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A qualitative study of how teacher perceptions within a 1:1 iPad® Program may contribute to changes in teacher practices

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A qualitative study of how teacher perceptions within a 1:1 iPad® Program may contribute to changes in teacher practices

By

Eric Christopher Shafer

A dissertation submitted to the graduate faculty
in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

Major: Education Administration

Program of Study Committee:
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The student author, whose presentation of the scholarship herein was approved by the program of study committee, is solely responsible for the content of this dissertation. The Graduate College will ensure this dissertation is globally accessible and will not permit alterations after a degree is conferred.

Iowa State University
Ames, Iowa
2017

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ABSTRACT

Background: Schools around the United States are implementing costly school-wide 1:1 iPad programs to support student learning. Technology integration in schools has the potential to influence teachers to include more student-centered approaches. Student-centered approaches can be defined as methods of teaching and learning that place more responsibility on students. Numerous studies suggest that key elements of student-centered approaches incorporate student activity and engagement into the learning process. The increase in access to technology that is afforded students by school-wide 1:1 iPad programs can potentially bring about a change in teacher practices.

Purpose: The primary purpose of this study was to understand the perceptions of high school teachers regarding their experience with 1:1 iPad programs related to teacher practices.

Setting: One Midwest high school that implemented a 1:1 iPad program.

Participants: High school teachers within the school-wide 1:1 iPad program.

Research Design: Phenomenological interviews and classroom observations.

Data collection and analysis: Interviews, classroom observations, ongoing data analysis with coding, and document analysis were all used.

Findings: 1:1 iPad Programs changed teacher practices in the areas of constructivist approaches, improved lesson planning through teacher collaboration and the ability for teachers to formatively assess. Constructivist teaching lead to less lecture based teaching and more student activity and engagement in the learning process.

Conclusions: The results could provide potential evidence to support a 1:1 iPad program to change teacher practices, among other factors.
CHAPTER 1: INTRODUCTION

Introduction of the Program

Schools around the United States are implementing school-wide 1:1 iPad programs for their students. In 2013, one Iowa high school purchased an iPad for every student in grades ten to twelve (approximately 1,400 students) at a cost of $1.42 million over three years (Kieler, 2013). There are approximately 152 schools that have implemented a 1:1 program in Iowa. (Sauers, 2017). A 1:1 program can have different aims, including increased student engagement levels, improved test scores, increased student technology use, and improved teaching and learning.

This study focused on how two components of teaching and learning—teacher practices and student-centered approaches to learning—intersect in the context of a school-wide student 1:1 iPad program. Teacher practices can be described as teacher actions that promote student learning—which can include types of instruction, as well as assessment methods, teacher collaboration, etc. Student-centered approaches can be understood as methods of teaching and learning that place more responsibility on students. Numerous studies (Fosnot, 2015; McCombs & Miller, 2007) suggest that key elements of student-centered approaches include student activity and engagement in the learning process. A 1:1 iPad program has the potential to enhance the effectiveness of both components.

The United States has spent over $38 billion to bring technology and Internet access to schools; however, this does not mean teachers feel well prepared to integrate technology into the classrooms (Benton Foundation, 2001; Franklin, 2007; Levin & Wadmany, 2008; Mouza, 2008; Park & Ertmer, 2007). As schools continue to invest
large amounts of resources into technology, they want to ensure that the technology is used in ways that benefit students. Unfortunately, a large amount of technology is not used in ways that enhance student learning. Research emphasizes technology use that supports inquiry and collaboration, but many teachers tend to use technology for enhancing existing practice (Harris, Mishra, and Koehler, 2009).

Teacher practices have a direct impact on appropriate technology use for student learning, and teachers are the most important variable in the classroom (Marzano, 2003). Computer use by teachers can be hindered by many factors, such as lack of teacher preparation, lack of leadership, lack of time, and lack of availability/access to computers (Bauer & Kenton, 2005; Becker, 2000a; Franklin, 2007; Li 2007; Park & Ertmer, 2007). A new potential reason, with 1:1’s becoming more prevalent, could be the individual teacher’s embrace of technology and a growth mindset (Dweck, 2006; Ketterer, 2007). If we want to develop effective technology integration, we are going to have to invest in supporting teachers to use it. Stakeholders must determine and address teacher utilization of the iPads before they determine a program’s overall success or failure.

Technology will likely always play a pivotal role in education. Special education teachers once used the PalmPilot® device in Individual Education Plans (IEPs) for students who had trouble with organization and long-term planning. The emergence of 1:1 devices in education is not surprising, as teachers and students both bring technological fluency to our schools. The personal computer has revolutionized every other aspect of society, and one would expect that the same to be true for education. Teachers need resources to extend beyond the curriculum textbooks or content knowledge, or they feel restricted because the textbooks are the only source of
information that is readily available for all students. Additionally, this causes students to miss out because they are only getting information from one source, as opposed to all the viewpoints that are present on the web.

Research efforts with 1:1 programs primarily focus on students, not teachers; yet teachers are the most important variable that affect student learning (Marzano, 2003). Therefore, the iPad device might be only as good as the teachers who decide to utilize it in their classrooms. A teacher who makes creative and effective use of an iPad may feel better about himself or herself as an instructor and could provide more differentiation, engaging material, and online collaboration and cooperative learning (Greaves, Hayes, Wilson, Gielniak, & Peterson, 2010). However, this could be a circular process as well. The device can be a tool to promote collaboration and productive group work. A study (Greaves, et al., 2010) that involved nearly 1,000 1:1 schools found that using technology daily for student online collaboration and cooperative learning appears to contribute to higher levels of achievement in schools. It is practical to study teacher practices within 1:1 iPad schools due to the large amount of school districts implementing 1:1 iPad programs. Apple has sold over eight million iPads directly to education institutions worldwide (Apple, 2012). In California, 26,000 iPads were purchased for San Diego Unified School district, while Texas saw McAllen Independent School District purchase 25,000 iPads.
Traditional teachers should change instructional delivery methods to meet the needs of all students in today’s classrooms (Fallon, 2010). Computer technology, especially 1:1 programs, can enhance learning and instructional strategies when implemented successfully (Hansen, Sunnevag, & Kostol, 2011). But the presence of technology itself does not automatically guarantee an improvement in teaching and learning (Waterhouse, 2005).

It should be noted that the research focuses on teacher practices generally and how the device, while in each student’s hands, can make a difference for individual teachers. The study is not interested in teacher technology efficacy, although this participant attribute may have implications on changing teacher practices. The study focused on the 1:1 program changing teacher practices, regardless of teachers’ technology efficacy. This specific portion of teacher efficacy can be important information for further research because teacher practices are likely change if teachers have a high technology efficacy level. The study was interested in teacher practices changing due to the 1:1 iPad programs regardless of their technology efficacy.

Technological Pedagogical Content Knowledge, or TPACK, is referenced often in this study. Technological Pedagogical Content Knowledge (TPACK) is a tool which attempts to identify the nature of knowledge required by teachers for successful technology integration in their teaching. TPACK will also address the complexity, and intersection of technology, teacher pedagogy, and content knowledge (Mishra & Koehler, 2006). Effective technology integration for pedagogy around specific subject matter requires finding the right technology and using it at the right time.
One-to-one programs have the potential to change teacher practices. Therefore, this research is important to study the implications of a costly initiative on teacher practices. Current accountability systems hold schools responsible for the assessment outcomes of their students, and the primary thrust of growth analyses over the last decade has been the determination of how much student progress/growth is attributable to the school or teacher (Braun, 2005). Research suggests educational reform efforts have consistently promoted student-centered teaching practices as the most effective way to prepare our students for the 21st century (Voogt, 2008). Therefore, improving teacher practices should be important to school districts in order to improve student achievement. School districts must see the holistic picture of a 1:1 program and that it has an effect on all stakeholders: a 1:1 technology program has the potential to improve teaching and learning.

Any new program in education must be subjected to scrutiny before it can be praised. Therefore, it is necessary to highlight a few studies regarding 1:1 programs. Researchers in Massachusetts studied the impact of 1:1 programs on five Massachusetts middle schools. Teacher surveys revealed beliefs that student engagement and student motivation had both increased (Bebell & Kay, 2010). Another study was conducted in Florida with a primary goal of changing teaching practices. The program included 447 classrooms in various K-12 subject areas. Student practices changed with “high student attention, interest, and engagement activities,” but more importantly “a decrease in the use of traditional “independent seatwork” (Dawson, Cavanaugh, & Ritzhaupt, 2006; Rockman, 2003). As part of the current study, teachers who currently teach in a 1:1 iPad program, were asked about their perception of their 1:1 program experiences in regard to
their teacher practices. The participants were asked to explain their experiences with the process, professional development, settings, and roll-out implementation of their schools’ 1:1 iPad programs.

**Statement of the Problem**

About half of all Iowa school districts have 1:1 computing initiatives for their students. 15 percent of the 1:1 computing districts have some form of iPad integration (AEA 267, 2013). These computing initiatives carry a large cost to cover expenses, time, and trainings. Although schools decide to implement computing programs for a variety of reasons, stakeholders typically expect to see change with such a large investment. Current literature and research focus on student achievement, with little attention paid to teachers. It is safe to say that student achievement did not increase simply because students acquired computing devices. It is important to acknowledge the variables that exist within a school’s 1:1 technology program and how a teacher’s technological, pedagogical, and content knowledge all coexist to facilitate changes in teacher practices.

Many educators believed the mere presence of technology in classrooms would lead to instant student-centered instruction, shifting education away from traditional teaching methods (Matzen & Edmunds, 2007). However, research has shown that the shift has not occurred (Matzen & Edmunds, 2007; Potter & Rockinson-Szapkiw, 2012). Research indicates the use of technology affects student achievement, but the effects are dependent on how the assimilation of technology occurs in classrooms (Ritzhaupt, Dawson, & Cavanaugh, 2012). Many teachers have used technology in ways that were consistent with traditional instructional practices instead of using the technology to engage students in their own learning (Matzen & Edmunds, 2007; Potter & Rockinson-
Szapkiw, 2012). Thus, the present study was designed to investigate teachers’ TPACK based on data collected from observations, document review, and interviews to expand on the body of knowledge about teacher practices changing with a 1:1 iPad Program. This study measured the quality of the technology integration in the context of constructivist approaches to teaching. At this time, there is no research that adequately links how 1:1 iPad Programs improve the quality of instruction. Even more important, however, is the impact of teachers, who actually decide how devices are to be used at the classroom level—hence the additional focus on how supports and barriers impact the use of technology in the classroom when implementing a 1:1 iPad Program.

**Purpose of the Study**

In this study, the phenomenon of iPad programs was studied through the perceived realities and experiences of teachers within a 1:1 iPad school. The purpose of this qualitative case study was to understand the meaning of schoolteachers’ experiences in the 1:1 school with an emphasis on the perception of changes in teacher practices after the implementation. This study also examined teachers’ perceptions when implementing a 1:1 laptop program and how supports and barriers impact teacher perceptions of the use of technology in the educational environment. Each of the educators interviewed had a shared experience as a teacher in a 1:1 iPad program.

The primary research objective of this study was to understand teachers’ perceptions of their teacher practices within a school-wide 1:1 iPad program. The practical purpose was to hear from teachers about their perceived changes with the 1:1 programs. The participants expanded on their experiences with the implementation, including but not limited to: professional development, settings, and the rollout process in
order to develop a list of themes for successful implementation. This information could be used as a resource for school administrators and school boards in developing policy of a 1:1 program implementation.

It is the study’s goal to establish a resource upon which school districts can base their decision on whether to adopt a 1:1 iPad program, and to develop themes for successful implementation. Study results may shed light on another reason to implement a 1:1 program with the potential to change teacher practices. The findings of this study can provide educational stakeholders with knowledge and facts necessary to further develop and support teachers in implementing a 1:1 iPad program. The research adds to the educational body of knowledge by identifying teacher perceptions of supports and barriers.

**Significance of Study**

This study is significant because of the rising popularity of 1:1 computer technology programs and the cost they represent for school districts and taxpayers. But the study has greater significance at the point where school accountability, teacher practices and student achievement intersect. Schools are responsible for improving student achievement and oftentimes put additional stress on teachers to produce results. One-to-one computing programs have recently been introduced to try to spark new levels of student achievement, but to date, scant research has been done that focuses on the teachers within 1:1 computing programs—and in particular, on how their perceptions have influenced their practices and contributed to student achievement. The research in this study has the potential, therefore, to contribute to school transformation. Educational policy-makers will understand perceived supports and barriers and how the two are
related to professional learning. This understanding can enable teachers and policy-makers to better assess the levels of technology implementation and professional development needed to sustain the 1:1 iPad Program.

**1:1 Programs and Their Effect on Teacher Practices**

Teachers must approach their work with constant reflection and experimentation. Our concept of teaching has shifted from an industrial model of a teacher replicating a specific set of instructional tasks to a model of innovation, and we aren’t there yet (Tolley, 2015). Teachers are expected to alter curricula, assessments, and teaching styles to meet the needs of the student population they serve. One-to-one research indicates a decrease in the use of traditional “independent seatwork” and a significant increase in the amount of “project-based learning” (Bebell & Kay, 2010; Donovan, Green, & Hartley, 2010; Rockman, 2003).

Other studies examining teacher behaviors in laptop schools found an increase in small learning groups as opposed to large group instruction (Gulek & Demirtas, 2005; Rockman, 2003; Russell et al., 2003). Teachers in Michigan’s Freedom to Learn (FTL) program showed significantly greater confidence in their ability to integrate laptop use into lessons than the national norms of schools that are not provided laptops (Dawson, Cavanaugh, & Ritzhaupt, 2006). Another significant teacher practice that increases in one-to-one schools is teacher collaboration (Bebell & Russel, 2006; Evans & Trimble, 1986; Rockman, 2003; Silvernail & Lane, 2007;). The power of teacher collaboration in schools is important for student achievement (Marzano, 2003).
Related Research on Teaching Practices

Students in our schools are engaged in a world that differs in many respects from the one their parents experienced. Many of the needs, goals and learning preferences of today's students differ as well. Therefore, we should not expect today's classrooms to look the way they did twenty years ago—nor should we expect the practices of today's teachers to be the same. The teacher-centered model of lecture-based knowledge transfer is giving way to student-centered strategies, which Voogt (2008) asserts are the most effective means of preparing our students for the 21st century.

It is natural to include a discussion of constructivist thought in a study of student-centered practices. Key elements of constructivist strategies include student activity and engagement in the learning process (Prince, 2004); these approaches make the learner an active participant in his or her learning (Bransford, et al., 1999; Land, et al., 2012). The literature suggests that while schools that adopt constructivist teaching practices might not see improvements in student achievement, they are likely to positively influence student attitudes and study habits. Studies of constructivist practices also suggest that students retain information longer and perhaps develop enhanced critical thinking and problem-solving skills (Prince, 2004).

Assessment is not limited to measuring learning; it also has the capability to support learning. People are familiar with what is referred to as summative assessment—evaluation tests typically at the end of learning units or courses. Another type of evaluation, termed formative assessment, “is a planned process in which assessment-elicted evidence of students’ status is used by teachers to adjust their ongoing instructional procedures or by students to adjust their current learning tactics” (Popham,
Formative assessment can happen in the form of teacher feedback from classroom assessments to give students a clear picture of their progress on learning goals and how they might improve.

As with summative assessments, the goal of a formative assessment process is measurable student achievement. However, formative assessment differs from summative assessment in that it incorporates ongoing opportunities to provide feedback, and this has the double benefit of keeping the student engaged and informing instruction. A review of nearly 8,000 studies found that the most powerful single element that enhances student achievement is teacher feedback (Hattie, 1992). The rate of learning in classrooms where teachers were using formative assessment was found to be double the rate found in similar classrooms that were not using formative assessment (William et. al, 2004). Another major review of research found that formative assessment had the largest ever reported gain for educational intervention (Black & William, 1998). The potential final outcome for formative assessment is clear, but it can also provide ongoing feedback to inform instruction.

**Teacher Feedback about 1:1 Program Implementation Processes**

This study is also significant in its application to 1:1 program implementation processes. Feedback from teachers about how each process impacted individual teacher practices could be an important influence on the planning of future one-to-one implementations. The Los Angeles Unified School District planned to bring iPads to all 662,000+ students in the district, but halted the program with 58 schools currently using iPads. The School board approved another $40 million to be used for technology including iPads and Chromebooks (Lapowski, 2015). In 2011, Apple officials (U.S.A.
Today, 2011) said they knew of more than 600 districts in the United States that have launched one-to-one programs in which at least one classroom will get individual iPads for each student to use throughout the school day. Obviously, this number has greatly increased now. The definition of a 1:1 program that was used for the study provides one tablet/laptop for every student to take to every class and home. Generally, 1:1 implementation is a system-wide decision that is often made by a school leader with approval from a school board with some input from classroom teachers. Thus, the decision to implement a 1:1 program is out of the hands of individual teachers. It is important to hear from teachers within 1:1 programs because they are the ones who implement the technology use in their classroom.

A research synthesis by Penuel (2006) concluded that four goals for 1:1 programs were improving academic achievement, increasing equity of access to digital resources, increasing economic competitiveness, and effecting a transformation in the quality of instruction. Penuel’s research synthesis matched up with numerous school district goals. The 1:1 program visions, along with the goals of five schools that recently implemented 1:1 computing programs, all aligned with Penuel’s synthesis. Since the quality of instruction improves with the presence and accessibility of technology (Hadley & Sheingold, 1993), Penuel's fourth goal, transforming the quality of instruction, could imply technology-driven changes in teacher practices.
The 1:1 Pad program enhances student access to technology and should lead teachers in 1:1 programs improving their lesson planning—and thus play a pivotal role in helping teachers become better educators. This accessibility should promote and foster improved lesson planning for all teachers. The programs intended for students can play a pivotal role in helping teachers become better educators.

This study strives to identify teacher perceptions of their practices in regard to 1:1 iPad programs. The study should be of interest to numerous stakeholders. Most importantly, the study should attract the attention of school leaders who are trying to move their schools toward 1:1 programs, specifically iPad programs. It should be of interest to school board members, parents, and/or registered voters who may have a say in a special vote to determine if a school should adopt such a program. Teachers want to understand the implications of their involvement in a 1:1 iPad program—and to be heard if their districts decide to adopt one.

**Limitations and Delimitations**

For the purpose of this study, the sample was delimited to one high school that has a 1:1 iPad Program. The study was focused specifically on iPads because of their ease of use (for both teacher and student) and their mobility. The study also delimited the term “1:1 iPad program.” Often a school may claim to have a 1:1 program because it provides an iPad for the student while at school. For this study, however, a 1:1 iPad program is understood to provide each student an iPad for every class and to take home. Limitations of this study included a large number of individuals in the sample who did not participate due to the level of depth and time required of each participant. This limitation could have impacted the study if the responses of those interviewed were dissimilar to the rest of the
teacher population within their respective school. However, the depth of qualitative interviews explored the various boundaries of a problem in a flexible manner. The context of the experiences assisted the interpretation of results as a whole.

The sample size within this study was small, with four participants. Due to the small sampling size, trustworthiness of the study was a challenge. However, the trustworthiness was well established with prolonged engagement with the research participants (Lincoln & Guba, 1985). The study utilized interviews and several observations of the participants, along with document analysis, which were be collected and triangulated (Baxter & Jack, 2008).

This study asked participants about their experiences and perceptions of the implementation of the 1:1 iPad program. The study assumed that when they responded to the questions, participants made comparisons of their teacher practices before and after the 1:1 initiative. However, it is possible that teachers may not have accurately recalled their previous teacher practices prior to the program. Another limitation involved participants with different experiences and years of experience with 1:1 programming; for example, a participant who is entering year two with a 1:1 iPad program could potentially experience success or respond with improved teacher practices to a greater extent than a teacher who is in his or her first year of the program.

