teachers indicated students’ behavior during instruction that included their devices was more dependent upon the individual student. Again, teachers felt effective classroom management was the key to ensuring successful lessons. Similarly, teachers’ ability to be flexible was identified as another important factor.

Teachers reported during instruction that included student devices they facilitated and provided some direction. They indicated facilitating was possible if the teacher’s planning was effective. Additionally, during these lessons the teacher ensured students were on task,
monitored their progress toward the learning objective, and offered support as needed. Teachers reported they were able to provide immediate feedback and guidance as students completed their assignments. Teachers shared higher level questioning and opportunities for students to give feedback supported students making relevant connections in their learning. Similarly, extensions and additional opportunities for students to work with the content also supported student achievement. Digital citizenship instruction and technology support were identified as critical factors to the success of this type of instruction as well.

Classroom Observations

I completed two classroom observations on each participant. These observations afforded me the opportunity to witness the participants’ instruction, and closely monitor students and teachers behavior during both types of lessons. Table 22 is summary of the classroom observations in which student devices were included. These areas were included as they were the main focus of the classroom observation protocol.
I completed the first round of classroom observations during lessons that included student-owned devices. Students were engaged in the learning throughout the observation. Students were participating in problem solving and using their critical thinking skills, and they were able to make connections in their learning. Conversely, there were some students who were distracted and it was difficult to determine if they were making connections in their learning.

The lessons were learner-centered in most of the classrooms. The teachers shared the learning goal with the students, and they varied the motivational and instructional strategies they utilized in the lesson. Most teachers used appropriate pacing and sequencing throughout the lesson. They made certain the value and importance of the lesson was communicated to the students. Some teachers illustrated knowledge of a variety of student devices as they supported the learning. The teachers utilized effective questioning, and they included other forms of assessments to monitor students’ progress effectively toward the learning goal. Students were
reinforced in their learning, received specific feedback to maintain their progress, and were provided with re-teach opportunities as needed. In some classrooms, the teachers worked quite closely with students; in other classrooms there was very little interaction between the teacher and the students once they began their activities.

The teachers ensured students received clear instructions and guidance prior to the lesson beginning. In most of the classrooms, students were self-directed and teachers were facilitating the learning. Teachers reinforced appropriate student behaviors and there were equitable teacher-student interactions that met the needs of the students. They consistently addressed any off-task or distracting behaviors during the observations. The participants ensured that instructional time was utilized effectively. Table 23 is summary of the classroom observations in which student devices were not included.

Table 23

*Summary of Classroom Observations—Student-Owned Devices Not Included*

<table>
<thead>
<tr>
<th>Instruction Descriptors</th>
<th>Teacher Behaviors</th>
<th>Student Behaviors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learning centered</td>
<td>Learning objective communicated</td>
<td>Engaged in learning</td>
</tr>
<tr>
<td>Varied motivational strategies</td>
<td>Value/importance emphasized</td>
<td>Problem solving</td>
</tr>
<tr>
<td>Varied instructional strategies</td>
<td>Questioning, some assessments</td>
<td>Making connections</td>
</tr>
<tr>
<td>Appropriate pacing/sequencing</td>
<td>Specific feedback and guidance</td>
<td></td>
</tr>
<tr>
<td>Instructional time used effectively</td>
<td>Reinforcing students’ progress</td>
<td></td>
</tr>
<tr>
<td>Assessments aligned to instruction</td>
<td>Addressing students’ behavior</td>
<td></td>
</tr>
</tbody>
</table>
I completed the second round of classroom observations during lessons in which student devices were not included in the instruction. Students were engaged and successful in the lesson. Students were able to make connections in their learning, and they were required to use critical thinking skills and problem solving. In some classes, students were self-directed during the observations. Students were engaged in content discussion and interacting with the teachers in several classrooms.

The instruction was learner-centered in each of the classrooms. The teachers explained the learning objective and provided clear instructions. The importance of the lesson’s content was illustrated to the students. The lessons had appropriate pacing and sequencing; the teachers included varied instructional and motivational strategies in their lessons to ensure students’ success. Appropriate questioning was utilized in most of the classrooms. The teachers monitored and assessed students’ progress throughout the observation. Their instruction was aligned to the assessments they included, and they provided re-teach opportunities for students. Teachers’ feedback was timely and specific and they reinforced students’ progress toward the learning objective.