Methodology

Epistemological Scope

The epistemological scope for this study was rooted in social constructivism. Crotty (1998) identified some assumptions when discussing constructivism. One
assumption was that human beings construct meaning as they engage with the world. The study used open-ended questions so participants could share their viewpoints. The second assumption was that human beings construct meaning from the world they live in through their historical and social perspectives. It was important to understand not only the participants' responses but also their various contexts, along with the meaning conveyed in their tone and non-verbal cues. For this reason, it was important to collect information from participants in person whenever possible. The third assumption was that the generation of meaning is always social through interaction with human community. The study generated meaning from the data collected in the field by finding themes present in respondent answers, observations, and document analysis.

Research Methodology

In qualitative research, interviews are appropriate for understanding the lived experience of other people with an interest in others’ stories because they are of worth and importance (Seidman, 2013). The qualitative research method for this case study was phenomenological. The phenomenological approach is a research design of inquiry in which the researcher describes the lived experiences of individuals about a phenomenon (Creswell, 2014; Fraenkel & Wallen, 2009; Giorgi, 2009). The phenomenon studied here was the lived experiences of teachers in 1:1 iPad schools. Data about the lived experiences of teachers within 1:1 iPad programs was collected via personal interviews, observations, and document analysis. Qualitative case study data was gathered and analyzed using a comparative approach, through interview documentation. Since individuals seek understanding of the world in which they live and work by constructing
subjective meanings of their experiences, this research approach was expected to help inform understanding of the role of 1:1 iPad schools on teacher practices.

In addition to several classroom observations, in-depth interviewing gave “voice” to teachers who are responsible for teaching students with the devices. This study thus adds to the conceptual understanding of the motivation and teaching processes with a 1:1 iPad program. With this knowledge, researchers and educational stakeholders may be able to create 1:1 iPad programs that have a greater potential for transforming instructional practices and increasing teacher effectiveness.

Conceptual Framework

This study’s design and research questions are connected to the Technology, Pedagogy, and Content Knowledge (TPACK) Model. This model is often associated as a guide for teacher knowledge about technology integration. TPACK can be used when analyzing the wide scale knowledge of implementation with technology in schools, but it is non-evaluative in that it does not evaluate actual teacher practices.

TPACK

The Technology, Pedagogy, and Content Knowledge (TPACK) model which conceptualizes the relationship and roles of technology, pedagogy, and content knowledge (Harris et al., 2009). The TPACK model built upon the PCK, or “pedagogical content knowledge,” model that Shulman (1986) was credited with popularizing. The PCK model combined teachers’ subject knowledge with their pedagogical knowledge. Pedagogical knowledge is concerned with the “how” of teaching, generally acquired through education coursework and personal experiences. Content knowledge, on the
other hand, is comprised of the “what” of teaching. Pedagogical content knowledge derives from both the knowledge of a disciplinary expert and from general pedagogical knowledge. Shulman saw the development of the PCK model as a major shift in education.

Shulman (1986) later wrote about how effective teachers blend content and pedagogy into an understanding of particular topics or problems rather than focusing on them in isolation. Shulman described pedagogical content knowledge (PCK) as the blending of content and pedagogy in order to effectively deliver instruction. Harris, Mishra, and Koehler (2009) built upon Shulman’s concept to apply it to technology in education and guide teacher actions with technology, pedagogy, and content knowledge in their classrooms—hence TPACK.

It is important to consider the complex relationships and intersection of technology, pedagogy, and content knowledge (Harris, Mishra, Koehler, 2009). Harris, Mishra and Koehler (2009) and Shulman (1986) claimed that often the three areas (Technology, Pedagogy, and Content Knowledge) are isolated from one another in education. Professional development in schools rarely focuses on a holistic approach such as the TPACK model describes; for example, a school may focus its professional development activities solely on technology software. However, this type of approach leaves teachers unprepared to integrate technology into their classroom successfully due to the variables and varying contexts that are present in education. On the other hand, professional development whose goal is to assist teachers in integrating technology, pedagogy and content knowledge prepares teachers to deliver more effective instruction.
The TPACK model is a framework used for teacher knowledge about technology integration. An important aspect of the model is that the framework exists within the scope of context, as seen with the dotted circle in Figure 1.1. The impact of teachers and their knowledge of students depends upon how successfully each teacher adapts to the unique context (Kelly, 2008a). This research study is in the context of four Gertrude Teachers, who are teaching in a 1:1 iPad Program. The technology-rich context requires the participants to have knowledge of TPACK in order to facilitate effective technology use. A visual representation of the TPACK model follows in Figure 1.1.

Figure 1.1. The components of TPACK framework (Mishra and Koehler, 2009).
The TPACK framework can be thought of as a representation of effective technology integration in the classroom. All of the knowledges described earlier are enclosed in a dotted line, representing the different contexts, which has been described as central to the TPACK framework (Koehler & Mishra, 2006). The TPACK framework is personal and no one teacher or environment has the exact variables or combination of TPACK factors (Mishra & Koehler, 2006). Effective technology integration could look different in different contexts, like differences in subject matter, grade level, and student background. Good understanding of the TPACK framework remains essential for effective technology implementation. Each teacher uses the context they teach with as a frame of reference when planning lessons, whether that includes classroom factors, school factors, teacher factors, and/or societal factors.

**Summary**

The research questions analyzed whether technology competency, pedagogy, or content knowledge in teachers changed due to the 1:1 iPad Program. The TPACK framework asserts that technology knowledge is one of three important components needed to improve teacher practices. The 1:1 program could improve any one of the three areas, but the study was focused on the intersection between TPACK and the ways in which teachers change their personal behavior depending on factors including the environment, people, and behavior.
Additionally, the TPACK Model was used to help guide participants in understanding technology integration. Teachers, after having the knowledge and understanding about technology integration, could then evaluate the 1:1 program by determining if the devices have helped transform instruction. Triangulation was utilized with interviews, observations, self-reported protocols (SRP), and document analysis.

The ideal TPACK with true meaningful teaching through technology allows teachers to utilize the technology because they can weave their pedagogy knowledge, content knowledge, and their technology knowledge. Harris, Mishra & Koehler (2009) establish a comprehensive definition for TPACK:

TPACK is the basis of effective teaching with technology, requiring an understanding of the representation of concepts using technologies; pedagogical techniques that use technologies in constructive ways to teach content; knowledge of what makes concepts difficult or easy to learn and how technology can help redress some of the problems that students face; knowledge of students’ prior knowledge and theories of epistemology; and knowledge of how technologies can be used to build on existing knowledge to develop new epistemologies or strengthen old ones. (p. 60-70)

The TPACK framework appears to align naturally with research around 1:1 technology implementations in schools. The TPACK framework should be a used as a model for teachers to be knowledgeable about technology integration in schools. The research questions for this study align with the TPACK framework.
**Research Questions**

To date, scant literature exists that describes the perceptions of schoolteachers who have taught within a 1:1 iPad school in regard to their own teaching practices. These questions guided this study:

1. **How do teachers in a high school experience school-wide iPad implementation with relation to their teacher practices?**

2. **According to participants, what aspects of teaching change due to the 1:1 iPad program (Technology, Pedagogy, Content Knowledge, Lesson Planning, Teacher Collaboration, Assessment, etc.)?**

   Additionally, little has been written about the themes for successful iPad implementation. The lack of literature led to the development of another guiding research question:

3. **How do teachers in a high school experience school-wide iPad implementation with relation to organizational characteristics the district provided such as technology training, professional development, technology support, proper controls/setting, teacher collaboration, etc.?**

   The responses to these three research questions address the gap in the literature and could assist school districts in implementing successful 1:1 iPad programs. The responses could provide school districts and other stakeholders an important resource for supporting a 1:1 initiative while considering the implications of organizational practices a district can provide.
Summary

This study seeks to inform policymakers and other leaders about the perceptions of teachers within the studied 1:1 iPad schools. School districts and policy makers may try to pursue technology initiatives without asking their teachers about their perceptions about 1:1 initiatives. The lack of communication from leadership could potentially lead to declines in the levels of teachers’ job satisfaction, commitment to the profession, and efficacy beliefs. We live in an era of accountability to ensure all students succeed. An intersection that requires much research is the improvement of teaching and learning through technology initiatives.

This chapter contained an overview of the study including the introduction to the problem, statement of the problem, purpose, significance, limitations and delimitations, conceptual framework, and research questions. Chapter two provides an overview of the literature reviewed for this dissertation. Chapter three includes a detailed discussion of the research design and methodology utilized during the study. Chapter four presents the results from the study. Chapter five provides the discussion and recommendations obtained from the study.
CHAPTER 2: LITERATURE REVIEW

Introduction

The review of literature is divided into three subsections related to how technology, specifically 1:1 initiatives, and teachers’ practices, are important concepts in the area of education. The first section clarifies the need for changes in teacher practices. The second section provides a look at the movement of technology in education. The third section focuses on the interconnection between 1:1 programs and changing teacher practices. It was seen from the literature reviewed that little research has been done on the influence of teacher perceptions of 1:1 iPad programs with regard to changes in teacher practices.

Teacher practices are not a static character trait of an individual, but rather, teacher practices are an active and learned system of beliefs held in context (Bandura, 1997; Maughan, Teeman, and Wilson, 2012). Teacher practices have the potential to change; and extant research focuses primarily on four factors leading to positive change: 1) leadership, 2) planning and preparation, 3) practice development, and 4) monitoring and evaluation (Maughan, Teeman, and Wilson, 2012). In this context, technology has the power either to change teacher practices or further entrench their practices. Thus far, little attention has been paid to how technology has the potential to change teacher practices, especially with regard to teacher perceptions.

Computer technology is ever-present in our world today; it should be considered a welcoming feature in the classroom. Computer technology has played a pivotal role in improving our society with advances in business, telecommunications, and manufacturing. The technology has already benefitted teachers and students. The iPad
can help students organize, record, collaborate, and learn. Research tells us that 1:1 programs can improve student efficacy (Henson, 2002; Kenny & Gunter, 2004; O’Donnel, 2005). 1:1 programs have also proven to increase student achievement (Berry & Wintle, 2009; Gulek & Demirtas, 2005; Penuel, 2006; Silvernail & Lane, 2004). The devices surely affect students one way or the other and teachers can harness the tools to promote better practices.

**Section 1: Teacher Practices**

Teaching has evolved over the course of this century into a complex and interactive activity. Teaching has shifted away from an industrial model approach, where teachers replicated a specific set of tasks. There are numerous reasons for this shift, including a more diverse student population and changes in our workforce. The shift requires teachers to evaluate and often alter their teaching practices. This study highlights three categories for potential change with a 1:1 iPad program: constructivist teaching practices, assessment and collaboration.

**Constructivist teaching practices**

Constructivist teaching practices are those which make the learner an active participant in his or her learning (Bransford, et al., 1999; Land, et al., 2012). Constructivist practices and student-centered learning place the emphasis on the learners constructing their learning. The two terms of student-centered learning and constructivist are used synonymously here.

Qualities of a student-centered classroom can be linked back to Piaget, Dewey, and Russian developmental psychologist Vygotsky (DeVries, 1997; Fosnot & Perry, 2005; Piaget, 1971). Constructivism states that students learn more by experiences and
active involvement than by observing (Brooks & Brooks, 1993). Learning is social and all individuals learn first on the social level, between people, then on an individual level (Vygotsky, 1978). Brooks and Brooks describe the value of allowing student responses to steer lessons and create instructional strategies based on what students know or do not know. Asking questions and leading students to solutions is recommended over giving answers (Brown, 2008).

Research affirms that there are some common attributes linking student-centered classrooms to student engagement and success (Bransford et al., 1999; Brooks & Brooks, 1993; McCombs & Miller, 2007). In a student-centered classroom, instruction revolves around the needs and abilities of the students, as well as student interest, student activity, and engagement, which are all key elements in the learning process (Prince, 2004). Studies suggest that students retain information longer and perhaps develop enhanced critical thinking and problem-solving skills when teachers utilize a constructivist approach (Prince, 2004).

Assessment

Assessment is critical to determining the effectiveness of teaching and learning. Assessment has the potential to measure learning, but it also has the capacity to support learning. Assessment can be formative or summative. Formative assessment involves the practice of assessing students used by teachers to adjust their ongoing instructional procedures (Popham, 2008). Summative is completed, generally, near the end of the terms, sections, or semesters to determine what the students learned.

A meta-analysis of nearly 8,000 studies found that the most powerful single modification that enhances student achievement is feedback (Hattie, 2009). The rate of
learning in classrooms where teachers were using formative assessment was double the rate found in similar classrooms that were not using formative assessment (William et. al, 2004). Another major review of research found that formative assessment had the largest ever reported gain for educational innovations (Black & William, 1998). The potential final outcome for students from formative assessment is clear, but it can also provide ongoing feedback to inform instruction.

Collaboration

A teacher practice that could potentially appear with a 1:1 program is teacher collaboration. Current teachers in most schools are asked to be a part of PLCs (Professional Learning Communities), look at data, and share lessons. However, schools often use the term “PLC” casually, even carelessly, while teachers continue to teach in isolation and resist change to their practices. A 1:1 program can provide the development of individual autonomy while nurturing a community of teacher learners within a school. This practice of teacher community can allow teachers to engage in critical conversations regarding goals, procedures, and practices. As teachers are changing their practices, in terms of an instructional model, it can be anticipated that their practices change in how they interact with their colleagues.

Collaboration can be important for teachers to receive support from colleagues and administrators, while isolation can impede teaching and learning. Isolation can be the greatest impediment to improving existing skills for teachers (Rosenholtz, 1989). A significant teacher practice that increases in one-to-one schools is teacher collaboration (Bebell & Russel, 2006; Evans & Trimble, 1986; Rockman, 2003; Silvernail & Lane, 2004). The power of teacher collaboration in schools is important for student
achievement (Marzano, 2003). Collaboration has the possibility of improving teaching and learning (Goddard & Heron, 2001; Pounder, 1998). Recent reform efforts in education have included an emphasis on increasing teacher collaboration (Brownell, Yeager, Rennells, & Riley, 1997; Louis, Marks, & Kruse, 1996), but to date, little research has been published about its effect on teacher practices. There are studies with reported positive outcomes of collaboration for teachers, including improved efficacy (Shachar & Shmuelevitz, 1997), more positive attitudes toward teaching (Brownell et al., 1997), and higher levels of trust (Tschannen-Moran, 2001), and these outcomes have the potential to help improve teacher practices. Teacher collaboration is likely to improve teacher practices because of the exchange of ideas, processes, and teacher methods. Little has been done, however, to test the prediction that collaboration within a 1:1 program positively affects teacher practices.

The more frequently teachers collaborate, the more they are able to converse knowledgably about technology, pedagogy, content, and processes of teaching and learning, and thus improve their instruction. As collaboration increases to a high level, it has also proven to increase student achievement (Dufour, Dufour, Eaker, & Many, 2006; Englert & Tarrant, 1995). Professional collaboration can benefit both teachers and students. 1:1 programs could hold the key to unlocking the positive change in teacher practices.

**Section 2: Technology in Education**

**Computer Movement in Education**

Four great waves of computer technology have brought us to today’s age of mobile computing. According to Saylor (2012), these waves are characterized by the
mainframe, the minicomputer, the personal computer, and the Internet PC. Each device was built upon the previous one and each wave made a great impact.

The first wave of computing originated with punch-card-reading machines and other rudimentary computing engines developed during the 19th century. The mainframe did not come along until the middle of the 20th century, but there was little demand for such a device. These computers were massive in both weight and space. For example, the ENIAC (Electronic Numerical Integrator and Computer), weighed more than thirty tons and covered more than 1,800 square feet (Saylor, 2012). ENIAC was first announced in 1946. These devices had no real impact on education due to their size and cost. Most of the devices were originally created for urgent demands during World War II, but they were not in operation until after Hiroshima (Saylor, 2012). However, the development of the mainframe spurred on the next wave of technology, which brought with it lowered costs, new products, and the creation of new jobs (Saylor, 2012).

The next wave of computing introduced the minicomputer. These “minis” were the size of a refrigerator but quite a bit cheaper than the mainframe. However, the devices still cost an interested party $18,000 (Saylor, 2012). In the 1970s they were built to control and run equipment. It was during this wave that an innovation emerged: the microprocessor, also known as the central processing unit (CPU). Microprocessors made it possible for just about anyone who was interested to build his or her own computer (Saylor, 2012). In 1965, mainframes and minicomputers were placed in some schools, but mostly for administrators (Murdock, 2004).

The third wave of computing technology saw the emergence of the desktop, beginning with the Altair, a build-it-yourself computer kit with a microprocessor (Saylor,
The device originally found its place with word processing, storage, and interoffice mail (Saylor, 2012). What nobody expected from the device was the innovation of the spreadsheet, which made the average office worker into a small-scale programmer. The Plato was one of the most-used early computers in education. Personal computers can be traced back to the early 1970s with the first Apple II. Public Schools in the U.S. averaged about one computer for every 92 students in 1984 (Dunn, 2011). When Ronald Reagan was re-elected in 1984, 31 states used 13,000 personal computers for career guidance. Most workers were using computers in work, but schools were not yet preparing students to use computers in the working world. Also in 1984, the Apple Macintosh computer was developed; It offered computer-based tutorials and learning games developed by commercial software manufacturers (Murdock, 2004). In 1985, U.S. legislators increased funding for technology in schools to advance technological skills (Murdock, 2004). Also in 1985, the Microsoft corporation introduced computers running Windows, which grew to be the world’s most-used all-purpose operating system prior to the emergence of Android. In 1986, 25% of high schools used personal computers for college and career guidance. The classic PC, with either a Windows or Macintosh operating system, was capable of running programs, typing, playing games, calculations, and personal productivity. By 1987 the proportion of high schools using computers had grown to 95 percent (US Congress 1988), and in 1990 the number reached 97 percent (Becker, 1994).

A trend in the availability of computers in education grew substantially. For example, the percent of eighth-grade students who had computers available in their schools rose from eight percent in 1990 to fifty-one percent in 1998. Additionally, there
was an increase from 42 percent to 73 percent of twelfth-grade students during those years (US DOE, 2000). In 2009, ninety-seven percent of teachers had one or more computers located in their classroom every day, while 54 percent could bring computers into the classroom. Internet access was available for ninety-three percent of the computers located in the classroom every day and ninety-six percent of the computers that could be brought into the classroom. The ratio of students to computers in the classroom every day was 5.3 to 1 (Gray et al., 2010).

The fourth wave of computing was the Internet personal computer. The commercial Internet as we know it arose from a Department of Defense research tool known as Advanced Research Projects Agency (ARPANET). By 1996, countries around the world had connection to the worldwide Internet (Saylor, 2012). It was in this same year that many schools rewired their buildings for Internet access and a few schools installed web servers (Murdock, 2004).

The Internet was quickly seen as useful for teaching and learning. Schools had the capacity to access human experts on the web, and those experts were willing to collaborate with students and teachers (Stallard & Cocker, 2001). Through videoconferencing software such as Skype, teachers are able to connect with classrooms in other countries and communicate with politicians and business and medical professionals.

The previous four waves led us to our current reality, which is the mobile Internet. Since the iPad belongs to this era in the evolution of computer technology, this new wave is especially important to this study. In 2001 Apple introduced the iPod, a portable player device capable of accepting, storing and playing uploaded media files from other devices
or downloading media files via Apple's Internet-capable iTunes software. In 2007, Apple followed with the first touch-screen “smartphone” in the United States, the iPhone, which was such a sensation that it sold out of many stores (Saylor, 2012). Applications, more commonly known as “apps” could be developed to run on smartphone operating systems; apps revolutionized the industry—and perhaps the way many of us live. With smartphone apps, users can watch videos on sharing sites such as YouTube; consult interactive map services such as Google Maps, use global positioning system software, and much more. There are 1.4 million apps currently available through Apple’s App Store, (Richter, 2015)

The four major technology waves all had outcomes that were expected, but all of them had unexpected results that benefited our society (See 1:1 positive outcomes with table 2.1). Table 2.1 presents a concise representation of the waves of technology. The first wave brought the mainframe. The intent of the mainframe was to assist with war demands, but unexpectedly it allowed for further advancement of technology. The minicomputer was created to control and run equipment, but then it unexpectedly brought about the creation of microprocessors. The Internet personal computer was developed for the Department of Defense but quickly became a worldwide phenomenon because of its ability to connect users with information, services and other people. Originally the handheld phone was created for calling, but endless opportunities came about with the mobility of the technology. Computer facilities in classrooms were introduced to allow for more time with students, but the use of these facilities also has the potential to take time away from students. One-to-one programs have been proven to accomplish a lot for education, but do teachers believe 1:1 programs have the potential to change their teacher
practices and their colleagues’ teacher practices? Changes in teacher practices could be one of the unintended results of the use of 1:1 programs.

Table 2.1. Unexpected Reality (Source: Murdock, 2004; Penuel, 2006; Saylor, 2012)

<table>
<thead>
<tr>
<th>Device</th>
<th>Intent</th>
<th>Unexpected Reality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mainframe</td>
<td>War demands</td>
<td>Advancement of technology</td>
</tr>
<tr>
<td>Minicomputer</td>
<td>Control and run equipment</td>
<td>Microprocessors</td>
</tr>
<tr>
<td>Personal Computer (PC)</td>
<td>Word processing</td>
<td>Spreadsheet</td>
</tr>
<tr>
<td>Internet PC</td>
<td>Department of Defense</td>
<td>Worldwide phenomena</td>
</tr>
<tr>
<td>Mobile Internet</td>
<td>Handheld device to call</td>
<td>Endless opportunities</td>
</tr>
<tr>
<td>Closed Circuit and Television</td>
<td>Change instruction with different viewpoints</td>
<td>Students mostly viewed classroom teachers</td>
</tr>
<tr>
<td>Teaching machines</td>
<td>Individualized learning</td>
<td>Expensive page-turners</td>
</tr>
<tr>
<td>Computer facilities</td>
<td>More time with students</td>
<td>Potential to take time away from students</td>
</tr>
<tr>
<td>1:1 programs</td>
<td>1) Improving academic achievement, 2) increasing equity of access to digital resources, 3) increasing economic competitiveness, 4) transformation in quality of instruction.</td>
<td>Potential to change teacher practices? *</td>
</tr>
</tbody>
</table>

*Some devices had outcomes that were expected, but all of them had unexpected results that benefited our society.

**Benefits of Computers in Education**

The push for more technology in classrooms is the result of a few different factors. No Child Left Behind Act of 2001, or NCLB, provided prescriptive ultimatum to improvement student achievement for all learners. These requirements became increasingly unworkable for schools and educators, and, in 2010, the Obama administration enacted the Every Student Succeeds Act, or ESSA. The main factor of ESSA is an aim to improve student achievement. Educators are accountable for all students to be “proficient” according to standards established by each state. There are provisions for technology within the ESSA bill for funding decisions. One common
solution is to increase the amount of technology that is available to students. This solution can also answer another stipulation from ESSA, to support and grow local innovations (US DOE, 2017). The form of improving innovation for students can come in various technology packages. Some schools, generally elementary schools, have opted for the use of a mobile iPod cart equipped with a number of devices, which a teacher can reserve for use in his or her classroom. Teachers usually share carts within the building, and who gets to use the carts is typically determined on a first come, first served basis. Some schools also have laptop carts and/or iPad carts.

Not all schools are quick to capitalize on tools and technologies. For example, a 2016 research project with 140,000 direct classroom observations in K-12 schools in the U.S. and across the globe, determined that there are still relatively few classrooms in which student use of digital tools and technology is a regular part of a student’s school experience (Van Broekhuizen, 2016). Clearly, availability of technology has increased, but teacher beliefs and readiness play a role in the use of technology (Herold, 2015).

There is a growing body of research that reports higher achievement in science and math, improvement in reading scores, and stronger engagement in learning with effective technology integration (Blin & Munro, 2007; McCormick & Scrimshaw 2001; Jenkins et al., 2007; Papert, 1993; Tam, 2009). Effective technology integration occurs when teachers employ technology daily in the classroom, using a variety of tools for students to complete assignments and create projects that demonstrate a deep understanding of content (Koehler, & Mishra, 2009; Puentudura, 2012). There may be more computers and technology available to teachers, but it is the individual teacher’s decision to implement them effectively. However, many teachers still struggle to find
ways to integrate technology meaningfully into what they do. The use of a computer for word processing is not meaningful technology integration. Effective technology integration might look something like this in our schools:

- High school writers create children’s books using a simple editing program for the text and drawings. They follow a writing process from drafting to publication and then share their books at a nearby elementary school (Gertrude CSD).
- High school students create a rap using Audacity on computers to describe WWII and some of the events that transpired (Gertrude CSD).
- High school language arts students exchange descriptions of their lives with teenagers in Cairo, Egypt; they talk in real time—via writing and Skype—about the role of the United States as a world “superpower” (Gertrude CSD).
- Using an iPad, high school students must record their techniques on the following weightlifting exercises: squat, hang clean, power press, and deadlift. Each individual must teach the exercise as if he or she is speaking to a beginner and teach the proper form and provide video demonstrations of the proper lift (Gertrude CSD).

These examples of iPad use in various classroom settings, all from Gertrude High School, are some possibilities of the ways to integrate technology meaningfully into learning activities. These possibilities still required a teacher to implement technology in a meaningful way as described to change their teacher practices.
Origins of 1:1

One-to-one computing is a fast-growing phenomenon in American classrooms. The one-to-one computing concept was introduced so that students would develop computer literacy and 21st century skills (US DOE, 2004) such as critical thinking, collaboration, agility, initiative, oral and written communication, analyzing information, and imagination (Wagner, 2008). The 1:1 idea evolved out of the school computer labs and carts that were present in many schools. These labs and carts are still present in schools that do not facilitate a 1:1 program, and they remain a viable option for improving computer literacy for our students. However, these carts and labs are often shared and require precise planning and organizing of lessons to line up learning activities with dates the devices are available; teachers must often sign up for them nearly a month in advance. Multiple labs or carts appear not to offer students a much better opportunity for meaningful technology use. Access to computers has risen in the past few years, but the amount of time that most students spend on computers at school has not significantly changed, and their primary access to computers still is in computer labs or libraries (Schifter, 2008). A 1:1 movement could potentially change the time students are engaged in technology learning.

There are multiple definitions of the concept of “1:1 school.” This study used a fairly stringent definition: a 1:1 school is one that provides a take-home device for each student across a given grade span in the school system (Sauers & Mcleod, 2012). For example, all eighth graders within a school district may receive MacBook Airs. Although this study is on iPads, the study utilized research from 1:1 schools that adopted laptops or iPads. The literature on 1:1 schools is still relatively new and not comprehensive in
nature. Most research studies have involved recent program initiatives; the topic has not been studied long-term to determine its impact over time. Since iPad programs have been studied even less than laptop initiatives, there was needed additional research related to the benefits and drawbacks of 1:1 computing. Research on laptop programs can yield viable representative data; therefore, including a review of available 1:1 laptop program research provided a rich account on the state of 1:1 schools.

The next section in the literature review is a summary of the impact of 1:1 technologies on student achievement outcomes and other benefits to school districts. The other benefits include, but are not limited to, student engagement, attendance, behavior, student dropout rates, technology proficiency, and student efficacy.

1:1 Programs in Education

Many one-to-one computing programs have provided opportunities and resources for teaching and learning; there have also been instances of programs that were cancelled due to lack of evidence for achievement gains (Hu, 2007). Educational leaders and policy makers are attempting to weigh the costs of one-to-one programs as well as the pros and cons of implementing them. The “laptop for every student” concept is changing how, when, and where students learn (Penuel, 2006). A 1:1 laptop initiative can produce a number of benefits, but the transition from occasional use of computing devices to the integral use of computers in all areas of education has to be the most challenging. Effective technology integration involves teachers employing technology daily in the classroom with a variety of tools for students to complete assignments and create projects (Koehler, & Mishra, 2009; Puentudura, 2012;). Numerous state-level one-to-one initiatives are being adopted. The state of Maine implemented a statewide laptop
program (MLTI: Maine Learning Technology Initiative) through the Maine Department of Education in 2002. Initiatives were also adopted in Florida (Leveraging Laptops), Michigan (Freedom to Learn), North Carolina (1:1 Learning Technology Initiative), Pennsylvania (Classrooms of the Future), Texas (TIP: Texas Immersion Pilot), and Virginia (Teaching and Learning Initiative). Some programs continue to thrive with positive outcomes, while other programs have fizzled out, often due to lack of funding. The study addressed state initiatives later in terms of what each program accomplished. Some of the state programs have been discontinued and may not have had adequate time to test the initiatives’ outcomes.

1:1 Potential Positive Outcomes

Student achievement

The area thought to have the greatest potential for growth with 1:1 programs is student achievement. Studies using a variety of research methodologies have suggested an increase in student writing achievement resulting from 1:1 programs (Anderson et. Al, 1988; Hutchison, 2012; Lowther, et al., 2003; Moore & Esselman, 1992; Ross, 1992; Silvernail & Gritter, 2007; Bebell & Kay, 2010; Goldberg et al., 2003; Gulek & Demirtas, 2005; Silvernail & Lane, 2007; Watson, 1991). There is some evidence to suggest that 1:1 programs have had positive effects on student achievement in math and science; however, less research is available from these subject areas. For example, one study of a middle school focused on the impacts of its 1:1 program on science and math achievement; the study yielded evidence of increase in science achievement compared to the control group, while there were no significant increases in math (Dunleavy &
Heinkecke, 2007). Another study indicated that the greater access to technology students in high school and middle school have, the more enhanced their science education (Berry & Wintle, 2009).

**Student engagement**

Student engagement is defined as the student’s active participation in academic and co-curricular or school-related activities and commitment to educational goals and learning (Christenson, Stout, & Pohl, 2012). Research also suggests that student engagement can prevent student dropout rates (Jerald, 2006; Newman, Wehlage, & Lamborn, 1992; Roderick, 1993). Therefore, increased student engagement is a worthwhile goal for 1:1 programs. Shapley, et al. (2009) found that students who attended 1:1 schools were much more satisfied with school than students in the control group. The study also reported fewer discipline referrals and suspensions, which could be the result of an increased level of student engagement.

Numerous other studies have found that both student engagement and motivation increased after 1:1 implementation (Bebell & Kay, 2010; Lemke & Martine, 2004a; Lemke & Martin, 2004b; Lowther et al., 2003; Greaves et al., 2010). For example, in the span of three years, Bebell and Kay (2010) found that 79 percent of the teachers they surveyed felt that engagement had improved for their students. The change in student engagement was also directly observed. When survey and interview results from observations across five participating schools were triangulated, the data indicated that the majority of students were more engaged when provided the opportunity to use technology in their classes.
Student discipline

Students who are more motivated and interested with the technology can be expected to demonstrate better discipline than those who are not. Shapley’s research (2009) suggests that students at 1:1 schools were sent to the office less frequently and were suspended less frequently than students from the control schools (Shapley, 2006); Lemke and Martin (2004a) also reported improved attendance. In Alabama, a laptop implementation at Auburn City Schools brought about a 29 percent decline in schoolwide discipline problems (Intel Inc., 2008). This is reflective of the motivation, engagement, and interest level of students in schools with technology present in the form of a 1:1 program. The decrease in student discipline issues may have important practical benefits in terms of student learning and teacher practices, because teachers spend less time dealing with student behavior and focus more on student learning (Holcomb, 2009).

Teacher practices

Teachers should approach their work with constant reflection and experimentation. Teachers are expected to alter curricula, assessments, and teaching styles to meet the needs of the student population they serve. One-to-one research suggests there is less traditional seatwork, more personalized teaching, and a significant increase in constructive practices. (Donovan et al., 2010; Bebell et al., 2010; Howard, Chan, & Caputi, 2015; Rockman, 2003)—which suggests teachers are changing their practices to a teaching methodology that utilizes more student-centered projects to facilitate student learning (Mergendoller, 2006). This method of teaching has proven to be more effective than lecture based instruction (Baumgartner & Zabin, 2008; Chu, et al., 2011; Duncan & Tseng, 2011; Gultekin, 2005; Mioduser & Betzer, 2007).
Other studies examining teacher behaviors in laptop schools found an increase in using small learning groups as opposed to large group instruction (Russell et al., 2004; Rockman, 2003; Gulek & Demirtas, 2005). Teachers in Michigan’s Freedom to Learn (FTL) program showed significantly greater confidence in their ability to integrate laptop use into lessons than national norms (Dawson, Cavanaugh, & Ritzhaupt, 2006).

Student efficacy

Schools that implement 1:1 initiatives have the potential for raising student efficacy levels; students have reported feeling empowered with the technology and more organized (Lei & Zhao, 2008; O’Donnell, 2005; Henson, 2002; Kenny & Gunter, 2004; Silvernail & Lane, 2004; Taylor, Hasselbring, & Williams, 2001; Anderson et al., 1988; Midgley et al., 1989). Although the context is different, a study conducted by Romi and Zoabi (2003) should be considered in a discussion of the implications of technology on student efficacy levels, despite its limited applicability to this study topic due to its different context. Romi and Zoabi’s research examined the impact of computer technology on the self-esteem of dropout Arab youth. The study had a control group and a focus group, each consisting of 60 secondary-level students. The intervention group was exposed to the Microsoft Office Suite to use in their learning, while the control group had no access to technology. Pre- and post-intervention questionnaires were administered to determine students’ attitudes toward learning, self-esteem, and efficacy. They found a significant increase in student attitudes toward learning and efficacy. Students in a 1:1 school have the potential to improve their efficacy levels with organization tools available to them through the technology. A situation in which students feel empowered to learn might also motivate teachers to make changes in their teacher practices.
Student Technology Proficiency

Students in a 1:1 program often improve their technology proficiency as well. One study found that technology skills of students in a laptop program improved so much that after three years, low-income students in the 1:1 laptop schools displayed the same levels of technology proficiency as wealthier students in the control schools (Shapley et al., 2009). An increase in students’ technology proficiency can help raise teacher confidence in his or her students’ facility with technology—which can help teachers move their teaching towards more project-based strategies.

Barriers, Critics, Drawbacks of 1:1 Programs

There is an overwhelming amount of research that seems to represent 1:1 programs in a positive light. However, a few studies conducted across the U.S. have found little or no change resulting from some 1:1 laptop computing programs. It is important for school districts that are planning 1:1 programs to learn from unsuccessful past programs and implementations in order to address potential problems proactively.

One of the main arguments critics raise is the cost of 1:1 laptop initiatives. One high school recently purchased an iPad for every student in grades ten-twelve at a total cost of $1.42 million over three years (Kieler, 2013). This is minimal compared to the $50 million that the Los Angeles Unified School District invested in order for every K-12 student and teacher in the district to have a device by the fall of 2014 (Meyer, 2013). Some districts do not have the capacity to make budget commitments of those proportions. However, the programs do have a potential for savings. A school that adopts a 1:1 computing program could spend less for printing, photocopying, bubble sheets and even some textbooks—and this could amount to a substantial savings across its district.
Furthermore, nationally, on average, 25 percent of all students—roughly a million students a year—drop out of school. The human cost is incalculable and can span generations (Greaves et al., 2010). One-to-one programs that motivate students to stay in school help mitigate this human cost.

Another argument of the 1:1 critics involves the misuse of the devices. Blume (2013) reported the following from a building administrator:

It took exactly one week for nearly 300 students at Theodore Roosevelt High School to hack through security so they could surf the Web on their new school-issued iPads. Students were sending tweets, socializing on Facebook and streaming music through Pandora. (p. 1).

This caused the district to postpone their iPad plan. Some districts are terminating their 1:1 programs due to misuse of the devices.

Hu (2007) reported that Liverpool, NY abandoned their 1:1 program for multiple reasons: in addition to reporting that students misused program laptops by cheating on tests, downloading pornography, and hacking into school networks, school officials were unable to track any impact by the program on student achievement. Teachers in this district cited the devices as a distraction to the learning environment. Hu (2007) found no overall difference between a control (not 1:1) and focus (1:1) group on state test scores. The same study also reported six out of 21 schools that received the devices opted not to use them the following year. Matoaca High School in Virginia eliminated its program after students who were issued devices showed no academic gains compared to those without the devices (Hu, 2007). It should be noted that oftentimes student achievement data between groups of students in 1:1 programs and groups not in 1:1 programs were the
same, slightly above or below. There is evidence that suggests that 1:1 programs may not produce academic achievement alone. It is difficult to determine actual cause of academic achievement because of the variables that exist simultaneously in schools.

Another concern is that the devices are not affecting the way that instruction takes place. In some places, computers are simply replacing books, paper, and filing systems, rather than being utilized to transform how teachers teach and students learn. This is not the case in all classrooms, since research appears to support in the inference that teacher practices change with the introduction of technology and 1:1 programs (Lemke and Martin, 2004a; Russell et al., 2004; Rockman, 2003; Gulek and Demiras, 2005; Dawson, Cavanaugh, & Ritzhaupt, 2006). Amidst the success stories of 1:1 implementation, there are reports of schools finding no statistically significant effects from 1:1 computing. Four years of research in Texas suggested that providing each student with a laptop did not increase student achievement in reading and writing (Garner, 2008).

Lastly, teachers ultimately decide the amount of computer use in each classroom. If computer use is sporadic, it makes study results inconclusive, and if students are not using the devices, it makes little sense to expect any kind of return on the investment in technology, especially in relation to student achievement (Weston & Bain, 2010). In 2005, it was determined that elementary teachers were not using their laptops to enhance and support teaching and learning, so 30 laptops were given to teachers at a different school with a stronger commitment to technology integration (Hu, 2007). In another study, it was discovered that the more extensively students used their laptops, the better they scored (Silvernail & Gritter, 2007). If a difference in student achievement depends
on the frequency of device usage in a 1:1 program, it is important to invest in improving teacher practices by improving teacher knowledge of TPACK.

Section 3: Connecting Teacher Practices and 1:1 Programs

Addressing Teacher Change

This section focuses on the interconnection between 1:1 programs and changing teacher practices. Computers have become an integral part of classrooms; however, the manner in which they are integrated into the classroom varies. Some teachers use computers to reinforce skills taught in class; others use them simply as word processors for their students. Still other teachers incorporate computers into actual lesson presentations (Ertmer, Addison, Lane, Ross, & Woods, 1999). This section examines research into the features that motivate teachers to change their practices and choose the third of these three options.

Training and Professional Development

A three-year evaluative study into the implementation of a student-owned portable computer program (PCP) by a secondary school in Perth, Western Australia found some teachers felt pressured to make use of the computers and they were not sure how they should use them (Newhouse & Rennie, 2001). Despite differences in the context of the Australian research project vs. studies about 1:1 programs implemented by U.S. school districts, the Australian study can provide insights into teacher perceptions of computing programs and about the effects of proper implementation. School districts that desire changes in teacher practices need to understand that teachers generally hold the key to proper implementation but need training to assist them.
It is important for teachers to be trained to use technology in alignment with the curriculum. One-to-one schools should consider uniform integration of technology in every class to ensure accountability within the classroom (Greaves et al., 2010). Schools should continue to provide training—especially training that takes into account teacher perceptions, attitudes and beliefs (Penuel, 2006; Bandura, 1977). Finally, the program should employ a process that holds teachers accountable for using the devices in accordance with the training they received.

It is important to validate teachers’ negative responses and the reasons for the negative responses in regard to technology integration. This process allows 1:1 stakeholders to consider prior attitudes, beliefs, barriers, and the perception of barriers before they proceed with a major investment. This does not mean all effort and resources should be used to eliminate these obstacles, but norms should be established for 1:1 implementation. Implementation must consider professional development to give teachers the training necessary to make use of technology (Penuel, 2006; Drayton et al., 2010; Shapley et al., 2010; Silvernail & Lane, 2004); likewise; time needs to be given to teachers for learning and collaboration (Greaves et al., 2010).