Students were provided with clearly defined expectations for participation and behavior, and the teachers ensured students understood the classroom procedures. Some teachers had lower expectations for students and their classroom procedures were not clearly defined. However, most teachers reinforced appropriate behavior and consistently addressed off-task or distracting behavior. Teachers exhibited varied characteristics in their interactions with students. Their interactions with students were equitable and seemed to meet students’ needs. Most of the teacher used instructional time effectively.
Lesson Planning Documents

I reviewed the lesson planning documents to gain a better understanding of participants’ planning considerations and procedures. Table 24 summarizes the components of plans for instruction that includes students’ devices and instructions that do not include students’ devices. The components were identified in most of the participants’ lesson plans.

Table 24

Summary of Lesson Planning Document Reviews

<table>
<thead>
<tr>
<th>Lesson Components−Devices Included</th>
<th>Lesson Components−Devices Not Included</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lesson frames</td>
<td>Lesson frames</td>
</tr>
<tr>
<td>Lesson introductions, guided practice, independent practice</td>
<td>Lesson introductions, guided practice, independent practice</td>
</tr>
<tr>
<td>Alternate activities</td>
<td>Pre-planned questions</td>
</tr>
<tr>
<td>Activities that required student devices</td>
<td>Plans for recognizing/reinforcing students’ participation and progress</td>
</tr>
<tr>
<td>Pre-planned questions</td>
<td>Lesson closure</td>
</tr>
<tr>
<td>Guidelines for device use</td>
<td></td>
</tr>
<tr>
<td>Plans for monitoring/supporting use of devices</td>
<td></td>
</tr>
<tr>
<td>Instructional technology identified</td>
<td></td>
</tr>
<tr>
<td>Plans for recognizing/reinforcing students’ participation and progress</td>
<td></td>
</tr>
<tr>
<td>Lesson closure</td>
<td></td>
</tr>
</tbody>
</table>

The participants lesson planning documents were reviewed for each of the lessons observed. I reviewed the lesson planning document for the lessons that included student devices initially. The teachers included a lesson frame with “We will” and “I will” statements to communicate the focus and learning objective of the lesson. These statements were written in student-friendly language to engage students in the learning. Teachers planned introductions to their lessons, and included topics for class discussions. They also planned guided practice
activities and opportunities for students to work with the content individually or in small groups with less support from the teacher. Alternate activities were planned for students who did not have devices or whose devices were not working. Pacing and issues with sites and applications were addressed in some teachers’ plans.

Teachers included specific content-focused questions to initiate small group discussions during instruction. Open-ended questions were included to engage students in high level thinking and problem solving. Teachers planned activities for independent practice and individual student work during the lesson. They included specific activities that required students to use their devices, and they planned for monitoring students’ work on their devices. The teacher considered the guidelines they would share with students, and the level of supervision/support students would require with their devices during the lesson. They also planned for the instructional technology that would be included and the technical support students would require. Teachers included plans for recognizing and reinforcing students’ participation and progress toward the lesson frame. Finally, teachers identified class discussions, questioning, activities with student devices, and exit tickets as the types of formative assessments they would use during their lessons.

Subsequently, I reviewed the participants’ lesson planning documents for the lessons that did not include students’ devices. Teachers included lesson frames with “We will” and “I will” statements. These statements provided students with an overview of what the teacher planned for the class to do, and what the teacher planned for each student to be able to accomplish at the end of the class. They were written in a manner to help engage students in the lesson. Teachers’ plans included an introduction to the lesson, topics for class discussions, guided practice, and activities
for independent practice. The teachers did not address any additional instructional resources to support students with exploring the lesson’s content.

The teachers included seed questions or content-focused questions to guide students’ small group discussions throughout the lesson. These were rigorous, open-ended questions designed to promote higher-level thinking. Teachers did not reference any additional instructional tools or resources to support students’ discussions. They did plan for independent practice and individual student work. Teachers identified materials and resources that would be used to support students’ progress toward the lesson frame or learning objective. The teachers developed a number of these items. Teachers planned for the effective use of instructional time for their lessons. Additionally, they included notes to recognize and reinforce students’ progress toward the lesson frame and their participation. They included formative assessments such as class discussions, questioning, and exit tickets.

Findings Related to the Literature

The findings are based on the data collected through interviews with each of the 20 participants, classroom observations, and lesson planning document reviews. I compared the study’s finding to the literature and previous studies to identify similarities and differences. The findings supported some of the existing literature and offered some additional information about teachers’ experiences with BYOD initiatives.

Participants reported one of the most significant differences or challenges in planning for instruction that included student-owned devices was whether or not students had a device to use in class. Similarly, research indicated equity and access in BYOD initiatives were challenges that school leaders had to take into consideration (Lagarde & Johnson, 2014). They also had to plan for the possibility that students’ devices would not work during the lesson. Alternate activities
had to be planned that did not require a device, but would address the content successfully. Participants’ lesson planning documents included activities for students that did not have a device.