Individual teachers may believe that technology can help them become better teachers, but they could be hesitant for a variety of reasons, including lack of relevant knowledge (Lawless & Pellegrino, 2007), low self-efficacy (Mueller et al., 2008), and existing belief systems (Ertmer, 2005; Hew & Brush, 2007; Subramaniam, 2007). Professional development provided during the 1:1 implementation process should be designed to address these issues. Rowe (1993) observes that a 1:1 program provides a user with a flexible device, like a Swiss Army knife, which extends not only the user's
physical but also his or her intellectual capabilities. The tool must become “one” with the user to be used most effectively. Some people would argue that the user who needs to be “one” with the device first is the teacher.

Effective professional development for technology integration requires a focus on (a) technology knowledge and skills, (b) connection between technology used and subject content being taught), and (c) technology-related classroom management and skills (Hew & Brush, 2007; Kanaya et al., 2005). Successful technology integration that targets student learning requires teacher knowledge that enables them to use appropriate technologies to address needs, solve problems, and enable student exploration, analysis, and production (Cennamo, Ross, & Ertmer, 2010). The technology available to teachers changes frequently, which makes the task of gaining the knowledge mentioned earlier difficult for teachers and administrators providing professional development. It is important to establish teacher self-efficacy because of the constant state of learning required of teachers.

**Efficacy**

Self-efficacy is “the belief in one’s capabilities to organize and execute the courses of action required to manage prospective situations” (Bandura, 1997). Bandura states self-efficacy beliefs are crucial to human agency, or our ability to act. Self-efficacy is connected to motivation, constructivist thinking, and social cognitive theory. Self-efficacy beliefs determine how people think, feel, and behave (Bandura, 1994). Therefore, people’s thoughts influence their actions. For example, an educator who likes technology likely responds to a 1:1 program with an increase in intrinsic motivation.
Alfie Kohn (1999) found a direct positive correlation between intrinsic motivation (better intrinsic motivation leads to higher efficacy) and academic achievement.

The TPACK framework was used to gauge teachers’ knowledge of integrating technology to facilitate and enhance the teaching and learning at the participating school. The study tried to determine if knowledge develops through the impact of the 1:1 iPad program, while identifying teacher perceptions on their teaching practices in regard to a 1:1 iPad program. Henson explains (2002):

If teacher efficacy is the powerful predictive construct it has been thought to be, then research examining the processes by which such efficacy is built is critical to fostering teacher efficacy and, ultimately, changing behavior (p. 142).

Ultimately, schools want to change teacher behaviors to improve teaching and learning. School districts need to consider how to facilitate TPACK to address the needs of their teachers in implementing the 1:1 program.

The most powerful strategy for helping teachers build self-efficacy attitudes is enabling them to have successful personal experiences (Mueller et al., 2008; Ottenbreit-Leftwich, 2007). Some suggestions for building technology self-efficacy include the following:

- Allow teachers time to play with technology (Somekh, 2008)
- Start with small successful experiences (Ottenbreit-Leftwich, 2007).
- Encourage collaboration with peers (Ertmer, Ottenbreit-Leftwich, & York, 2006)
• Promote participation in a Professional Learning Community (Putnam & Borko, 2000)

• Allocate time to innovate and adapt new practices (Hennessey, Ruthven, & Brindley, 2005).

Technology is not an end-all, cure-all for education. Sahlberg (2011) explains, “Technology is not a substitute but merely a tool to complement interaction with teachers and fellow students (p. 144).” However, the use of computer technology does have the possibility of increasing our own abilities or efficacy levels. The futurologist Kurzweil (1999) holds that the tools we have available to us can actually enable us to increase our cognitive abilities. He goes on to explain that people are able to be more creative and have the potential for endless cognitive gain as a result of access to computing devices. One-to-one programs allow teachers to be more creative and have the potential to help improve teacher practices.

**Educator attributes**

Teacher beliefs are strong, and impact their actions, including how teachers use technology in the classroom (Angers, & Machtmes, 2005; Hermans et al., 2008; Windschitl & Sahl, 2002; Haney, Lumpe, Czerniak, and Egan, 2002). Teachers with traditional beliefs generally implement more “low-level” technology uses, whereas teachers with more constructivist beliefs implement more student-centered or “high-level” technology uses (Judson, 2006; Roehrig et al., 2007). One study noted changes in the pedagogical beliefs of some teachers who had observed changes in their students (Sandholtz & Ringstaff, 1996; Sandholtz, Ringstaff, & Dwyer, 1997). This change
suggests 1:1 programs can influence pedagogical beliefs, which can lead to changes in teacher practices.

The overall effectiveness of a 1:1 program relies heavily on teacher strategies used to implement the devices into their curriculum. Educator attitudes have the potential to affect teacher application and to fulfill the need for improving teacher practices. A teacher who is reluctant about technology is unlikely to use devices as frequently as a teacher who is confident with technology. Lee (2006) reported that reluctance from teachers to incorporate technology tools in meaningful ways would alter the educational experiences of students. Holden and Rada (2011) reported that school districts might help increase teachers’ acceptance and use of current technologies by focusing on increasing influential individual external factors such as self-efficacy.

Technology has just recently been conceptualized into the definition of good teaching (Fajet, Bello, Leftwich, Mesler, & Shaver, 2005). Teacher knowledge has a significant impact on their decisions; therefore, to help teachers change their practices, we must help them expand their knowledge (Borko & Putnam, 1995)—both content knowledge (CK) and pedagogical knowledge (PK) (Shulman, 1986). Shulman (1986) combined CK and PK in order to address the specific needs of learners in a particular context (PCK). Mishra and Koehler (2006) built upon Shulman’s concept to apply it to technology in education and guide teachers’ actions with technology, pedagogy, and content knowledge in their classrooms (TPACK). Teachers need not just technology literacy, but also the knowledge of how to develop plans for teaching with appropriate computer applications to support meaningful student learning.
1:1 Programs and Teacher Practices

There is conflicting research about teacher practices as some schools implement one-to-one computer programs. Technology is not typically used to support the kinds of instruction (e.g., student-centered) believed to be most powerful for facilitation of student learning (Cuban, Kirkpatrick, & Peck; 2001; International Society for Technology in Education [ISTE], 2008). Reports from classroom data suggest that actual use of 1:1 computer technology still tends to be “low-level” — i.e., simply to support lecture-based instruction (Maddux & Johnson, 2006; Russell, Bebell, O’Dwyer, & O’Connor, 2003).

Teacher practices and technology intersect. We are in the age of technology, with information at our fingertips on a constant basis — in particular, the smartphone. How many individuals would feel disconnected if they lost or misplaced their smartphones? In addition to providing telephone access almost anywhere, today’s cell phone also serves as a calendar, a planner, a connection to contacts, and a gaming, music and video entertainment center. It acts as an appendage for some individuals. Technology is not used solely as a supplemental teaching tool, but can promote effective teaching that integrates technology with pedagogy and subject content.

Researchers have found positive results from 1:1 computing implementation with regard to collaboration and productive group work (Greaves et al., 2010), lesson planning (Bebell & Kay, 2010; Dawson et al., 2006; Greaves et al., 2010; Rockman, 2003; Zheng, Warschauer, Lin, & Chang, 2016), and student achievement (Bebell & Kay, 2010; Silvernail & Gritter, 2007; Shapley et al., 2006; Penuel, 2006; Zheng et al., 2016). Teachers have improved their collaboration, productive group work, lesson planning, and teacher efficacy levels with 1:1 programs, which demonstrates the ability for 1:1
programs to change teacher practices. Technology can make it possible to “adopt new and arguably better approaches to instruction and/or change the content or context of learning, instruction, and assessment” (Lawless & Pellegrino, 2007, p 581). The context of a 1:1 iPad program can potentially develop teacher knowledge of technology, pedagogy, and content interaction in instruction.

**Summary**

Teachers are the most important variable that affect student learning (Marzano, 2003). A change in teacher practices, specifically TPACK, could have the potential for greater impact on student learning. The call for raising digital literacy (US DOE, 2017), coupled with the broad emergence of 1:1 programs, shows the need for improving teacher practices with the programs. One-to-one programs could be an avenue to any or all of Penuel’s four goals (academic achievement, increased equity, increased economic competitiveness of a region, and/or transforming the quality of instruction). The fourth goal of transforming the quality of instruction was the focus of this study. As Hargreaves (1994) says, “It is what teachers think, what teachers believe, and what teachers do at the level of the classroom that ultimately shapes the kind of learning that young people get” (p. IX).

Neither a one-to-one laptop program nor an improvement in teacher practices is the silver bullet to [today’s] educational problems. However, both can help drive progress in schools. They both can serve as agents for transforming our educational system. 1:1 programs have the potential to stimulate great progress in our schools—and what appears to remain is the effective use of technology by teachers (Newhouse & Rennie, 2001).
The need for changes in teacher practices with 1:1 programs is evident in the research: the positives and negatives of a program are often in the hands of the teachers. Self-efficacy has been identified as a significant factor influencing people’s decisions to use technology (Compeau & Higgins, 1995; Kellenberger & Hendricks, 2003; Teo, 2009; Wang et al., 2004). Similarly, teachers’ self-efficacy beliefs play an important role in their decision to integrate technology into their classrooms (Vannatta & Fordham, 2004). Teachers play the pivotal role in 1:1 implementation. Interestingly, a 1:1 program’s implementation process has the potential to improve teacher efficacy levels—which is often reflected in increased student engagement and motivation. Conversely, 1:1 implementations are better served when teachers have high efficacy levels to use the technology.
CHAPTER 3: METHODOLOGY

Overview

The purpose of the study was to understand the meaning of schoolteachers’ experiences in 1:1 schools with an emphasis on the perception of changes in teacher practices after the implementation. This chapter communicates the methods that were employed to answer the research questions. The chapter includes sections about the epistemological scope, research design, population, and the role of the researcher, data collection methods, study variables, data analysis, limitations and ethical issues.

Demographics of Participants

Participants’ experiences and feedback added insight to the research questions posed in this study. Listening to and analyzing the experiences of these teachers allowed the study to obtain valuable information about Gertrude High School’s 1:1 iPad program regarding teacher practices as well as participants’ perceptions of how Gertrude implemented the iPads. Additionally, classroom observations provided valuable insight on teacher practices with the technology.

The results of this qualitative study are based on interviews and classroom observations of four Midwest High School Teachers who have taught within the same school’s 1:1 iPad Program. All teachers voluntarily participated in the study. Prior to the study beginning, the school board approved study at Gertrude and an email was sent to all high school teachers in the building. All 1:1 documents were gathered through district administration.
The four participants in this study taught at Gertrude High School. Participants in this study have all been teaching at the school from the beginning of the 1:1 iPad program four years ago. Of the four total participants, three were veteran teachers (15+ years teaching), while one teacher was a career teacher (6-14 years teacher). All four participants were female. Also of the four participants, one of the participants taught in a subject core (Math, Science, or Language Arts), while the remaining three were non-core (any fine arts or vocations such as Physical Education, Business, Foreign Language, Family/Consumer Science, Art, or Industrial Tech). Table 3.1 presents information about participants in a concise manner.

Table 3.1. Participant Pseudonyms

<table>
<thead>
<tr>
<th>Participant Pseudonym</th>
<th>Gender</th>
<th>Experience</th>
<th>Core/Non-Core</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sammy</td>
<td>F</td>
<td>Veteran (27)</td>
<td>Non-Core</td>
</tr>
<tr>
<td>Molly</td>
<td>F</td>
<td>Career (8)</td>
<td>Core</td>
</tr>
<tr>
<td>Fallon</td>
<td>F</td>
<td>Veteran (15)</td>
<td>Non-Core</td>
</tr>
<tr>
<td>Bailey</td>
<td>F</td>
<td>Veteran (16)</td>
<td>Non-Core</td>
</tr>
</tbody>
</table>

All participants were interviewed in person. The interviews were recorded and transcription of interviews was completed. Interviews were transcribed verbatim by the researcher within three days of occurrence. The personal attention to and reflection on the verbatim transcription assisted analysis throughout the study. The transcription of interviews was sent to participants, who reviewed, changed, and/or verified their comments. Field notes were written throughout the interviews. Interview times varied and were scheduled at times convenient for both participants and the researcher. All
interviews were conducted during the month of April. All observations were conducted during April and May.

**Research Site**

Gertrude High School serves students grades ten through twelve in a suburb of a city. The high school served approximately 1,500 students at the time of the study. The high school employs 125 teachers and staff members. Gertrude is located in an affluent area, but also has low income areas. Students who eat free or reduced lunch are 15.7%. Approximately 11% of students are identified for the TAG, or talented and gifted program, while 9% of the student population have an IEP, or individualized education plan. Student demographics include 78% White, 5% Hispanic, 5% Black, 7% Asian, and less than 1% Pacific Islander, less than 1% Native American, and about 4% two or more races.

The building had many initiatives that could have been potential variables within the study. The initiatives are relevant because the trainings or professional development that teachers received for them could be the reason for changes in teacher practices, as opposed to how teachers responded to the iPads. This list is not exhaustive, but some of the building initiatives include:

- Professional Learning Communities
- Productive Group Work
- SAMR Model

Productive Group Work can be defined as instructional arrangement for two to six students working together on a shared task to collectively demonstrate their knowledge and understanding of the content with the presence of five principles to ensure successful
group work (Frey, Fisher, & Everlove (2009). The SAMR (Substitution, Augmentation, Modification, Redefinition) model was designed to help educators evaluate technology use and make small shifts in lesson design to discover new ways for using technology as a tool for learning (PuenteDura, 2006).

- Multi-Tiered System of Supports (MTSS)
- Instructional Leadership Team (Instructional Coaches, Lead Teachers, Model Teachers)

The school was selected as the most appropriate site for this study because it has an innovative 1:1 iPad Program and has been recognized as a leader among 1:1 iPad implementation schools. The site was relevant due to the school’s commitment to the iPad, as they started their iPad program in 2012. This longevity, although not that long, can provide information to schools that want to know more about long term success and processes. Most schools generally purchase other forms of technology but Gertrude has continued purchasing iPads for their students. Finally, the site was chosen because of proximity to the researcher, which allowed for more regular observations, twenty per teacher.

**Epistemology**

The epistemological scope for this study stems from social constructivism. Individuals seek understanding of the world in which they live and work and construct subjective meanings of their experiences. Crotty (1998) identified some assumptions when discussing constructivism. One assumption is human beings construct meaning as they engage with the world. Open-ended questions were used so participants could share their viewpoints. The second assumption is human beings construct meaning from the
world they live in through their historical and social perspectives. This is why it was important to collect information in person when possible from teachers to understand the context of the participants. The third assumption is that meaning is always generated through social interaction with human community. The meaning from the data collected in the field was generated into themes.

In this study, the phenomenon of a 1:1 iPad school was studied through the perceived realities and experiences of teachers within the school. The purpose of this study was to understand the meaning of school teachers’ experiences in the 1:1 school with an emphasis on the perception of teacher practices after the implementation. The conceptual perspective was a phenomenological single-case case study. The single case study was selected due to the study evaluating the success of the 1:1 iPad Program on a single particular case (Gertrude), but within this case are four teachers. The phenomenological approach was a research design of inquiry to describes the lived experiences of individuals about a phenomenon (Giorgi, 2009; Fraenkel & Wallen, 2009; Seidman, 2013). The phenomenological approach was used to gain a better understanding of the role of 1:1 iPad schools on teacher practices. Regardless of teacher experience, good phenomenological research must first identify the shared experience. Each of the educators interviewed and observed had a shared experience as a teacher in a 1:1 iPad program. The questions were “directed at participant’s experiences, feelings, beliefs and convictions” about their teacher practices and the 1:1 program (Welman & Kruger, 1999).

The single-case case study applies to the depth of interviews, observations, and document analysis present in this study. The ability to engage in such rich data analysis
helped illuminate the case. The Gertrude School was chosen because of their commitment to providing teachers with necessary training alongside a Technology Instructor. It was also chosen because of the proximity, which allowed for more observations. According to Yin (2003), a case study design should be considered when trying to answer the “how” and “why” questions, as well as covering the contextual conditions. The study sought to determine the types of decisions made by teachers and the factors that influenced the decision-making.

Interviews were conducted to capture interpretations by teachers at the 1:1 iPad school—which allowed insight into their experience in the 1:1 school environment. The study was focused on teacher practices because of the importance of high-quality teacher practices; and equally interested in learning about teacher perceptions with 1:1 iPad programs. The participants were asked to reconstruct their experiences and reflect on the significance of the implementation process to their practices (Seidman, 2013). For this study, four high school teachers were interviewed from the focus school to provide a detailed account of the teachers’ perceptions in regard to their implementation. Data collection from observations and interviews were continued until the topic was saturated—that is, when participants produced no new perspectives on the topic. The data was then analyzed in an attempt to construct meaning from the participants’ 1:1 iPad experience with a focus on their teacher practices. The following research questions guided this study:

1) How do teachers in a high school experience school-wide iPad implementation with relation to their teacher practices?

2) According to participants, what aspects of teaching change due to the 1:1 iPad
program (Technology, Pedagogy, Content Knowledge, Lesson Planning, Teacher Collaboration, Assessment, etc.)?

3) How do teachers in a high school experience school-wide iPad implementation with relation to organizational characteristics the district provided (technology training, professional development, technology support, proper controls/settings, teacher collaboration, etc.)?

**Qualitative Research Approach**

A qualitative research approach for this study was used because qualitative methods are effective in discovering the meaning that people give to events that they experience (Creswell, 2014). Specifically, the phenomenological method was used to understand how participants construct meaning from the phenomenon being studied, i.e., the potential implications of a school wide 1:1 iPad program on teacher practices at the high school level. Phenomenology is effective in seeking to understand the living experiences of a small number of people—in this case, four participants from the focus school—as part of uncovering meaning (Dahlberg et al, 2008) and to put behavior in context and provide access to understanding their action (Seidman, 2013). A single-case case study is appropriate for this research because the case study occurred in a real-world setting and the phenomenon was not influenced in any way by the researcher (Flick, 2006). The single-case refers to the school, and not to the individual teachers. Participants were told that divergent views and experiences were welcome. The school was the boundary of the case, and the study approach allowed investigation of the phenomenon of technology in the 1:1 iPad School as a possible variable in aiding to transform instructional delivery methods.
The school was selected as the most appropriate site as it has an innovative 1:1 iPad Program. The focus school was also an appropriate site due to the ability to connect with gatekeepers from participating in a professional learning network together. The professional learning helped develop relationships with professionals through coursework and by joining educational conversations online.

The qualitative research methods that were utilized for this study include purposive sampling and open-ended interviewing, which provided a full and revealing picture of what is going on. It is purposive sampling due to the focus school 1:1 program and the district leadership agreement for the research. Other qualitative research methods that were used are described further below and include respondent validation, data collection and analysis. Specifically, the phenomenological method (Giorgi, 2009; Fraenkel & Wallen, 2009; Seidman, 2013) was used to analyze the data and describe the lived experiences of high school teachers about their practices after a school-wide 1:1 iPad program had been implemented. An Institutional Review Board (IRB) application is approved purpose and procedures for this study and is available in Appendix A.

**Research Design**

The procedures for selecting study participants, interviewing protocols, and collecting and analyzing data are described in the following section.

**Population**

The participants in this study included teachers within a school-wide 1:1 iPad program. The goal of the study was to understand the meaning of schoolteachers’ experiences in a 1:1 iPad school with an emphasis on the perception of teacher practices after the program’s implementation. Prior to the study beginning, the researcher gained
access to teachers at the focus school by obtaining board approval and superintendent approval. An email message was sent to the high school staff that encouraged them to participate in the study. Each teacher who was interested in participating was contacted directly and an interview was scheduled.

The potential teacher participants were sent an e-mail (Appendix B) with the study’s purpose and participant expectations, as well as the Informed Consent Form (Appendix C) that includes a description of the research study, research procedures, risks and benefits of participation in the study, protection of confidentiality, and participant rights. Teachers who signed the consent form became participants in the study and received a direct phone call about the interview process with the goal of setting up interview and observation dates and times. The Teacher Interview Protocol (Appendix D) was emailed to each participant after the initial planning phone call. The observations and interviews of participants concluded when data saturation occurred and the information received from the interviewees no longer sparked new insights or revealed new properties (Creswell, 2014; Boyd, 2001).