Participants also had to consider whether or not students sharing a device would be appropriate for the lesson. They emphasized the importance of ensuring lessons including students’ devices were mobile device friendly across all other devices and platforms. Rossing et al. (2012) stated that devices and application must have a use-friendly interface. Participants indicated they had to use applications and websites to identify any challenges their students might experience. Findings from the literature showed students’ level of interest and excitement decrease when they experience technology challenges during a lesson. Students also reported an increased level of stress about the possibility of failing technology or connectivity problems during activities (Manuguerra & Petocz, 2011; Rossing et al., 2012).

Participants reported that possessing some basic knowledge of their students’ devices was a critical factor in effectively supporting students’ learning in BYOD initiatives. Correspondingly, I observed teachers exhibiting their knowledge of student devices as they provided technical support during the lessons. Additionally, the participants’ lesson planning documents included notes on assisting students with their devices. The literature indicated professional development was an important factor in preparing for teachers to effectively integrate students’ technology and manage BYOD initiatives in their classrooms (Bolkan, 2014; Burns-Sardone, 2014; Harris, 2012; D. Johnson, 2012; Kay & Lauricella, 2014; Nelson, 2012). Participants added other considerations included determining whether student devices would be beneficial for lessons, how the devices would support student learning and assessment, and the types of instructional technology that best compliments their teaching style and the students’
needs. The literature reinforced the need for teachers to design lessons and activities that include students’ devices in a manner relevant to students (Beeson et al., 2014; Broussard et al., 2014; Crichton et al., 2012; Kim & Jang, 2015; Rossing et al., 2012).

Participants had to ensure that including students’ devices would not slow the pace of instruction nor diminish the lesson’s content. I observed most teachers utilizing appropriate pacing and sequencing during these lessons. Students’ use of varying devices can create challenges due to the inability of the devices to communicate with one other. At times, including student devices can cause the learning process to be slowed (Hill, 2011; Nelson, 2012). Participants addressed pacing and potential challenges with students’ technology, sites, and applications in their lesson plans. Some participants reported planning for instruction that included students’ devices was overwhelming and required more time because of the amount of instructional technology at teachers’ disposal. Fingal (2012) reported BYOD programs cause teachers a great deal of anxiety as they plan how to use students’ devices. In contrast, other participants reported that having numerous instructional technology resources allowed them to better support students’ individual needs. They were excited about the opportunity to include students’ devices in their learning.

Banister (2010) reported the way teachers instruct and present content should reflect students’ needs. The teachers reported they had to consider students’ grade level, their interests, and their technology skills. Additionally, the teachers indicated they had to evaluate their own technology skills to ensure they could provide the necessary technology support for students. Similarly, objectives for technology use should be aligned with learning objectives and students skills (Auchincloss & McIntyre, 2008; Bauleke & Herrmann, 2010; Murray, 2010).
During the classroom observations, the teachers provided clear instructions and guidance prior to the lesson. I observed lessons that were learner centered in most of the classrooms. Participants shared the learning goal or lesson frame with the students at the beginning of the class. I also observed the teachers utilizing varied motivational and instructional strategies. The participants were observed emphasizing the value and importance of the lesson to their students. They included a variety of questioning strategies and assessments. Students received content specific feedback, re-teach/review opportunities, and consistent reinforcement. The participants lesson planning documents were reviewed for each of the lessons observed. Participants’ lesson planning documents included lesson frames with “We will” and “I will” statements to illustrate the learning objective of the lesson. They were written in a manner that students could understand to support engagement. Participants’ plans included introducing the learning objectives, student discussion topics, and lesson activities. They planned guided practice, and opportunities to work with the content individually or in small groups with less support from the teacher. Finally, alternate activities plans were included for those students who did not have devices or whose devices were not working.

The literature suggested teachers would require professional development to design engaging lessons that would leverage these types of technology in the classroom (Beeson et al., 2014; Broussard et al., 2014; Colvin, 2013; Crichton et al., 2012; Peluso, 2012; Rossing et al. 2012; W. Wong, 2012a). Teachers reported participating in professional development that addressed instruction which includes student-owned devices. The training focused on planning, instructional strategies, student engagement, and assessment. Peluso (2012) indicated many professional development departments have begun to recognize the need for preparing school staff for effectively including technology into their instruction.
Participants felt students experienced greater focus and engagement during instruction that included their devices. Sucre (2012) maintained student achievement could be positively affected by students utilizing their devices during instruction. Participants added students had a better understanding of the content, and they retained more information. The literature presented similar findings. Steele (2007) suggested content was more likely to be relevant and attainable to students when presented utilizing instructional technology. Furthermore, students were more likely to engage in the enrichment activities. During the classroom observations, I observed students engaged in the learning. Students seemed to be more actively engaged during lessons that included student devices. Students participated in activities that included problem solving and using their critical thinking skills. Additionally, students were able to make connections in their learning. The literature indicated students were more creative and experienced higher levels of engagement when their devices were included in their learning (Bolkan, 2014; Knuckles et al., 2012; Ray, 2013; Ullman, 2011a). Participants concluded students were more engaged when using their own devices as they were able to transition between different activities. They added this type behavior was more closely aligned with students’ real-life experiences. Rosen (2010) supported leveraging technology that is so prevalent in students’ lives to enrich instruction.

The literature suggested teachers would need to develop structured lessons with explicit instructions and close monitoring when utilizing students’ devices (Charles, 2012). The study’s findings were reflective of the research. Participants reported effective planning and structure increased student engagement. Their lesson planning documents included specific activities for independent student work and small group collaboration during the lesson. Additionally, they planned for the specific instructional technology that would be included and the technology support required for the lesson. Similarly, the research offered that teachers needed to plan
learning opportunities that included devices in a relevant manner to maintain student engagement (Beeson et al., 2012; Broussard et al., 2014; Crichton et al., 2012; Kim & Jang, 2015; Rossing et al., 2012). The teachers agreed students’ level of engagement depended upon their level of interest in the instruction.

Participants stressed the importance of effective classroom management with procedures and guidelines for the use of student devices. The literature reported classroom management would have to be different to support students’ learning during lesson that included devices (Colvin, 2012; Rossing et al., 2012). I observed teachers reinforcing appropriate student behaviors, providing equitable teacher-student interactions, and addressing off-task or distracting behaviors during the lessons that included student devices. Reviews of the participants’ lesson planning documents identified specific activities that required students to use their devices. Additionally, participants included guidelines they would share with students, and the level of student supervision/support involved with students using their devices during the activity. Their lesson planning documents reflected strategies for recognizing and reinforcing students’ participation and progress toward the lesson frame.

Some educators expressed concerns about students becoming distracted by their technology, using their technology to cheat, and other technology challenges (Galindo, 2012; Hill, 2011; Kay & Lauricella, 2014; Kennedy, 2012; Nelson, 2012). Similarly, some participants in this study reported students’ devices caused them to become distracted at times. Cheating and using their devices for other activities were identified as concerns by participants as well. The literature reported the possibility of bullying, accessing non-school related social media, accessing inappropriate sites, and decreasing students’ engagement in their school work as additional concerns (D. Johnson, 2010; Morgan, 2010-2011; Obringer & Coffey, 2007; K. M.
Thomas & McGee, 2012). According to participants, determining some students’ level of engagement in these lessons or activities was difficult at times. Some participants reported this type of behavior varied depending upon the student. Additionally, they shared clearly defined expectations, guidelines, and digital citizenship instruction was a contributing factor to the success of these types of initiatives. The literature concurred students must be provided with structure and a robust digital citizenship education (Burns-Sardone, 2014; Hill, 2011; “Living,” 2014; Nelson, 2012; Ray, 2013; Ullman, 2011a).

Teachers indicated during instruction that included student devices they facilitated and provided guidance. I observed higher level questioning, students collaborating with their peers, and opportunities for students to provide feedback. Participants’ lesson planning documents reflected preparation to support this type of learning. The teachers included questions to initiate small group discussions during instruction. Teachers developed open-ended questions to engage students in higher level thinking and problem solving during these lessons. Students used their devices to plan, investigate, and develop content projects. These strategies seemed to support students making connections in their learning. Findings from the literature suggested student devices can be used to support content creation, student-centered learning, collaboration, authentic learning, and differentiation (Cosier et al., 2015; Sterner, 2015; K. M. Thomas & McGee, 2012).

Hill (2011) explained the teachers’ roles during these types of lessons include assisting students with evaluating and synthesizing information. Additionally, the literature suggested these types of learning environments would require teachers to adjust their thinking, and learn to support students as guides and mentors; not the sole source of information (Bolkan, 2014; Galindo, 2012; D. Johnson, 2012; Nelson, 2012). The participants indicated facilitating was
possible if planning had been effective. They ensured students were focused on their assignment and monitored their progress. At times, I observed teachers working closely with students. Conversely, there were times in which very little interaction occurred between the teacher and their students once they began their activities. During most of the classroom observations, students were self-directed and teachers were facilitating their learning. The participants reported students would assume some of the teaching responsibilities during these types of lessons. The literature reinforced lessons including student technology would allow students to assume a more active role in guiding their own learning (Duplicham, 2009; Ferguson et al., 2015; Groff & Haas, 2008; Handsfield et al., 2009; Hao & Lee, 2015; P. Johnson, 2009; Steele, 2007).