**Role of the researcher**

The high school in the study has implemented a 1:1 school-wide iPad program. There was an interest in understanding teacher practices within iPad programs and the factors that influence teachers’ practices. The school district also shared an interest in hearing from their teachers regarding the 1:1 implementation. These factors could help district leaders seek to positively affect teachers’ practices—and this may ultimately help improve student engagement and achievement. The 1:1 program may additionally help teachers improve their integration of technology in the TPACK framework and the
district can improve implementation practices if other buildings intend to go 1:1 with iPads. School districts with a teacher implementation approach that works, according to teachers, can be a great place to start.

The researcher was the primary research instrument in this study, which is common for qualitative research. Two threats to the trustworthiness of qualitative conclusions are researcher bias and reactivity. Researcher bias includes understanding how particular values and expectations could influence the conduct and conclusions of the study. Therefore, it is important to state possible biases and how the researcher dealt with them with integrity. Reactivity is the influence of the researcher on the setting or individual participants. The researcher’s goal was not to eliminate his influence but to use it positively (Maxwell, 2013).

The researcher’s experiences incorporating technology into instruction has (a) changed his teacher practices, (b) increased student engagement, and (c) increased his confidence as a teacher. Therefore, the researcher acknowledged that his personal preconceptions could have influenced the interpretation of this study’s data. To mitigate the influence of these biases, the research used rich data and respondent validation. The study focused on using “rich” data that revealed a picture of what was going on with the teachers that included verbatim transcripts from the teachers and observation (Maxwell, 2013). Respondent validation, also known as member checking, was used by gaining feedback about the data and conclusions from the participants in the study (Maxwell, 2013; Rossman & Rallis, 2012). The participants were provided with follow-up questions that summarized and restated what they said to ensure no information was misinterpreted or mistaking the meaning of what participants said. Interview transcripts were provided
to participants to gather further information and check accuracy after the interviews had taken place. Classroom observations were used to gain a new point of view and to ensure that more than a fraction of the situation was revealed (Rallis & Rossman, 2013). District documentation was used about the school implementation as well. The documentation included PD plans for staff, goals of the program, and surveys from staff, students, and community members. Lastly, numbers, simple numerical results derived from the data, were used to support any qualitative claims (Maxwell, 2013). The numerical results of classroom visits and themes that emerged helped determine if occurrences were prevalent.

**Data collection methods**

There were numerous aspects of data collection necessary in obtaining the in-depth understanding that was sought for the research. Each method together allowed answering the research questions and paint an overall picture of the topic. The data collection activities were discussed separately to unpack each method. As explained earlier, multiple sources of data collection were used to involve different methods as a check on one another to support a single conclusion (Maxwell, 2013).

**Interviews**

Interviews were used in this phenomenological single-case case study as a primary source of data collection. In qualitative research, interviews are appropriate for understanding the lived experience of other people with an interest in others’ stories because they are of worth and importance (Maxwell, 2013; Seidman, 2013). The goal of understanding the phenomenology of teacher practices within the 1:1 iPad program necessitates interviewing and observing. The interviews, without observations, could be a
misrepresentation of what is happening versus the self-reported interview responses. The three kinds of questions used with this qualitative research: (1) questions about the meaning of teacher practices and the 1:1 iPad implementation to the participants, (2) questions about the influence of the iPads on practices and social context, and (3) questions about the processes by which these events and activities and their outcomes occurred (Maxwell, 2013).

The interview questions were developed with the help of a dissertation committee, but primarily through conducting a capstone experience, which is a smaller scale pilot study. More questions were added to the pilot study questions to provide depth to the study. Additionally, questions were included that asked teachers to reflect on TPACK, so background knowledge wasn’t assumed by the researcher. Feedback from the capstone included establishing meaning for the teacher, so questions attempted to hear that reflection from the participants.

For this study, phenomenological interviewing with open-ended questions was used. The participants were asked to reconstruct their experience of the 1:1 iPad implementation with special attention to their teacher practices (Maxwell, 2013). All interviews were conducted as personal face-to-face interviews. Seidman (2013) tends to use a three-interview sequence in phenomenology research. A modified version of this interview process with access to the participant for any follow-up questions that arose was used. Seidman’s (2013) three-interview approach involves establishing the context of the participants’ experience during the first interview. The second interview allows participants to reconstruct the details of their experience, and the third interview encourages participants to reflect on the meaning. Questions were used that addressed the
three different interview sections during the interview. There were opportunities for follow-up questions at the end of classroom observations as well. Member checking allowed participants to bring up questions or added concerns to share as well. This process seemed to align with the research goals and there is no fixed set of methods to conduct this type of research (Van Manen, 1997; Garza, 2007). The different phenomenological approaches are dynamic and undergoing constant development as the field of qualitative research as a whole evolves. The flexibility and adaptability of phenomenology inquiry is one of its greatest strengths (Garza, 2007).

Before the interview process began, a pilot interview was used with fellow educators to ensure quality of the questions and ask for potential revisions. This helped clarify the work and explore the implications of the study (Maxwell, 2013). The dissertation chair and committee members reviewed the interview questions prior to the beginning of the study to help refine the questioning. The follow-up questions were important to determine underlying information that was not always shared initially. It was important to seek meaning from the participants in what the iPads did for them.

A series of predetermined steps were followed during each interview. Initially, the review of the Informed Consent Form (Appendix C) took place as participants signed and agreed prior to beginning the interview. Next, the purpose of the study was outlined, research procedures, risks and benefits of participation in the study, protection of confidentiality, and participant rights. During qualitative interviews, it is important to develop and navigate research relationships with participants.

A working partnership was established with the participants so they felt comfortable sharing personal matters. A few ways rapport was established involved
identifying the researcher as a doctoral student at Iowa State University and a fellow teacher while sharing experiences that were relevant, such as teaching in a 1:1 iPad school and helping facilitate an elementary 2:1 at school program (Seidman, 2013). The relationship could be mutually beneficial as well. Participants knew their involvement in the study would contribute to the value of teacher practices and how the school district looks to adopt other school-wide 1:1 iPad programs in other buildings. Interview participants were given the interview protocol (Appendix D) prior to the time of the interview to give them time to prepare for the questions. All interviews were audio-recorded, upon participant consent, along with typed notes taken during the interview. The typed notes provided accessibility of the data to review any key points in each interview. These notes helped focus the study on listening to what the participants were saying, hearing their “inner voice,” and being alert for the process as well as the substance (Devault, 1990). Each participant was to answer the questions as if he or she were speaking to a colleague about the topic so that answers were authentic. This was communicated to participants so they could communicate freely about the 1:1 iPad program.

A phenomenological approach was used with open-ended questions. This approach allowed the study to build upon and explore the participant’s responses in regard to their experience within the topic under study (Seidman, 2013). This approach was selected because of the transitory nature of human experience. Teacher practices do not remain static and are likely to change, so the process of asking participants to reconstruct and reflect on their experiences searched for the essence of the participants’ lived experience. Each participant was interviewed for approximately one hour. The
participants were called again if there were any follow up questions. The first part of the interview focused on the details of the experience and the second part was a reflection of the meaning of their experience (Seidman, 2013). Follow-up questions were asked to the participants for clarification as well.

Interviews with the participants took place prior to observations. A relationship was developed with the participant first before coming into the classroom to observe. The relationship was designed to help the participant feel at ease before conducting an observation in the classroom. A lot of follow-up questions were asked during observations or if there was more information to pursue following initial interview. The questions were crafted through the capstone pilot study, in addition to advice on answering the question, “what does this mean for teachers?” Participants were able to view the TPACK model (Figure 1.1) prior to answering questions about TPACK. TPACK was explained to participants during the interview using the following protocol:

Technological Pedagogical Content Knowledge (TPACK) is a tool which attempts to identify the nature of knowledge required by teachers for successful technology integration in their teaching. TPACK addresses the complexity, and intersection of technology, teacher pedagogy, and content knowledge. Effective technology integration for pedagogy around specific subject matter requires finding the right technology and using it at the right time. Please take a minute or so to look over the following attributes of TPACK (Question #15 on Appendix D).
Observations

Classroom observations were an important part of the data collection process in order to observe actual teacher practices in the 1:1 iPad classroom. Observations allowed another data source, as some teachers may not be able to accurately access their technology integration. Via observations, it was evident that technology integration was occurring with the 1:1 iPad Program. Data saturation was completed with 20 classroom observations for each of the four participants. There was not a set number of observations at the beginning of the study, but observations stopped when data saturation occurred (Creswell, 2014). The observations were completed after each teacher’s initial interview. All participants knew when observations were going to occur, and they were only scheduled when technology was going to be present and utilized during a lesson, as determined by the teacher. Participants were emailed to determine if the dates would work and to ensure technology was being utilized. The interviews enhanced the observations because of some background information that was identified to look for when observations occurred. Interviews and observations connected the data, and follow-up questions about technology implementation occurred before, during, and after observations. This is in addition to the one-hour interview completed prior to any observations taking place.

The observation protocol (Appendix F) used was developed and tested by Hofer et al (2011). The observation instrument was selected because of its process of identifying characteristics of the classroom before completing the rubric. The intentionality of the rubric ensured the observation was focused on the primary learning goal. The rubric also includes curriculum topics addressed (Content Knowledge),
Instructional strategies/learning activities (Pedagogy), and technology used or present (Technology), which is the conceptual framework driving this study.

**Self-Reported Protocol (SRP)**

A third method of data collection utilized tools that are current in the field of technology integration in education. The SRP, which is available in Appendix F, was developed from Harris et al (2012). The Self-Reported Protocol or SRP, for this study, was named as such to differentiate between the interview questions. The original name was TPACK Interview Protocol. Participants completed this document every time an observation was to occur in the classroom. The document provided information regarding the purpose of the lesson. The SRP also helped determine if the technology “fit.” The SRP informed the researcher about things unseen, such as contextual information with student needs and preferences. The document was shared with participants prior to beginning and were provided with a demonstration of how to complete it.

**District Documents**

District documents were also collected to give a better understanding of what support the district was offering the teachers. The document analysis greatly helped comprehend the participants’ experience during the interviews and during the coding process because of prior knowledge on what the participants were trying to communicate about their professional development (PD). Document analysis consisted of using school documents/artifacts in regard to PD implementation, teacher training, and implementation cycle/schedules. District agendas, manuals, and information shared with board members were other documents of information. The documents served as further basis of
discussion in interviews according to themes (Maxwell, 2012). The data collection of documents was most relevant for answering research question three about district support of iPad implementation. Participants were also asked about trainings throughout the process, even when participants did not bring them up during initial interviews. The documentation included PD plans for staff, goals of the program, and surveys from staff, students, and community members, and was available via district leadership.

**Data Analysis**

The analysis was an ongoing process for this study, because new themes and trends were discovered along the way that could help to explain the phenomenon of teacher practices within the 1:1 iPad schools (Rallis & Rossman, 2012). Transcribing the interviews allowed for a complete review of the transcripts and for the researcher to become familiar with the data. Themes emerged from this first data set. Categorization and identifying patterns and themes, using different colored highlighters to emphasize significant quotations from the transcriptions, was part of the coding process. The strategy of categorizing was used to identify similarities and differences with the data (Rossman & Rallis, 2012; Charmaz, 2000; Glaser & Strauss, 1967). This open coding process organized the text of transcripts with single words (Auerbach & Silverstein, 2003; Merriam, 2009). The single words depended on what themes emerged to find units of meaning that have seemed important to the study. An example of this was when all participants interviewed made statements about student excitement, engagement, or fun repeatedly. Additionally, engagement was a reoccurring word brought up on the SRP, as well as observed in the classroom.
Matching Data Sources with Research Questions

The study set out to establish the connection between the data sources and the research questions. Data was collected to address the research questions through interviews, observations, field notes, Self-Reported Protocols, and district documents.

1) How do teachers in a high school experience school-wide iPad implementation with relation to their teacher practices?

Research Question 1 was examined using the data from teacher interviews to determine how teachers described the 1:1 implementation in regard to their teacher practices. The research question addressed the teacher description of the 1:1 iPad program to gain insight on how teachers perceived the program. To get a variety of experiences, participants were from different content areas.

2) According to participants, what aspects of teaching change due to the 1:1 iPad program (Technology, Pedagogy, Content Knowledge, Lesson Planning, Teacher Collaboration, Assessment, etc.)?

Research question two was answered through teacher interviews, observations, and document analysis. The question helped determine conceptualizations by the participants about the iPad program and its design elements. This question focused on what aspect design elements existed and how they may have changed teacher practices, such as classroom management, student engagement, lesson planning, etc. Document analysis was utilized because teachers may not have fully conceptualized the holistic approach of a 1:1 program and its design elements.
3) How do teachers in a high school experience school-wide iPad implementation with relation to organizational characteristics the district provided, such as technology training, professional development, technology support, proper controls/settings, teacher collaboration, etc.?

Research Question three was examined using the data from teacher interviews, observations, and document analysis to determine what design elements during the 1:1 implementation were present and which elements were missing. Document analysis consisted of using school documents/artifacts in regard to PD implementation, teacher training, and implementation cycle/schedules. District agendas, manuals, and information shared with board members were considered as data sources. The documents served as further basis of discussion in interviews according to themes (Maxwell, 2012). This question was designed to help identify the sorts of things school districts should do during an implementation process to produce positive teacher change for future 1:1 iPad programs. The alignment of research questions and data sources can be found in a concise table with Table 3.2. It was adapted (Maxwell, 2013) to fit the needs of the study. The matrix was created for readers to determine the importance of the research question, along with sources and methods.
Table 3.2. Perceived Changes in Teacher Practices within a 1:1 iPad School (Maxwell, 2013)

<table>
<thead>
<tr>
<th>Research Questions</th>
<th>Why do we need to know this?</th>
<th>Sampling decisions: Where do we find this information?</th>
<th>Data collection methods—What kind of data answer these questions?</th>
<th>Whom do we contact for access?</th>
<th>Data Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. How do teachers in a high school experience school-wide iPad implementation with relation to their teacher practices?</td>
<td>Schools are using 1:1 iPad programs to raise student achievement. Therefore, it is important to understand teacher perceptions on these processes.</td>
<td>High school teachers.</td>
<td>Interviews, school artifacts.</td>
<td>High school teachers.</td>
<td>Audio recording, transcription, coding, on-going analysis.</td>
</tr>
<tr>
<td>2. According to participants, what aspects of teaching change due to the 1:1 iPad program (Technology, Pedagogy, Content Knowledge, Lesson Planning, Teacher Collaboration, Assessment, etc.)?</td>
<td>Schools are using the popular method of 1:1 iPad programs. We know the importance of teacher practices in regard to student achievement among other important variables in education. Therefore, it is important to understand what about the iPad programs</td>
<td>High school teachers.</td>
<td>Interviews, school artifacts, and observations.</td>
<td>School administration and teachers.</td>
<td>Audio recording, transcription, coding, on-going analysis.</td>
</tr>
</tbody>
</table>
Establishing Trustworthiness

The credibility, validity, and dependability of qualitative research depended on objectivity and transparency. A process of verification was necessary for establishing objectivity and trustworthiness in this qualitative research (Creswell, 2013; Wertz, 2005). The verification processes for this study included member-checks of interview transcripts and artifacts. The study utilized researcher reflection as well as seeking input from

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**Table 3.2 (continued)**

<table>
<thead>
<tr>
<th>3. How do teachers in a high school experience school-wide iPad implementation with relation to organizational characteristics the district provided (technology training, professional development, technology support, proper controls/settings, teacher collaboration, etc.) need to be changed or added?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Many schools rush into a 1:1 program and end up unprepared to implement a strong program. It is important to hear from teachers and administrators on what needs to be added or changed from a variety of schools who have a 1:1 iPad Program.</td>
</tr>
<tr>
<td>High school teachers, observations.</td>
</tr>
<tr>
<td>School administration and teachers.</td>
</tr>
<tr>
<td>Audio recording, transcription, coding, ongoing analysis.</td>
</tr>
</tbody>
</table>
professional learning networks, committee members, and the dissertation chair.

Committee members are respected as experts in the areas of education, technology, and more specifically, TPACK. Therefore, credibility was addressed through crosschecking data among different sources. The verbatim transcription of individual interviews with verification techniques also ensured credibility.

Validity was established through beneficial relationships built with participants. Participants were reminded during interviews that the interest was in learning more about their experiences to support the field of education. To deal with bias, the study had ongoing extensive reflection through interviews, artifact collection, and data analysis from multiple viewpoints (Maxwell, 2012; Rossman & Rallis, 2012). The multiple viewpoints include the data that was collected from interviews, observations, SRPs, and document analysis. Multiple vantage points helped clear any bias there may have been.

This study is not intended to be generalizable. However, internal generalizability could extend research results and conclusions in any future study of similar high schools. The high school represented is a 1:1 iPad school situated in the Midwest, but the type of school, based mainly on location, can provide additional information to readers as identified as a suburb school district. The intent of the study was to provide rich description and insights for policy makers and possible stakeholders of all schools (Maxwell, 2012). An audit trail was provided with thick descriptions to describe how data is collected and coded and how decisions were made. This would allow others to apply some of the research in similar contexts (Maxwell, 2012).
Ethical Considerations

Due to the nature of the study, confidentiality was important in this research. All data was carefully collected and stored in a secure location. Hard copies were in a locked filing cabinet, while electronic files were password-protected. Pseudonyms for the school and teachers were used to protect the identity of research participants. The participation in the study was voluntary, and “gatekeeper” permission was gained by the school district (Maxwell, 2012), which required school board approval. An approval letter was obtained from the Gertrude School Board to complete the research in the district. Participants signed a letter of informed consent (Appendix C) that outlined the potential risks for participants.

Summary

This chapter addressed the methods and procedures used to investigate the perceived changes in teacher practices within the 1:1 iPad schools. The study also answers what themes or design elements from the 1:1 iPad implementations were present, what changes are necessary, and what was absent from 1:1 program. This study stems from social constructivism to gain meaning from lived experiences of the teachers on their perceived teacher practices. This research utilized qualitative research methods. Data sources included interviews, observations, and school artifacts. There was an extensive and ongoing process to analyze the data. The chapter also included establishing trustworthiness and ethical concerns of the proposed research. Chapter four presents research findings.
CHAPTER 4: RESULTS

The primary aim of this study was to understand the meaning of school teachers’ experiences in the 1:1 school with an emphasis on the perception of teacher practices after the implementation. The other purpose of the study was to identify potential themes for successful implementation or suggestions for improvement. In this chapter, the three research questions are addressed with supporting evidence, including quotations, feedback, and collective trends from the participants and observations.

Research Questions

The following primary research questions guided this study:

1) How do teachers in a high school experience school-wide iPad implementation with relation to their teacher practices?

2) According to participants, what aspects of teaching change due to the 1:1 iPad program (Technology, Pedagogy, Content Knowledge, Lesson Planning, Teacher Collaboration, Assessment, etc.)?

3) How do teachers in a high school experience school-wide iPad implementation with relation to organizational characteristics the district provided, such as technology training, professional development, technology support, proper controls/settings, teacher collaboration, etc.?

Findings

Four distinct themes emerged from the research data. The major themes identified from the results of this study included:

1. Teachers were able to formatively assess with greater ease with the 1:1 iPad Program.
2. Teachers were able to be more efficient and saw improvements in their lesson planning with the 1:1 iPad Program.

3. Student motivation and engagement increased with the 1:1 iPad Program.

4. There were changes in teacher practices with the 1:1 iPad Program.

Themes one through four answered the first research question: How do teachers in a high school experience school-wide iPad implementation with relation to their teacher practices? More specifically, theme four addressed the second research question: what aspect of their teaching changes in relation to TPACK. The third research question; how do teachers in a high school experience school-wide iPad implementation with relation to organizational characteristics the district provided such as technology training, professional development, technology support, proper controls/settings, teacher collaboration. was answered through documents and explained by teachers during interviews. However, there was not enough evidence to discuss it as a theme in the study. It is discussed in the additional findings section. This question was harder to triangulate because the researcher was not present at trainings and professional development.