Researcher Observations

There were some outcomes that were not anticipated in the study. Similarly, there were some circumstances that contributed to the success of the study. Teachers from two high schools were invited to participate in the study. First, the majority of the teachers who chose to participate were from one high school. Additionally, most of the participants taught advanced classes as well as regular classes. They seem to have higher expectations for all of their students regarding participation and achievement. Additionally, they included more rigorous instructional strategies in all of their lessons.

Secondly, participants were engaged in the interviews, and they provided me with some thoughtful responses. A number of the teachers had participated in teacher leader academies and the district wide improvement committee. Additionally, most of them were members of their district’s leadership team. Several of these teachers had volunteered to participate in the district’s technology initiatives. Consequently, most of the teachers recognized the benefits of including
students’ devices in the instruction; and they sought out meaningful ways to support student learning.

Thirdly, the participants spent a great deal of time planning for instruction that included students’ devices. They had to determine whether or not technology would support the lesson content, and identify the instructional technology that would best fit their teaching style and meet students’ needs. Additionally, they had to ensure the technology was mobile device friendly. In most cases, the teachers would interact with the technology themselves prior to their students accessing it. Teachers also spent time planning for the potential technology support their students would require during the lesson. Lastly, the teachers had to plan alternate activities for students who either did not have devices or whose devices failed.

Lastly, most of the teachers recognized the importance of allowing students to guide their own learning. The teachers reported these types of lesson required them to relinquish some of the control in the class, and facilitate the students’ learning. They provided instructional support that allowed students to explore the content, collaborate with their peers, and produce information as well as consume it. In some instances, students were afforded the opportunity to provide some of the instruction in their classes. Teachers stated that effective planning and clearly defined procedures and expectations ensured that students could take a more active role in contributing to the learning.

Conclusions and Implications for Practice

With this study, I sought to examine secondary teachers’ perceptions regarding BYOD initiatives and the effects that participating in the initiatives had on their instructional planning and their classroom environment. The participants were secondary teachers whose district was participating in a BYOD initiative at the time of the study. Teacher interviews, classroom
observations, and lesson planning documents provided me with a greater understanding of their experiences with the district’s BYOD initiative. I was able to draw some conclusions based on the findings.

As the participants each used a standardized lesson plan, they followed very similar steps in planning for lessons that included students’ devices and for lesson that did not include student devices. However, the lessons that involved students’ devices presented teachers with some additional considerations. Participants reported these types of lessons required them to identify the appropriate instructional technology for their lessons, anticipate challenges with students’ technology, plan relevant activities to utilize students’ devices, and ensure the lessons afforded students the opportunity to take an active role in their learning. The participants indicated structure and clear expectations allowed students to interact with the content in a more engaging manner.

Subsequently, teachers would benefit from relevant professional development and timely technical assistance in their classrooms. Providing beneficial support for teachers will require collaborative efforts from curriculum, instruction, and technology leadership in school districts. The challenges teachers face in providing this type instruction is diverse and would necessitate expertise in several areas.

The findings indicated students experienced greater levels of engagement during lessons that were well planned and included their devices in a relevant manner. Additionally, the students’ level of engagement was reflective of their level of interest in the lesson content. This suggests teachers will have to take greater measures to ensure their planning takes into account their students’ interests. Effective communication between teachers and their students regarding classroom content could aid in the provision of instruction that more successfully meets students’
needs and interests. Similarly, teachers will have to leverage the experience and technological savvy of their colleagues. Most of the teachers who participated in the study were from different teams in their buildings. Subsequently, each content area had one or more team members who possessed effective instructional technology skills. District leaders should consider utilizing these teacher leaders to help with providing professional development to other teachers.

During lessons that included student devices, teachers reported they became the facilitators of students’ learning. Presenting content information was no longer the sole responsibility of the teachers. This type of classroom environment requires a shift in the mindset of some teachers. Teachers will have to trust in their planning and preparation, and allow students to take the lead in some aspect of their learning. Correspondingly, teachers have to provide appropriate formative assessments, timely feedback, and opportunities for collaboration to support students making relevant connections in their learning. Additionally, the teachers indicated providing students with opportunities to work with the content in a variety of ways positively affected their learning. It may take some time for teachers to recognize the benefits of allowing students to take a different type of responsibility for their learning.

Similarly, administrators have to gain a better understanding of these types of learning environments as they monitor and support instruction. They may require some support with effectively evaluating instruction that includes students’ devices. Most administrators do not possess the level of technological savvy required to provide this type of instruction for students. Consequently, they may not be equipped to evaluate teachers’ instruction and provide helpful feedback or guidance to support teachers’ continuous growth and development. Some administrators will require professional development that addresses this type of instruction. Additionally, walk-through and observation documents will need to reflect the types of behaviors
that students and teachers would exhibit during these types of lessons. This will facilitate
administrators identifying the instructional strategies either being utilized or not being utilized to
support students’ learning. This would allow administrators to provide relevant, specific
feedback to support the teacher better.

Participants stressed the importance of effective classroom management. They shared
students become distracted at times, more focused on their devices than the lesson content, and
use their devices for non-school related activities. Classroom management during these lesson
required clearly defined procedures and guidelines. Teachers and campus leadership teams need
to work collaboratively to develop campus plans for the use of student devices in the classroom.
In addition to procedures and guidelines, the plan should include digital citizenship instruction
and a partnership with parents and guardians. Finally, consistency across students’ classrooms
will be a critical factor in ensuring they are able to use their technology in a responsible manner.

Recommendations for Further Research

High school teachers at two campuses in the same district were invited to participate in
the study. The participants were primarily teacher leaders on their campuses, teachers who had
participated in district technology initiatives and teachers who actively pursued engaging
instructional resources. Future studies would benefit from including a greater number of teachers
from multiple districts of varying sizes with diverse demographics. In addition, a cross case
analysis should be included to provide further information about the differences and similarities
that exist at the participating schools. This could result in data that would allow generalizing
across populations. Similarly, this could support the identification of additional factors that
would contribute to the success of these types of initiatives.
Participants in the study discussed their experiences with professional development designed to support instruction including student devices. One of the challenges they identified was the inadequate professional development. Future studies should examine the professional development provided by state and national organizations dedicated to supporting effective technology integration in all content areas. Teachers across the state and the country participate in these trainings, and gaining information about their experiences could better inform the development of the school districts’ trainings.

Teachers’ lesson planning documents were one of the sources of data collection for the study. The teachers used their district’s standardized lesson plan to prepare for their instruction. Each of the teachers addressed the specified components of the plan as required. While I was able to identify commonalities across the participants’ lesson plans, the structure of the plan limited the participants’ individuality. Future research might benefit from allowing teachers to use their own lesson planning documents. Eliminating the structure of a standardized lesson plan would afford teachers the opportunity to develop plans more reflective of the components they felt were important.

The focus of the study was secondary teachers’ experiences with BYOD initiatives and how they believed their planning and the classroom environment were affected. Teachers were interviewed once during this study. However, follow-up or multiple interviews with participants over time could better inform the research. Follow-up studies or future research should include campus administrators’ perceptions about these types of initiatives as well. Administrators are responsible for supporting and monitoring classroom instruction to ensure students’ needs are being met. Additionally, they are expected to provide teachers with feedback and guidance that will support effective instruction. Including administrators in future studies could provide
researchers with insight into the challenges they face with BYOD initiatives, and the type of support and professional development they require in meeting teachers’ needs.

Concluding Remarks

The purpose of this study was to examine secondary teachers’ perceptions about BYOD initiatives and their effects on instructional planning and the classroom environment. The prevalence of students’ devices in schools presented staff with an opportunity to leverage them to develop students’ 21st century skills and provide them with relevant experiences with technology. The findings indicated utilizing students’ devices to support instruction was effective in the classrooms. While there were benefits to student learning, teachers and school leaders were faced with some additional considerations.

Teachers were provided with the ability to include a vast number of engaging instructional resources in their instruction. Additionally, they were able to provide instruction and assessment in ways that addressed students’ individual needs better. Students were able to experience instruction strategies that were relevant and more closely aligned with their real life experiences. Their level of interest and engagement were positively affected during lessons that included their devices. In addition, students were able to guide their own learning with their teacher as the facilitators of the learning.

Teachers indicated the inclusion of students’ devices presented some challenges. Planning for this type of instruction required additional time, and for the teachers to possess some knowledge of the devices their students would be using in class. Furthermore, alternate and enrichment activities had to be included in teachers’ plans to address possible technology challenges and provide extensions for their high students. Teachers also had to adjust their
classroom management procedures to ensure students were using the devices for content purposes.