Additionally, teacher collaboration was more difficult to observe frequently, which means that there was not as much data to comment upon it there was for some of the other themes.

**Theme 1: Formative Assessment and Grading Practices**

The participants reported being able to formatively assess students with greater ease due to the iPad. All of the participants reported this ability during the interview. This information was also shared numerous times without prompting or questions about grading. Bailey mentioned,
I use Moodle for handouts, and then I use online tools for formative assessment. This is something that I can do immediately to determine what students know and what I need to reteach. This may be one of the biggest game-changers for me and my teaching practices.

During lesson observations with Bailey, the use of Kahoot was frequently observed. Kahoot is an online gamification platform for schools with an educational focus as a which can be used as a form of informal assessment. Kahoot was done as review prior to the start of projects. The students would receive a review of material in a fun and engaging way, while giving the teacher important information on what her students knew. Bailey would give more scaffolding and attention to those students who scored lower on the Kahoot game. This informal formative assessment would not be as easily obtained if the 1:1 technology were not present. During a classroom visit, Bailey was asked about her ability to track student progress and how to quickly provide them with their learning needs. Bailey said, “I am able to get much more immediate feedback on actual student learning and deal with it quicker. I did this before the 1:1 iPads came to our school, but it was more work and not as immediate.”

Sammy said she is able to monitor student progress in real time and use the data to give feedback and make teaching adjustments. She added, “Sometimes the teaching adjustments come to a small group, individually, or even the whole group.” The iPad allows her to give real-time feedback right away.

Sammy mentions, It becomes a lot less about the ‘grade,’ and more about what the students know and are learning. It has greatly helped me facilitate student learning. This shows a
shift in my own teacher pedagogy of best practices in helping students master standards and showing competency.

During lesson observations with Sammy, this type of formative assessment was observed firsthand. On one occasion, she asked students to research sample nutritional facts comparing and contrasting different fast food options. A few students were struggling figuring out the conversions and finding the correct websites. She asked the class numerous times if anyone was having problems with conversions and websites and none raised their hands. A few students completed the assignment, or so they thought, and turned it in on the Showbie App. The Showbie App allows teachers to have classroom folders where students submit classwork to their teachers. The app also allows teachers to annotate on the assignment submissions. When Sammy became aware that a few students had not mastered the concept after annotating on student work through Showbie, she went around the room asking follow-up questions to her students.

Molly brought up the assessment piece during the interviews as well without a question prompting about assessment. She noted,

I can look back on what a student did and because they missed points on their rubric, I am able to diagnose what the student is struggling with. You could have done this before with saving all the papers, but it would be more difficult. This was not a practice I engaged in regularly prior to the 1:1 implementation.

During lesson observations with Molly, she was checking in with students through commenting on papers that were ‘shared’ with her and students via GoogleDocs. She was also going around to different students checking in with them ‘in person.’ Molly was also witnessed going through her GoogleDocs. She has the ability to see all of her
students’ work with every paper they have completed for her along with their rubrics. She is able to identify trends in students’ work with this type of information, and to better assess their individual needs so that she can modify her instruction.

Fallon stated:

The 1:1 iPad program has allowed me a way to get more information on what students know and do not know. Whereas before, I had to rely on what I actually saw in class. I am sure I missed out on a lot of subtle cues and actual learning, or non-learning. It allows me more chances as a teacher, even when I am not on top of my game. I can see what the students know through the feedback I am receiving from the iPads. But now, I know what students are learning and here is exactly what they have learned and exactly what they need to work on.

In the classroom, Fallon was having students submit conjugated verbs and other translations to her from their devices. These students had to submit something quickly and in real time without the help of their peers. Fallon had students submit conjugated verbs quickly through email as a form of informal formative feedback. The activity provided Fallon with information on what every student knew and understood.

All participants talked about the different available apps they could use in their classroom to promote formative assessment. The apps allow teachers to check what the students know independently, and teachers can adjust their instruction based on student need. Participants were able to access and utilize formative assessment frequently with the 1:1 iPads. The increase in formative assessment was affirmed through interviews and observations with the teachers. The 1:1 iPads changed how teachers appropriately use formative assessment to guide their teaching. The technology provides teachers with an
easier format to know what every student knows, and get it quickly and efficiently. This would not have been as feasible prior to 1:1 iPad implementation.

Information was gathered from the interviews, observations, and self-reported protocols (SRP). The SRP helped understand how the technology “fit” with the instructional strategies the participants were attempting. The SRP was collected, and identified that the devices would allow teachers to get student data on what the students know, or be used for formative assessment. Participants reported through the SRPs that they can find commonalities of what the students did not learn through the first wave of instruction, and how they could potentially change their instruction or pedagogy in order that all students understand key concepts. The technology helps them represent the information in multiple ways when teaching and be able to adapt and be a reflective teacher (Schon, 1990).

Participants credit the iPad with gathering data in real time. “In terms of collecting assessment data, I think that is where technology can be really helpful to teachers,” said Molly. This means teachers are able to focus on student learning.

**Theme 2: Teacher Lesson Plan Improvement**

Interviewees also discussed various ways their lesson planning improved due to access of the iPads. All of these were evident, aside from teacher collaboration, during teacher observations. The reporting through SRPs also indicated an improved sense of lesson planning. Participants represented the student learning goals in their own words and explained their content goals in addition to the 21st century skills students should construct through the lesson. The theme of improved teacher lesson planning is described below in three parts: a) teacher collaboration, b) efficiency, and c) gaining resources and
differentiation. The three categories were the most common under the umbrella of improved lesson planning.

**Teacher collaboration**

All of the participants in the study mentioned improvement in or enjoyment of teacher collaboration due to the 1:1 iPads without the topic being prompted in the questions. The 1:1 program opened avenues for teacher collaboration with teachers being more comfortable helping each other, asking for advice, and sharing ideas. Molly stated,

It is so natural to ask teachers questions about the technology and what works well for them. The 1:1 iPads provide a platform for teachers to discuss and ask each other questions. It is fairly new for most of us, and with new and improved apps coming out daily, it is always fresh. I would say the technology makes it ok to talk about our practices.

Molly added,

Although teacher collaboration is pushed via our professional development, it is not always embraced by teachers at our school. I know it is considered a best practice to collaborate with other teachers, but it is not always comfortable. I worry sometimes that the other teacher does not want to share, or wastes their time, or that I am incompetent as a teacher reaching out to them. However, the technology is an easy bridge to questions and collaboration.

Many teachers are not willing to ask for help from their peers because of the negative connotation they feel it may bring (Friend, 2000). However, talking about iPads is an easy lead-in for teachers and breaks the ice on for additional conversation about teaching practices, pedagogy, and deeper learning conversations.
“I like to hear what other teachers are doing with different apps,” said Bailey. When answering a question about what trainings she participated in by Gertrude, Fallon mentioned, “I talk to other teachers too. I have been working with them and asking them. I learned about apps and ways other teachers are using the iPads as tools in the classroom.” Sammy responded to the question about trainings done by the district, that “A lot of it [training] is just talking between co-workers…randomly and not set up and formal, but just informal conversation. I would say this type of training has helped tremendously. Possibly more than what the district has provided because it is exactly what I need at that very time.”

This theme of teacher collaboration was harder to assess during the observations. However, there was a link through the interview responses and through the limited interactions that were observed. Twice, during observations, there were teachers visiting in the hallways about something they just learned they could do with the iPads. Additionally, a teacher (not in the current study), came into Bailey’s classroom asking her about an app called Verso. He was not sure how to utilize it, but felt comfortable asking for help from her, a peer. Bailey said this is pretty typical of the staff since the iPad initiative. She said collaboration happened in pockets prior to the implementation, but more and more teachers are feeling comfortable now.

The teacher collaboration was purposeful and natural. Observations of teachers supporting one another with simple fixes on questions or concerns. Additionally, teachers were working together on meaningful content presentation, pedagogy, classroom management (especially in regards with technology), and strategies for successful technology integration.
Fallon stated, “I feel like a better teacher with the openness that the iPads have allowed here. I now feel comfortable approaching nearly every teacher in the building with a technology or classroom problem.” Bailey mentioned she did not feel that openness until the iPads came to the building, “I can not say it was the iPads alone, but things certainly changed after the initiative started. I feel confident reaching out to my peers about anything now.”

Sammy had this to say about teacher collaboration and how teachers can do a better job at collaborating. “I am a veteran teacher, but I have never felt like I could not learn from anyone. Young teachers always have an eagerness and passion that I need from time to time to ignite my own passion for teaching. Additionally, the technology learning curve is much greater for myself than for new teachers.”

The participants were asked about collaboration and participants talked about how they can seek out collaboration themselves. Some collaboration trends developed through participant responses. Most participants brought up individual or personal steps for effective collaboration; including, but not limited to, building relationships and trust, asking questions, sharing frustrations, and observing a lot of teachers. Sammy responded to the question about what worked and did not work, “I love that I can share with my teaching mates about frustrations, but also share in small wins within the classroom. There has been a lot of teacher trust built up with this technology undertaking.” Fallon talked about opening her classroom up for her peers to see her teach, “I know the content is different, but it is important that we are get into each other’s classrooms and see what effective teaching looks like.” The technology piece made it a new “normal” to ask questions and collaborate because most of the teachers had the same questions. Molly
said, “Sometimes in teaching, you can play along and figure it out as you go. However, the new technology piece made this nearly impossible. There were roadblocks, and it forced our hands to ask each other questions.” Participants talked about how teacher collaboration became part of their culture for most of the school.

Participants in this study were asked open-ended questions about when their district implemented iPads, but nothing specifically about teachers working together or collaborating. Nevertheless, half of the teachers brought up how they collaborate as a result of the iPads. Molly said, “That has kind of been a huge part, teachers have been able to share their experience with it. And not just do something in an isolated classroom and not tell people, but share with each other what went right and what went wrong.” Sammy brought up the topic twice during her interview, saying, “I learned about apps and ways other teachers are using the iPads as tools in the classroom…and they are able to help me. It is great to find someone and dig deeper.” Molly shared, “Now more of what it is, is our PLCs are talking and sharing with each other.” Teachers who work toward a common goal, share, and grow professionally together develop better practices.

**Efficiency**

The participants in the study brought up how the device allows them to be more efficient as teachers. When asked about her attitude towards technology in education, Molly said,

The devices can really help in learning, but it can also help make the teacher more efficient. I am able to put more effort into the things that are important and less effort into the things that are tedious.” Fallon had this to say about her planning procedures: “The efficiency of it [iPad] is fantastic. I am able to put
documents into one place on Dropbox for all of my classes, and students upload them there.

When explaining her experiences with the iPads in relation to her teacher practices, Sammy answered, “It is a much more efficient way to do things… I do think it made us more effective.” When Bailey was asked what interests her about using technology in the classroom, she responded, “Definitely being able to do things easier. Being able to be more organized.”

As noted earlier with formative assessment, Bailey mentioned the “iPad gives me a very efficient and very effective way to collect meaningful information on what my students are learning.” A follow-up question was asked about how the technology has made her more efficient as a teacher, and she said it has helped her with planning. “It has helped me planning lessons with a whole new outlook and freedom, because I do not have to take as much time grading and determining what students know. I have that student information instantaneously during class.” Observations indicated this was a common practice and it was visible during Bailey’s lesson planning regularly. She utilized Kahoot weekly to engage students in game-like scenarios, but the gaming review also gave her an idea of what students knew about the current lesson. She was observed attending more to students who scored poorly on the Kahoot game. She was asked how she goes about seeking students during independent work time, and she responded, “It is a craft, but I know what the students know and do not know through the Kahoot activity, so I can provide additional assistance when we get to a portion of the class where they are missing that learning.”
Molly brought up that “there were some things that were helpful and some things that were more efficient.” Efficiency can allow some teachers to improve their teacher practices when they are able to focus on teaching and learning. She stated, “It made me more effective because I have been able to get more useful information from the students,” During one of the observations, Molly brought a student over to her desk and pulled up on the iPad the last four papers the student had turned in.” She showed the student the common errors that were present in all of his papers. Molly was asked a follow-up question about that student conversation and she said,

Unfortunately, there is not an app, yet, that identifies the common errors for each student. However, in reading the last paper he had turned in, I remembered that he had made this mistake twice before in previous papers. With Showbie, I was able to go directly to his turn-in folder and find his past four works and see the common mistake.

She also brought up how hard-copy papers can easily become missing after handing them back to student. The technology allows her and the student to have constant access to the paper and corrections over a long period of time. Teachers are realizing that technology is allowing them to obtain an organizational element to their teaching that provides longitudinal information on student growth.

When asked about how her TPACK has changed, Sammy talked about how the device seems to fit seamlessly into her pedagogy and content knowledge. “I love to adapt and explore and create projects. The iPads allow me to enhance the learning experience and I do not have to worry about what is available for the students as they have a powerful tool in their hands.” Teachers still have to spend the time gathering multiple
sources of information and different reading levels for students. The time commitment is less, and the results are much more individualized that what teachers were previously able to provide. because of what is available with the iPads. Sammy was asked a follow-up question about how it has made her more efficient and she said, “My efficiency has changed in how I can plan and allow them (students) to have self-discovery. Overall, I would say it is my planning and how it fits so well into my content area and the ‘how’ I teach.” Teachers’ planning time is important, as it is at a premium, therefore, if a school can protect that time by providing supportive technology, then it can be money well spent. If the technology was not present, Sammy, in this situation, would be spending a lot of planning time to organize learning activities and reserving technology because she wants to teach with a constructivist framework. The observations in Sammy’s room showcased a welcoming atmosphere where students were given a voice and all were working together. Sammy has an innovative teaching approach with creative projects and authentic learning. The group was working on some PSAs on health-related topics on a couple of the observation days. She agreed that the technology has complemented her practices. Teachers can be more efficient streamlining the student searches to fit their teaching style rather than spending additional time collecting sources of information.

Fallon talked about the learning curve initially with the technology. She also stated, “there is always a learning curve as it is ever changing. However, the devices changed my efficiency in regard to grading. The Showbie app allows me to easily organize and access [in arrangement] what students turn in and check it off once I have graded it.” The iPads have given students teacher feedback at a much faster rate with teacher comments and grades. During observations in Fallon’s classroom, students
received feedback immediately when they sent her answers in translations. Additionally, she was having students record themselves talking about what they did during the weekend in past and present tense. She then sent them video feedback in Spanish. The devices meant she could have students work on those videos and turn them in when completed, and she could immediately send her responses. She could be efficient and use the time in between videos to grade and determine what her students know.

Participants were asked about why efficiency is important for teachers. The participants, without hesitation, brought up stress levels when asked about the importance of efficiency. Participants brought up how teachers are leaving the profession with the high stress levels. They all, in some way, brought up how important time is for teachers and how it is what they are missing the most and need the most. “The fact that the technology can help us in the slightest bit be more efficient is of utmost importance,” said Fallon. Timing and efficiency allow teachers to stay committed to their job. “The fact that I can integrate my grading and planning while at school, means more time for my family while I’m home,” added Bailey. Sammy stated, “Time is a constant that we can not change, and if we can ‘buy back’ some of that time in how efficient we are as teachers, [it] means better learning outcomes for our students.” Molly brought up a content area-specific concern regarding efficiency: “Efficiency is important, extremely important, as an English teacher with all the papers I am to review and give feedback to students, so the devices with Showbie allow me to give them [students’] papers back with comments in an efficient manner.
Gaining Resources and Differentiation

The participants claimed the iPad program gave them additional resources they did not have before to assist them in providing differentiation for their students. In response to a question about what she likes about the iPads, Molly said, “The students have a lot of information at their fingertips, and access to a broad range of resources, which they did not have in the past or at least as easily.” The participants also brought up how the iPads level the playing field for students in terms of differentiation and providing access.

Molly brought up how the 1:1 program helped teacher practices by helping her be intentional on how to interact in different ways for each student. She added, “I think we were able to gain more resources and tools to impact student interest and learning ability at higher levels. It is cool to show [students] what is available and the expanse of information.” Molly showed how this differentiation can look in practice during observations. She was working with students individually, in groups, and also providing voice recordings for students at her computer. Additionally, Molly was observed providing written feedback with corrections via Showbie. She determined what is the best mode of correction for students and is able to adjust accordingly. Molly was absent on one of the pre-arranged dates for a classroom observation. However, she had a substitute and the directions were to log-in and watch a recording video from Molly. Molly had a sick child on that day and she gave directions on the video as if she were there. When asked about how absences have changed with the iPad program, Molly said, “certainly there are endless opportunities for ‘outside’ learning when someone is absent; whether they are sick or if we have a snow day!” This “outside” learning can provide schools with
resources for a blending learning model or a flipped classroom. A differentiated learning environment to ensure all students are learning, and have videos to enhance or review the teaching if they did not learn it the first time.

Sammy brought up how she is able to provide different offerings for student activities due to the iPads. She continued to bring up how she is able to adjust her curriculum through the use of iPads because her subject area is ever-changing. “I am changing my curriculum more with what I am able to do with the iPads, whether it is looking up current events, trying new applications. It really made me a better teacher because I am out looking for information I can use to cover what we are discussing in class.” Observations showed her willingness to be flexible and meet the needs of every student. One class period, she had an activity planned around healthy food choices, but a student was not able to calculate fat totals from a restaurant. She determined through the Showbie App on her iPad that other students had the same problem, so she made sure all students were able to calculate fat totals before she moved on to the activity she had planned. Additionally, when Sammy was asked about a creative project she had done during first semester, she said she was not doing it this semester. “I am always adapting what I do to better meet the needs of the students I have currently.” She mentioned this group of students were not as musically gifted as her students first semester, and would have felt uncomfortable performing. However, she said her learning outcomes are still the same, but applied with a more artistic demonstration of their learning. The technology platform allows Sammy flexibility in her lesson planning.

Fallon was intrigued by the versatility of the device and how differentiation can happen. Fallon insisted, “it is interesting to me how different students can use the device
in a variety of ways. It gives them a lot more potential to use the technology for their learning style.” Fallon stated that “my ability to differentiate with the iPad goes up a lot because I can post things on websites and have the organizational details done already for me, so I feel more confident doing differentiation activities if they go to this website, look at this resource, or that resource, so I think that has been very nice.” Fallon utilizes Moodle to share documents and has folders set up on the site where she can put in sources of information in folders that have different reading levels and then have certain student access the correct folder according to their level.

During observations in Fallon’s classroom it was common to see students showing mastery of a standard through different means. Fallon provided what the students needed to learn and show their understanding, but the “how” of what they learned was up to them. “The device helps me feel less stressed, because I know students have what they need [content at their level and production tools] whether it is to record, research, Skype, or whatever “their” learning requires.” The 1:1 iPad initiative has allowed Fallon to be confident in providing differentiation and student ownership during projects. Fallon has examples of different completed assignments that showcase student learning in a strength area for them. Therefore, students can see what mastery learning might look like for a student who does not like to share in front of people, but is comfortable with iMovie. Students in her class can look at multiple examples of the same learning goal, but represent a variety of ways to showcase that. Other examples included a board game [images], newscast, art piece [images], and a Day of the Dead brochure. However, students could choose other options to demonstrate their learning as well.
Bailey talked about the available resources to students at all times including at home. “The iPads level the playing field. Not all kids had an iPad prior to our implementation. Students not having or knowing how to operate an iPad in a technology driven society would put them behind the curve in their future world of work.” Students without a 1:1 initiative would still have an opportunity to operate and maneuver technology in schools. However, the commitment to engage in a 1:1 environment allows students to be more fully ingrained in the intricacies of technology. Bailey confirmed this when she said, “the technology allows students to master their craft and be fully functioning, rather than simply technology literate.” Bailey consistently demonstrated the necessity of having the 1:1 iPad initiative in her class. Nearly every observation, she was having students research information rather than provide it to them through guided instruction or lecture. She said, “I love using the iPads for research, group work, and creative projects.” The students were constantly researching and collaborating and it was evident that students were constantly on the iPads with effective technology use in terms of intersecting TPACK. Students were engaged in rigorous, authentic work (pedagogy) that showed skillful technology interwoven into the content. The interweaving is the enactment of PCK, with technology, demonstrating the middle intersection of TPACK. An example of TPACK would be asking students to research loan rates and vehicle costs, where students had to determine what bank to take out a loan with and determine the costs of vehicle ownership.