This study provided me with a greater insight into teachers’ experiences with their BYOD initiatives. Furthermore, I recognized the need for professional development and learning opportunities for teachers, staff, and campus administrators. Support and guidance for teachers as they work to include students’ devices in their instruction should be an ongoing focus for campus and district leadership. The success of BYOD initiatives will depend on the effective collaboration between teachers, instructional support teams, and technology staff in their districts.
APPENDIX A

IRB APPROVAL LETTER
February 2, 2015

Supervising Investigator: Dr. Doug Otto
Student Investigator: Shawn Miller
Department of Teacher Education and Administration
University of North Texas

Re: Human Subjects Application No. 14521

Dear Dr. Otto:

As permitted by federal law and regulations governing the use of human subjects in research projects (45 CFR 46), the UNT Institutional Review Board has reviewed your proposed project titled “The Effects of Bring Your Own Device Initiatives on Instructional Planning and the Classroom Environment.” The risks inherent in this research are minimal, and the potential benefits to the subject outweigh those risks. The submitted protocol is hereby approved for the use of human subjects in this study. Federal Policy 45 CFR 46.109(e) stipulates that IRB approval is for one year only, February 2, 2015 to February 1, 2016.

Enclosed is the consent document with stamped IRB approval. Please copy and use this form only for your study subjects.

It is your responsibility according to U.S. Department of Health and Human Services regulation to submit annual and terminal progress reports to the IRB for this project. The IRB must also review this project prior to any modifications. If continuing review is not granted before February 1, 2016, IRB approval of this research expires on that date.

Please contact Sheila Bourns, Research Compliance Analyst at extension 4643 if you wish to make changes or need additional information.

Sincerely,

Chad R. Trulson, Ph.D.
Professor
Department of Criminal Justice
Chair, Institutional Review Board

CT/sb
for that class period. A second observation will be for a class period in which student technology will not be used. Students will not be using a device (laptop, tablet, iPhone, or smart phone) as a part of the lesson for that class period. Observations will be documented using the classroom observation form. Handwritten notes from the observation forms will be used for data collection. You will be asked to share your lesson planning documents for both class period for review by the student investigator. You are being asked to participate in a 30 minute open-ended questions interview. The interview will be conducted on your campus during your planning period or before or after school. The interview can be conducted off campus for your convenience.

Students will not be present during the interview. Your permission to audio tape and transcribe the interview is request. This is not required. You will also be asked to review the transcript of your interview to ensure accuracy of the content. Your total participation time is 3 hours.

**Foreseeable Risks:** No foreseeable risks are involved in this study.

**Benefits to the Subjects or Others:** This study is not expected to be of any direct benefit to you, but we hope to learn more about secondary teachers’ experiences with BYOD initiatives. Specifically, we hope to learn more about the effects that secondary teachers’ believe BYOD initiatives have on instructional planning and the classroom environment. We believe that this study may provide valuable information regarding necessary training and staff development, and the technology necessary to support effective instruction utilizing student devices.

**Compensation for Participants:** None.
Procedures for Maintaining Confidentiality of Research Records: Participants’ names nor any other identifying information will be included in the study. Participants will be assigned a participant number. All protocols and lesson planning documents will be assigned the same participant number. The confidentiality of your individual information will be maintained in any publications or presentations regarding this study.

Questions about the Study: If you have any questions about the study, you may contact Shawn Miller at (469) 964-5945 or Dr. Doug Otto at (940) 565-2175.

Review for the Protection of Participants: This research study has been reviewed and approved by the UNT Institutional Review Board (IRB). The UNT IRB can be contacted at (940) 565-4643 with any questions regarding the rights of research subjects.

Research Participants’ Rights:

Your signature below indicates that you have read or have had read to you all of the above and that you confirm all of the following:

- Shawn Miller has explained the study to you and answered all of your questions. You have been told the possible benefits and the potential risks and/or discomforts of the study.
- You understand that you do not have to take part in this study, and your refusal to participate or your decision to withdraw will involve no penalty or loss of rights or benefits. The study personnel may choose to stop your participation at any time.

Office of Research Integrity & Compliance
University of North Texas
Last Updated: July 11, 2011

Page 3 of 4
- You understand why the study is being conducted and how it will be performed.
- You understand your rights as a research participant and you voluntarily consent to participate in this study.
- You have been told you will receive a copy of this form.

Printed Name of Participant

Signature of Participant ___________________________ Date ____________

For the Student Investigator:

I certify that I have reviewed the contents of this form with the subject signing above. I have explained the possible benefits and the potential risks and/or discomforts of the study. It is my opinion that the participant understood the explanation.