Participants’ responses to the interview questions and observations showed they believed their lesson planning improved while in a 1:1 iPad program. They also noted the iPads provided a culture of collaboration as teachers and among students. The devices
also gave the participants the potential, and facilitated their ability, to differentiate for students by using additional sources. A strong point of data came in the sense of efficiency the teachers felt with the devices. This was brought up constantly—not specifically, but in a way, that could be inferred from the teachers’ remarks about the ease of their work and the barriers that no longer constrain them.

**Theme 3: Student Motivation and Engagement**

A change in student motivation and engagement can be an indication of the technology’s use, but student interest could also be connected to the change in teacher practices. Teachers talked about how they have changed their practices due to the availability of the devices, and how, consequently, their students are more engaged/motivated. “I do not know what came first, them being engaged about the technology or the way I teach, but either way it was embraced by all parties,” Fallon added. The iPad seems to have passed the fad stage, and has been shown to be a powerful instrument for learning in authentic ways (Handwerk, 2013). Sammy said this in response to a question about sharing a story of the iPads, “Students love using the iPads. Initially, I thought the engagement would fizzle out, but students like to engage with the technology and we (teachers) are able to do more in how we present learning.”

The completed Self-Reported Protocols (Appendix E) from participants indicated a theme of strong student interest as an influence in lesson design, especially with question six regarding contextual influences. Student interest was identified and had more to do with the content and the “how” the students were going about the information, not necessarily the iPad device. Additionally, the SRPs included participant explanations of
the lessons as it unfolded in the classroom and the device certainly helped address some questions that the students had, but may not have asked.

During observations, Bailey had a positive classroom culture with engaged students. It is hard to determine what came first. Bailey was able to build rapport with students with or without the technology—however the learning activities she did with students during observations indicate her desire to keep them engaged with effective learning practices. One day she was having students work with a team writing and recording a rap, song, or cheer about a W-2 or W-4. The project was engaging and fun. The technology allowed Bailey to utilize this type of learning that was motivating for her students. She explained, when asked about how the iPads have supported her way of teaching, “How well the students are engaged with their hands on the technology allows me to be vulnerable and flexible as a teacher. I believe I can take chances on things that maybe are not “safe” in terms of classroom management.” She mentioned the iPads have helped support her way of teaching, “the iPads give me more engagement opportunities with simulations that are available, as well as creative projects that I am able to plan.” Bailey was asked how and why engagement has changed since the iPad program, and she claims, “Students can experience the information with the iPads, whereas before the students were regurgitating information.” Students creating and involvement can improve learning recall greater than repeating what the teacher has read or taught (Astin, 1999).

Sammy discussed how the technology has enhanced what she does because students have instant buy-in with the technology. “It becomes the craft of the teacher to continue the buzz, already present from the technology, to facilitate the learning of the content knowledge.” She mentioned that the technology allows her “freedom to make
learning more fun and challenging. The student engagement and motivation then continues with how the students are learning.” During observations, it was clear that students had freedom in the class to be on their iPads and utilize the self-discovery available to them through the iPads. During observations, there was frequent use of students searching information during instruction; however, it was always on topic. These questions would typically interrupt class, but it showed that students were interested in the content and engaged with instruction and technology. Sammy was asked how and why engagement has changed since the iPad program, and she claimed, “I am seeing more students helping each other, and that tells me both students are interested in the content. One of the students knows exactly what to do because they are engaged, while the other student is interested enough to seek help from a peer.”

Fallon talked about how technology is present in her students’ daily lives and if she does not use the iPads then she is going to lose their interest quickly. She shared, “Students are engaged with the technology and it is all about tapping into it for effective use.” She mentioned students already feel fairly comfortable on the iPads, but added, “I want to pique student interest and have them use problem-solving skills, as they are not as comfortable doing it [problem-solving with peers] but it definitely keeps their interest.” Observations involved students working on the iPads nearly every observation. One visit, students were engaging in conversation in a foreign language with students on Skype about what they did the past weekend. The students were then asked to change to future tense and call another student for conversation. Students being social with technology seems to be a perfect match for student engagement and motivation. Fallon was asked how and why engagement has changed since the iPad program, and she
claimed, “Student engagement has changed with the iPads because students are locked into what I am saying at the beginning of class and they know they are going to be ‘set free’ to figure out how to solve a problem with the iPads.”

Molly noticed the change in student motivation and engagement after her teaching practices changed. Molly said, “I wanted to ensure students were not on the iPads during times of guided instruction, so I had them close their iPads during that time. I then created projects and assignments for students to complete with the iPads. The students got right to work with the tasks.” Molly quickly realized that she could teach differently as student engagement increased with the technology. She added, “I know that students crave independent work on the iPads and I have since changed how students gain the initial information.” Molly was asked how and why engagement has changed since the iPad program, and she claims, “Students were quite apathetic towards school prior to the iPads, although mostly compliant. I would not say it was a life-changing turn of events, but with high school students any motivation for the (at-times) unmotivated goes a long way.” During observations, the students in Molly’s class were engaged in their work, which was primarily on the iPads. She often shared, approximately 20 times, via her Self-Reported Protocols (SRP), that she desired to have her students reading, writing, listening, and doing with technology.

The observations and participants’ responses to the interview questions, along with their Self-Reported Protocols, indicated that the participants believed that student engagement and motivation were improved with the 1:1 iPad program. It is still unclear whether it was the devices alone, or how the teachers adapted their teaching style. The TPACK model would tell us that the context of having a 1:1 iPad Program could lead to
the development of TPACK. The depth that educators develop their TPACK can be bound by other contextual factors, such as organizational characteristics (as indicated by research question 3) and student characteristics. High levels of student engagement then would allow teachers to develop the knowledge of TPACK and using technology that fits the content and pedagogical style of the teacher. Data was collected via observations, interviews, and SRPs which help establish improved levels of student engagement and motivation when 1:1’s are being used appropriately.

The participants brought up how students always will be engaged with the newest technology. However, the participants talked about how the iPads seemed to provide a newness to teaching and learning. “I believe it leveled the playing field with veteran and beginning teachers because it can be a completely different learning environment”, said Molly. The technology got the students excited, which in turn got teachers excited. Sammy said:

I believe the iPads put students and teachers together learning how to use the devices. Sometimes, more of the students teaching me how to use it. However, the biggest plus was the culture it promoted. I felt free to try things and I knew the devices allowed me to do projects I was not able to do prior. In turn, students continue to be engaged.

Participants in the study recalled their experiences while teaching students with iPads, and brought up student motivation from the open-ended questions. For example, Fallon talked about the opportunities the iPad creates and how students are motivated to learn. She said, “It holds students’ attention and connects to them. It is how they learn now…it helps students retain information and that is the way they like to see it and
interact with the information.” Molly talked about an authentic class project she was able to do with the iPads and the excitement of the students. She said, “I think about authentic uses, it is really cool and they were really into it.”

An added note: a few participants brought up how their classroom management is not necessarily better or worse due to the iPad devices but that it is different. They brought up how the students always had “something” to distract them whether it was doodling with pen and paper, a phone, or their neighbors. A few participants felt that the school was preparing students to become good digital citizens and preparing them for their future in college or in the workplace. Students will be able to use technology in college with few restrictions to social media sites. It is the responsibility of students to learn appropriate times and uses for the devices. This is what Sammy had to say: “I think we need to treat and teach students to be responsible. The filter has gotten better, and we have gotten better at how we manage our classrooms with the technology.”

A powerful testimony came from Sammy, who said, “It [the technology] has rejuvenated me and my teaching career. I would consider leaving the profession if the iPads were removed. It is hard to admit, but at times, I ran through the motions of teaching. I wanted to be better for my students when I saw their excitement.” Student engagement proved to be a motivating factor for teachers to be their best.

**Theme 4: Changes in Teacher Practices**

The main focus of this study was to determine if there were positive teacher practices after a 1:1 iPad implementation. The school being studied was on year four with their iPads in place. The timing of this study may have allowed teachers to change, albeit gradually, and hone their craft. This is important for school districts to consider, as there
is a learning curve or dip, which sometimes may show negatively when iPads are first introduced. However, the interviewees discussed in various ways how their teaching practices improved due to access of the iPads. All of these were evident during teacher observations as well. The theme of improved teacher practices is described below in three parts: a) differentiated instruction, b) constructivist teaching, and c) cooperative learning. The teaching practices identified above are not identified as the only way to reach students, but they have previous research regarding their effectiveness (Totten et al., 1991).

Study participants voiced their changes in their own teaching as positive changes from their previous practices. Sammy brought up the difference in her redesign of lessons. “I have worked hard at making smart, purposeful choices regarding technology usage. I reinforce the pedagogy and then show how the technology can help us get there.” Bailey added, “The great thing about the 1:1 iPads, although it is probably the hardest part, occurs when I let go of the control in the room and give the students ownership.” Fallon concluded,

We use the SAMR model as a district to help identify our technology use. I try to ensure we are, at the very least, achieving the modification level. I think this goes hand in hand with the TPACK model you explained. I try to make sure that we are blending the technology with best practices (pedagogy), and content knowledge. The 1:1 iPad program has allowed me to blend the three successful. The last thing I ever wanted was to use the devices for the sake of ‘using’ technology.
The SAMR model, explained earlier, is a four-level technology integration used by Gertrude. Specifically, participants are intentionally processing how to intertwine and blend their content knowledge, pedagogy, and technology successful.

**Differentiated Instruction**

The iPads have helped with gaining resources and differentiation. The theme of differentiation continued to emerge through observations, interviews, and the self-reported protocols. The emerging theme made it clear that the iPads were a difference maker for the teachers in regard to their ability to differentiate their instruction for all students. Additionally, the theme of differentiation helped showcase how teacher practices changed. The technology was necessary for this differentiation to occur in the way that it did.

Bailey was asked a follow-up question regarding her ability to differentiate, she claimed “I believe it [differentiation] goes hand in hand with the formative assessment piece, but being able to provide differentiation after I know where students are at, makes a world of difference for me.” Bailey was asked why it made such a positive impact on her, and she responded, “I am able to provide differentiation for students that are at different levels of learning with apps, texts, and research. This was available with hard copies or books, but not as accessible.” In observations, she was consistently providing different means of instruction to her students to reach them at their individual levels. Bailey demonstrated the ability to teach all students, especially the students who required a lot of assistance. The Self-Reported Protocol (SRP) always addressed the specific learning needs of her lower achieving students with a plan for their success included. She
added, “Sadly, I did not always have a plan for some of these students with the additional energy required, but the iPads have made this super simple and attainable.”

Sammy echoed a similar message: “I feel like I have changed my teacher practices in terms of helping all students, especially those who do not get it on the first try. Additionally, I know there are different formats to reach those students in the first place with the iPads.” Sammy reported how the technology “fits” with her instructional practices while filling out her SRPs. Observations showcased this “fit,” as she was able to integrate technology seamlessly into her classes. Observations showed that learning can take on different forms and students can show what they learned in different forms. There was a lot of voice and choice for students in demonstrating what they know; even though the material was the same, the students could display it in their own way to meet their strengths. Some examples of the voice and choice included, brochures, PSA, raps/songs, and commercials. One of the students made a website for his project.

Molly explained how the device helped her students realize that the material could be differentiated. “I started guiding students to websites and texts that were better for their current level. However, the students quickly figured out what they needed in order to learn the content. Some watched videos, while other students read texts that fit their needs better even without my assistance or guidance.” The culture of inquiry during observations in Molly’s classroom showed the students working at their own pace, in their own context, and with their own modes of content. Molly brought up the different learning needs throughout her SRPs. She addressed how the iPad really helps with differentiation:
I do not have to worry as much about being able to provide a lower text for a student and the correlating stigma that comes along with it. I used to give students a lower text, and all the students in the room could identify that the book was at lower level.

During an observation, students were all reading about Shakespeare. All of the students were reading different texts, but all of the students participated in the discussion because they all had something to add.

Fallon brought up some new information regarding differentiation. “The iPads helped with the class culture. It is less about managing, but students are able to catch up with the class. This makes learning accessible for all students.” During observations, the class culture was positive and all students were supported through Fallon and the class. Evidence of this positive classroom culture included Fallon (and students?) being inclusive of students with learning disabilities, and students talking to one another respectfully. Additionally, everyone was demonstrating respect to their teacher and peers when anyone was addressing the group, everyone else was attentive and stopped conversations. All students seemed to have the tools to be successful and if they did not, they were comfortable asking for help. Fallon was asked a follow-up question in regards to her classroom culture, to which she replied:

Students reach out to each other and myself when they are lost because they know they can look it up with their iPad to get back on track. Prior to the devices, I think a lot of those students would just let it go and get stuck behind.

Fallon reported, with her SRPs, that the iPads really account for the learning needs and preferences of all of her students. She later said, “I do not have to worry about
seeking out separate information with the students, who are traditionally lower, because there are texts that match levels and preferences for all students.”

Participants in the study recalled their experiences while teaching students with iPads, and shared how their lesson planning improved because of their ability to differentiate and perform formative assessment. For example, Sammy talked about how her teaching improved and how she is able to provide extension with the iPads. She said, “I was actually able to get them to engage in higher level thinking activities that I had not planned for that day because of the resource of the iPad.”

**Constructivist Teaching**

Constructivist teaching shifts learners from receivers to active participants of their learning. Constructivism is a theory in which people learn through experiences, or by constructing their own knowledge. Students use previous information, resources, and experiences when encountering something new to problem solve (Woolfolk, 2007). In the classroom, the constructivist view of learning can point towards a number of different teaching practices, which were both observed during classroom observations and discussed in participant interviews.

For example, Bailey was quick to note how the learners changed in her classroom due to her different approach. “The iPad has structured my teaching as it reframed low achievers to different learners. This teaching requires different mindsets, so traditionally low-achieving students find a niche that they did not expect. Similarly, traditionally high achieving students have to work a little harder or put more effort in.” Bailey also explained how she innovates her teaching: “I really try to develop scenarios in which students have to solve a problem using their pre-existing knowledge that applies the
content knowledge and the technology. The technology has changed my pedagogy in how I have students own their learning with creating and collaborating.” Information on teaching practices were based on observations with no previous knowledge about former practices. Bailey was comfortable and seemed to address numerous standards and 21st century competencies. For example, students had to analyze the pros & cons of credit cards and loans, which is a content standard, and captures a 21st Century Competency goal of Financial Literacy.

She would address her teaching style as Project Based Learning during her SRP notes. This project approach was observable during classroom visits and students took active roles in their learning, rather than passive roles. An example of one of the Project Based Learning activities observed included students going through an on-line simulation for two months that helped students understand what it is like to pay bills including credit card bills, installment loans and utilities. Student realized the pros and cons of utilizing credit by receiving rewards if they keep their credit card balance low and pay their loans on time, and suffer the consequences if they go over the limit on their credit card or miss a payment on a loan.

Sammy noted a shift in the amount of time she spent with direct instruction:

“I definitely taught more with lectures prior to having the iPads. I always thought it was so important to teach my content. Now I can see, the content I was ‘going over’ was simply Google-able information. I’m finding a nice rhythm with making projects and allowing students to figure out that content information in interesting ways and I have found that students remember it much more with the meaningful projects they create.”
Sammy did not specify that she was teaching with project based learning (PBL) with her SRP or interview questions, but there were components of PBL in her classroom. Sammy still utilized direct instruction or lecture, but for a short amount of time before the students dug deep with a project. Observations of project based learning was very common during the observations in Sammy’s classroom. An example of this would be an activity she called “Health in a Hurry”. In this activity, students were “shopping” and filling their opponent’s carts with the ten most unhealthy foods they could find while giving justification on why the foods were unhealthy. They did this with healthy foods as well. Another activity worth noting was a debate about which drug is more dangerous, Marijuana or Alcohol.

Fallon, in response to the question about redesigning her lessons after iPad rollout, reported she was more likely to have students produce work with the iPads: “My content area has always been one in which students are translating and speaking, but I have adapted my teaching so students are turning in tangible outcomes that are evidential of student learning.” During observations, there were many products, presentations, but mainly performances in the room. For example, the students would often be in conversation with one another in the foreign language or recording themselves via the iPad. Fallon, in her SRPs, noted that she wanted to provide “voice and choice” for her students with projects that they create or generate. This meant more freedom for Fallon to plan activities and projects that, according to her, “align with the standards.” Fallon also shared, “foreign language used to be known for its memorization, but the iPads have allowed me to teach in a way that utilizes higher-order thinking along with application of speaking and listening in a foreign language.” For example, one activity had students
complete a business meeting/transaction that blended cultural norms, currency, language, and problem-solving. This means a great deal for teachers to reach higher-order thinking that meshes well with technology and their content area.

Molly praised the iPads for helping her to share her guided instruction with the class. “I am able to share videos, tutorials, and information with the students through videos that students can access easily on their own with the iPads. The students can go back to those videos at any time or watch them slowly if they need additional time.” During observations, the class runs independently and students can access information and then begin with creating/refining a story or paper, similar to a flipped classroom. A flipped classroom is a blended learning instructional strategy that reverses the traditional learning environment by delivering instructional content, often online, outside of the classroom (Bergmann and Sams, 2012). Students then complete practice activities, typically considered homework, under the guidance of the teacher. Molly also explained how she can do more creative projects with the iPads than before she had them: “students are able to do research, and have the know-how to create a project that represents what they read, and the power to support what they learned through text evidence.” One of the classroom visits, she had students trying to locate songs that represent each major plot point in a Shakespeare story with text evidence on the “why.”

One teacher, Sammy, actually said, “it would be tough for me to teach in a system that did not have an iPad technology piece. I would be frustrated by that, so from that standpoint, I am glad I teach at a school that has iPads because I see the value of some kind of device.” These benefits and others may be good reasons for teachers to continue to advocate for 1:1 programs.
The observations and interviews helped determine the theme of constructive teaching practices, although it was not verbalized, was prevalent among all participants. This means a great deal for teachers, but especially for students, who get to have a relevant, rich, and creative learning environment. The iPads have allowed this type of environment to be more present with teachers planning these learning experiences more often. Perhaps teachers have used this type of pedagogy and practices since before the 1:1 initiative, but it is more predominant with the iPads. Teachers know students have the device, and they do not have to sign up for a computer lab that everyone might be vying to obtain.

Cooperative Learning

Learning is social, and all individuals learn first on the social level, between people, then on an individual level (Vygotsky, 1978). Therefore, social interaction and productive group work (PGW) tailor to student learning more than lecturing. Study participants mentioned they noticed a change in their teacher practices, in regard to their group work, with the implementation of the iPads. The participants talked about how their idea of group work has changed, with the iPads, to be more learner-centered and social with roles and responsibilities for each group member.

While describing a group activity, Bailey brought up that each person had a specific job within the group, such as “group leader, secretary, editor, and imagining.” This helped considerably with making sure all group participants were engaged and doing the work. The roles help keep students working together toward a common goal when they share a Google doc folder and can give each other feedback on their separate tasks.
She talked about how the iPads help with group collaboration and creative projects: “it is less of me standing in front of the classroom and more of the kids being able to get together in groups and research and create things on their iPad. The iPads make it easier for that shift and students working together.” During observations, it was evident that students were constantly working together on projects with all group members pulling their weight.

Molly talked about how the devices have helped her with peer review and collaboration. “I have the students do a lot of peer-editing and reviews on papers and when students are working on group projects. I have the ability to see all past edits and ‘participation’ of group members on Google Docs, so I know if group members are working effectively. Before the iPads, I had to trust that students were providing good feedback and reflection, or I had to print hard copies and go through them that way.”