Signature of Student Investigator ___________________________ Date ____________
APPENDIX B

INTERVIEW PROTOCOL
Schools leaders have been challenged with increasing students’ access to technology, and effectively addressing their learning styles. Fortunately, mobile computing devices have become affordable for families, and an increasing number of students are coming to school with their own mobile device. Schools have been afforded the opportunity to use students’ technology to cover curriculum develop 21st century skills. Consequently, a number of schools are implementing Bring Your Own Technology (BYOT) or Bring Your Own Device (BYOD) initiatives.

Bring Your Own Device (BYOD) initiatives have been introduced in several North Texas School districts to enrich teaching and learning, individualize students’ experiences, advance students and staff in a 21st century learning environment, and support college and career readiness. The purpose of this study is to examine secondary teachers’ perceptions about the effects of participating in Bring Your Own Devices initiatives on instructional planning and the classroom environment based on their experiences.

The information you provide may better inform instructional leaders about these types of initiatives. My interest is in learning about your experiences with the BYOD initiative in your district. All comments may be audio-taped and transcribed with participants’ permission. The transcriptions will be shared with participants to ensure accuracy. The interview will last about thirty minutes.
<table>
<thead>
<tr>
<th>Question 1</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>How do secondary teachers participating in a Bring Your Own Device initiative believe their instructional planning is affected?</strong></td>
<td>3. How does planning for instruction that includes the use of student-owned devices differ from planning for instruction or lessons that do not include the use of student-owned devices?</td>
</tr>
<tr>
<td></td>
<td>4. What instructional decisions must teachers consider as they plan their instruction?</td>
</tr>
<tr>
<td></td>
<td>5. Did you participate in professional development or training with a focus on instruction that includes the use of student-owned devices? If so, how did professional development or training better inform your instructional planning for the use of student-owned devices in class?</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Question 2</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>How do secondary teachers participating in a Bring Your Own Device initiative believe the learning environment is affected by the initiative?</strong></td>
<td>1. Does student engagement during instruction or lessons that include the use of student owned devices differ from student engagement during instruction or lessons that do not include the use of student-owned devices? If so, how does student engagement differ?</td>
</tr>
<tr>
<td></td>
<td>2. What types of behaviors do students exhibit during instruction that includes the use of student-owned devices?</td>
</tr>
<tr>
<td></td>
<td>3. What type of support or guidance does the teacher provide during instruction or lessons that include the use of student-owned devices?</td>
</tr>
</tbody>
</table>
APPENDIX C

OBSERVATION PROTOCOL
**Observation Protocol**

Participant Number_________  Date______________

<table>
<thead>
<tr>
<th>Domain I: Student Participation</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Engaged in learning</td>
<td></td>
</tr>
<tr>
<td>2. Successful in learning</td>
<td></td>
</tr>
<tr>
<td>3. Critical thinking/problem solving</td>
<td></td>
</tr>
<tr>
<td>4. Self-directed</td>
<td></td>
</tr>
<tr>
<td>5. Connects Learning</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Domain II: Learner-Centered Instruction</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Goals/Objectives</td>
<td></td>
</tr>
<tr>
<td>2. Learner-Centered</td>
<td></td>
</tr>
<tr>
<td>3. Critical thinking/problem-solving</td>
<td></td>
</tr>
<tr>
<td>4. Motivational strategies</td>
<td></td>
</tr>
<tr>
<td>5. Instructional strategies</td>
<td></td>
</tr>
<tr>
<td>6. Pacing Sequencing</td>
<td></td>
</tr>
<tr>
<td>7. Value/Importance</td>
<td></td>
</tr>
<tr>
<td>8. Appropriate questioning/inquiry</td>
<td></td>
</tr>
<tr>
<td>9. Use of Technology</td>
<td></td>
</tr>
</tbody>
</table>
## Domain III: Evaluation and Feedback
1. Monitored and assessed
2. Assessment and instruction aligned
3. Appropriate assessment
4. Learning reinforced
5. Constructive feedback
6. Relearning and re-evaluation

## Domain IV: Management
1. Discipline procedures
2. Self-Discipline/self-directed
3. Equitable teacher-student interaction
4. Expectations for behavior
5. Redirects disruptive behavior
6. Reinforces desired behavior
7. Equitable and varied characteristics
8. Manages time and materials

### Additional Notes
Lesson Plan for (Date)

Participant # __________

Subject

TEKS

Frame the Lesson, Engage the Students:

Explore the Concepts:

Talk about the Learning:

Elaborate and Apply:

Recognize, Reinforce, and Evaluate:
REFERENCES


Pearson Education. (2015). Study reveals students believe that tablets are game changers. *Education Digest, 81*(2), 62-64.


Thomas, K. M., & McGee, C. D. (2012). The only thing we have to fear is . . . 120 characters. *TechTrends, 56*(1), 19-33.