During observations in Molly’s classrooms, there were a lot of students giving peer reviews via Google, but also saw students turning their computers toward each other and providing feedback in person as well. The iPads may have helped students develop this skill and mindset for their own individual growth.

Sammy wanted to create an environment where students are learning from her and from their peers. When asked if she had to redesign any lessons after the iPads came out, she responded,

I’m doing a lot more with students learning with each other and through classroom discussions as that lends well to my content area. However, not everyone wants to talk about my content out loud, so the iPads have helped facilitate the discussion more. It makes for a “safe” classroom.
The observations in Sammy’s classroom demonstrated her thoughts on this topic. The class has topics that students do not always feel comfortable or confident talking about, especially, if they are with peers they do not have trusting relationships with. Sammy was having a classroom dialogue about drug use and abuse. Uniquely, the level of participation was not as high verbally, but some students were more reserved in person, but then Sammy turned the conversation to an iPad app called Verso. This app only allows others to see posts if they first post themselves. This was an effective practice so students could not simply nod and agree or copy their peer next to them. They had to post something meaningful in order to see what their peers wrote. Additionally, they could respond to their peers for a quality dialogue. Thus, the iPads have provided a system for cooperative learning that was not considered prior to the technology being present.

Fallon also noted the effectiveness of Google docs in understanding what each group member has done, “I think group projects, previously, were overrun with one student who did all of the work. Now, however, I believe students are working more closely to what their expectation is because they know we can see what they have contributed.” Fallon was asked if she believes she uses more cooperative learning now with the iPads, and she said, “I definitely use cooperative learning more, and thankfully, because I believe foreign language is something that should be taught with students speaking, writing, and listening together.” Classroom observations showed that Fallon believes in cooperative learning and providing opportunities for students to communicate with each other through and with the iPads. Although Skype participants are not there in
person, the technology allows students to communicate and cooperate together in their learning. Student collaboration was a common component during observations.

**Research Questions**

**Question 1**

The data collected provided a potential answer for the first research question: How do teachers in a high school experience school-wide iPad implementation with relation to their teacher practices? Participants in this study identified that the 1:1 iPad Program improved their teacher practices.

Teacher collaboration was an area participants agreed improved greatly with the 1:1 iPad program. The technology created a safe zone for teachers to approach one another to improve their teaching practices. Participants discussed how it could be intimidating to ask their peers questions about teaching. However, the iPads created a common culture in which it was acceptable to ask questions. Teacher collaboration can be a powerful component of affecting teaching and learning. A 1:1 iPad program doesn’t set out to improve teacher collaboration within schools, but this unintended result could improve teachers’ efficacy. The unintended result creates a culture of caring and support that could benefit schools in the case of losing teachers who don’t feel supported. Bailey said, “I feel like a better teacher with the openness that the iPads have allowed here. I now feel comfortable approaching nearly every teacher in the building with a technology or classroom problem.” Bailey also mentioned she did not feel that openness until the iPads came to the building, “I cannot say it was the iPads alone, but things certainly changed after the initiative started. I feel confident reaching out to my peers about anything now.”
Teacher practices improved through Gertrude’s 1:1 iPad Program. All of the participants discussed how their teaching practices have improved with less lecture based instruction. Participants talked about the benefit of students seeking information on their own with a sense of self-discovery. Students were less dependent on the teacher to impart the information to them, and became active participants in their own learning. Nearly every observation, Bailey was having students research information rather than provide it to them through guided instruction or lecture. She said, “I love using the iPads for research, group work, and creative projects.” 1:1 iPad programs have the potential to change teacher practices positively.

Question 2

Participants in this study identified that the 1:1 iPad Program improved their teacher practices and how their knowledge and application of TPACK improved overall. The participants were asked what areas of TPACK have changed for each of them and how they would rate their own relationships between technology, pedagogy, and content.

Figure 4.1. The components of TPACK framework (Mishra and Koehler, 2009).
There are seven components of the TPACK. The first is content knowledge (CK), which is a teacher’s knowledge about the subject matter they teach. Pedagogical Knowledge (PK) is teacher’s knowledge about the practices or methods of teaching and learning. Technology Knowledge (TK) is teacher’s ability of thinking and working with technology, tools, and resources. PCK is tailoring pedagogy in order to teach in ways that honor both the content and the students at hand. PCK captures the essence of what teachers do to make this happen. Technological Content Knowledge (TCK) is the manner in which subject matter can be changed by the application of technology. Technological Pedagogical Knowledge (TPK) is how teaching and learning can change when technology is used. Lastly, Technological Pedagogical Content Knowledge is meaningful skilled teaching with technology (Koehler & Mishra, 2009).

According to participants, there were aspects of improvement in their teaching due to the 1:1 iPad program, which helps answer the second research question: What aspects of teaching change due to the 1:1 iPad program (Technology, Pedagogy, Content Knowledge, Lesson Planning, Teacher Collaboration, Assessment, etc.)? Participants confirmed that teacher practices in the areas of lesson planning, differentiating, and formative assessment improved. TPACK is the basis of effective teaching with technology present, and participants in the study shared that the iPads provided conditions conducive to promote positive changes in their teacher practices including that of their TPACK.

All of the participants explained how they noted the differences in growth and how they believe each of the areas have been strengthened by the technology. “I believe
it has made my content area more available and interesting, and conversely the relationship of how my teaching has changed due to the iPads. I am able to reach my students with the right content in engaging ways with the technology blending as one piece.” explained Sammy. Bailey replied, “I believe I am providing students with meaningful content in an intriguing way with technology, as these things cannot be disjointed or it will not be as effective teaching and learning. I think the iPads have strengthened my teaching.” Molly talked about 21st Century Skills and potentially another concept for the TPACK framework:

“I have to think that content area, technology, and pedagogy need to be understood as concepts together, and not in isolation. Additionally, I believe 21st Century Skills could be added to this, as we want our students to know content, but also how to work together and think critically. That being said, I believe iPads lend themselves well to using these all together and strengthening my teaching.”

Fallon concluded, “I would say these areas have improved and the devices do seem to fit how I want to teach, how the district wants me to each, and what is considered best practices.”

The following themes were established from the participants regarding TPACK:

- Teachers felt that areas of their TPACK have changed and are primarily in the TPACK component range of truly meaningful and deeply skilled teaching with technology.
- Teachers reported this TPACK range was considerably lower before the iPads, and about the same level during their first two years within the iPad program.
• Teachers reported having improved lesson planning with the iPads.

Teachers reported a change in their teacher practices (less lecture/more PGW) with the iPads. Teachers reported transformations in their teaching with “redefinition” activities—which would have been inconceivable without the technology."

Interviewees discussed in various ways how their teaching practices improved due to access of the iPads. The study participants voiced their changes in their own teaching as positive changes from their previous practices. Most importantly, participants showed another dimension of pedagogy and engagement with the iPads. The most encouraging thing for me was seeing and hearing teachers improving their practices. Molly said,

“I keep looking back to how we view our teaching practices with technology and the SAMR model. I believe the iPads have helped me achieve the redefinition stage often. Therefore, I am able to transform my teaching with creating new tasks that would not be possible without the technology.”

The SAMR model was used as a technology integration model in the Gertrude district. Also noteworthy was observing technology being used for teaching and learning, not for the sake of technology use.

**Question 3**

Lastly, this chapter also presented findings from teacher perceptions regarding school level implications as part of a 1:1 iPad program. Participants included the factors the district did well to prepare, support, and put them at ease during the 1:1 program. The participants in the study helped answer the third research question: How do teachers in a high school experience school-wide iPad implementation with relation to organizational
characteristics the district provided such as technology training, professional
development, technology support, proper controls/settings, teacher collaboration, etc.? The potential factors that came out as trends involved having teacher choice and teacher-led PD and PLC sessions, adequate staffing, and gradual implementation communication. This question is defining what administration, leadership, and other stakeholders can do to best support their teachers with the technology. This lens provides insight for schools that are considering 1:1 iPad initiatives and what characteristics are important for their teachers’ development. Study participants’ responses and observations regarding what Gertrude High School administration communicated while implementing the iPads is discussed, along with what protocols were enacted to best serve the teachers. As a side note, these teachers had to recount their lived experience with the iPad roll-out, which was four years ago.

A theme developed from all participants that communicated Gertrude’s commitment to the program with the iPad Headquarters and full-time staffing. The personnel theme came from all participants, but not consistently throughout the study. Gertrude administration literally communicated that teachers should feel comfortable implementing the iPads gradually and at their own pace. Teachers reported this communication from administration put them at ease and made them comfortable with the technology and how they went about putting the iPads to use.

Molly talked about the freedom the district provided and replied, “Also the rollout process and expectations were not ultra-demanding at first. It was not like this is what you have to do, this is how you have to use it, they allowed you as a teacher to feel your way through it and figure out what works for your classroom, but at the same point
providing very good training. There has always been that support for gradual use in the classroom whichever way you feel best.” This type of teacher autonomy could potentially indicate that over time, teachers use the devices and improve their practices.

Sammy continued to support the use of peer collaboration and creating teachable moments with students as she said, “Part of that training is telling the teachers and reassuring them that they do not have to know everything and that it is okay to learn things from each other and from students.” She also brought up the topic in another response about the loose expectations for teachers with, “The biggest support that I can see is not pushing it and saying this is what we have to do and this is exactly how you have to use it, but allowing me as the teacher to have the freedom to explore to use technology and then to share that technology.” Sammy made a concerted effort to share how the devices helped with the power of teacher collaboration, which she considered a change in her previous practices.

Fallon said about this about what her school has done to prepare or support her with the 1:1, “The communication of gradual use was important for staff that were more reluctant, but I felt like we have these powerful devices and I want them to be utilized. However, for the majority of the teaching staff, I believe this communication was important.” The idea of being overwhelmed with technology can be disputed, but hearing from administration that it was all right to implement at their own rate helped make teachers feel comfortable in growing while taking steps toward being more fully integrated with technology.

Bailey had the same sentiment when asked about barriers with the 1:1 program:

“Rome was not built in a day, and I feel that I have come a long way in how I
utilize the iPads in the classroom. I think initially, it was figuring out classroom management with them and substitution (according to Substitution, Augmentation, Modification, Redefinition framework), but now I see a real shift in my teaching with redefinition more often than not.”

Bailey also recognized this transformation towards constructivism in the teachers around her, “I think collectively, you are seeing this shift in other teachers’ practices as well.” The power of collective efficacy around the school has built a learning environment that promotes student learning above all, including technology use for the sake of technology use.

The participants shared what the Gertrude School District did well for teaching and learning support while implementing the iPads and for continual assistance throughout the iPad program. The group shared that Gertrude High School committed to the program with adequate staff and an iPad headquarters. Additionally, participants indicated the trainings they received during their PD (professional development) and PLC times (Professional Learning Communities) were helpful. The PLC and PD trainings were provided and taught by the staff personnel with iPad headquarters.

Learning from full-time personnel with dedicated training times has helped Molly. “We have Appy Hour quite a bit at our school, which includes our technology coordinator leading us through a new and upcoming app. PD days, we have some sessions with our tech coordinator to learn how to use various apps. She also sends out emails if she finds something that we could use.”

Sammy complimented the technology support staff by “providing very good training, being there and being open. I know our iPad people have been available if you
had questions. They had very good communication in a timely manner.” Fallon added, “They have given us many ideas on how to use the iPad effectively. I would also say they promoted the use of the iPad.” Molly said, “We are continually having training for teachers throughout the year.” Bailey stated:

We had pre-training for six months and we have a 1:1 full-time person. We have had visits from other schools and just in dialoguing with them, (Wayne*) makes a world of difference to have a person to go to and to ask.

Fallon talked about the support: “We have an iPad headquarters. It is basically anytime we have questions or problems they are there to support us. They are really good at getting back to us immediately.” Sammy said, “The trainings that have always been going on and I am constantly learning a new app to use or a new way to use them in the classroom.” Molly added, “The most helpful thing we have done is hiring staff whose job is to work with the iPads. I just think staffing in general is the biggest thing.” Bailey added, “I think the number one thing was to bring our 1:1 tech support in at the high school…I mean if you are going to put up all that money for the iPads you should at least put in the salary to pay one person to train everyone on how to use them. Just the upfront but also the ongoing support is huge.” It was key to have the staff personnel initially, but also important to have ongoing support for teachers.

Participants’ responses to the interview questions showed that the majority believed that access to iPad Headquarters and the staffing provided participants with comfort and improved their teaching practices. The participants also brought up the

*Wayne is a pseudonym for the full-time iPad staff member at Gertrude.*
trainings during their PLC and PD and how they provided participants with support during the implementation process and throughout the iPad program.

- **iPad Headquarters** with full-time staffing and iPad trainings provided Gertrude teachers with support during and throughout the 1:1 iPad program.

- Building administrators’ communication regarding gradual implementation use provided Gertrude teachers with comfort during and throughout the 1:1 iPad program.

The following comments emerged during the interviews, and document analysis as processes the district could have done better to help support the teachers during the implementation or throughout the iPad program:

- a. Support teachers new to iPads (Teachers who came after initial roll-out).
- b. More time to plan lessons, learn about the device.
- c. Address individual needs of teachers
- d. Upfront communication about games (policy and communication on why to all stakeholders).
- e. Do not focus solely on technology but teaching and learning.

**Additional Findings**

The following paragraphs offer additional evidence beyond the above themes that iPad programs have the potential for improving teaching practices.
**Teacher excitement**

Participants in this study were asked what it was like for them when their district implemented iPads. All participants interviewed talked about their excitement about the iPad program. Some different examples included, “It holds students’ attention and connects to them. It is how they learn now…it helps students retain information and that is the way they like to see it and interact with the information (Fallon) to “It gives them a lot more potential to use the technology for their learning style” (Bailey). Another proclaimed, “I think about authentic uses, it is really cool and they were really into it” (Sammy). Molly reported, “I was excited about the opportunities that were ahead with it.” Teachers who are excited are likely to have higher teacher efficacy levels, which could in turn improve their practices.

**Student accountability and excitement**

Participants in this study were asked open-ended questions about when their district implemented iPads, but nothing specifically about what the device is able to do for students, as it was not the focus of the study. However, students who are more accountable for their work and excited due to the iPads could potentially impact teacher practices. All of the teachers reported student excitement with the iPad program, especially early on. Two teachers reported an improvement in student accountability and organization with the iPad program. Molly told a story about a student when asked about something interesting that happened with the iPads:

[I had a] student who was a bear in the fall, as he was always losing things, and I had to give him new worksheets all the time. In the Spring, I kind of explained
how to use Goodnotes and it was not right away, but his learning was a lot better and his performance was a lot better.

Another participant suggested: “so from an organizational standpoint it has really helped students become more organized. I would have kids who would have their sheets all over in their backpacks, and now it is in just one location” (Bailey).

**Disconfirming Evidence**

Disconfirming evidence was sought to ensure alternative interpretations were considered (Erickson, 1986). Throughout the study, discrepant and confirming cases were attempted to account for that type of evidence. For example, inconsistencies from what was observed versus the participants’ interview questions was sought. There were some inconsistencies in what the participants discussed in regard to what the district provided with professional learning versus what the district documents portrayed. This was discovered in the triangulation of data sources. Participants confirmed that the professional learning did occur, but it had been so long ago they had forgotten. There were some observable inconsistencies in the primary learning objective via observations and what the participant had written on the SRP. However, that learning object was usually achieved during the teacher’s next class observation.

**Summary**

This chapter presented the results from interviews with four Gertrude High School Teachers who taught in a 1:1 iPad program. The findings were presented to help support and provide insight into the themes in which teachers have a lived experience. Teachers are often left out of the equation when schools are deciding to implement a 1:1 program. Gertrude teachers within a 1:1 iPad program are the voices we want to hear as
they have a direct impact on how the devices are used in the classroom.

Chapter five presents a discussion of the results and gives recommendations to Gertrude for future implementations. It also gives recommendations for future research endeavors. The chapter concludes with the recommendations for any school that is considering 1:1 iPad initiatives.
CHAPTER 5: DISCUSSION AND RECOMMENDATIONS

This chapter includes a discussion of the results and gives recommendations for future implementations. It also gives recommendations for future research. Additionally, implications are shared for the following levels: teacher level, school level, and student level. The chapter concludes with the summary of Gertrude’s 1:1 iPad initiative.

The 1:1 iPad program has the potential to improve teacher practices. Based on the feedback and lived experiences described by the participants in this study, the 1:1 iPad Programs promoted positive changes in teacher practices. Themes one, two and four demonstrate areas of teacher practices developing positively.

1. Teachers were able to **formatively assess** with greater ease with the 1:1 iPad Program.

2. Teachers were able to be **more efficient** and saw **improvements in their lesson planning** with the 1:1 iPad Program.

4. There were **changes in teacher practices** with the 1:1 iPad Program.

A teacher who is able to do a formative assessment quickly knows what students know and be able to adapt their teaching to reach all students. Teachers who are able to be more efficient can focus on teaching and learning, thus improving their practice. Teachers, who collaborate find their practices improving with the professional dialogue. Theme three could indicate teachers’ practices improving with more student motivation engagement as a result of the 1:1 iPad program. Theme four indicates there were direct changes in teacher practices. Additionally, teachers with improved lesson planning with the iPads likely have improved teacher practices.
Discussion of Results

Chapter two presented the TPACK framework and how technology, pedagogy, and content are related. This intersection is meshing the concepts in constructive ways for the ideal teacher application. A few positive research results from 1:1 schools included collaboration and productive group work, student motivation, student engagement, lesson planning, student achievement, increase in equity, and student efficacy. The author decided to focus on teacher experience in using technology to teach, and not consider student achievement data.

Research Questions

Question 1: Teacher Implementation and Practices

The data collected helped come to a potential answer for the first research question: How do teachers in a high school experience school-wide iPad implementation with relation to their teacher practices? Participants in this study identified that the 1:1 iPad Program improved their teacher practices and how their knowledge and application of TPACK improved overall. The main findings were an increase in teacher formative assessment, lesson plan improvement, teacher collaboration, and constructivist teaching strategies. A 1:1 program that provided one of the above improvements would be a worthy aspiration, but to have all of those themes present from technology is ambitious. Interestingly enough, all of these items are of high importance with student success (Hattie, 2009). Schools want what is best for students, and it is hard to deny the variety of benefits a 1:1 iPad Program can provide.
The factors discussed for the first research question illustrate the effects of context, a 1:1 iPad program in year four of implementation, and the change in components of change in teacher pedagogy, collaboration, and efficiency.

**Question 2: TPACK Aspects**

According to participants, there were aspects of improvement in their teaching due to the 1:1 iPad program, which helps answer the second research question: What aspects of teaching change due to the 1:1 iPad program (Technology, Pedagogy, Content Knowledge, Lesson Planning, Teacher Collaboration, Assessment, etc.)? Participants confirmed that teacher practices in the areas of lesson planning, differentiating, and formative assessment improved. TPACK is the basis of effective teaching with technology present, and participants in the study shared that the iPads provided conditions conducive to promote positive changes in their teacher practices including that of their TPACK. All of the participants explained how they noted the differences in growth and how they believe each of the TPACK component areas have been strengthened by the 1:1 iPad technology. Students engaged in work that “fits” with a beautiful blend of content, pedagogy, and technology promotes a learning environment where all students have the potential for success.

TPACK was used as a conceptual model for this study. TPACK addresses the complexity, and intersection of teachers’ knowledge of technology, teacher pedagogy, and content knowledge (Mishra & Koehler, 2006). The intersection can be different depending on the context in which it occurs. The focus of this study was on the teacher perceptions of high school teachers regarding their experience with 1:1 iPad programs related to teacher practices. The TPACK framework provided a guide for teachers to
describe how they utilized the technology in the context of a 1:1 iPad program being implemented in their classrooms. All of the findings in this section describe what TPACK looks like in the context of a 1:1 iPad program. The factors discussed for the second research question illustrate the effects of context, a 1:1 iPad program in year four of implementation, and the change in components of the TPACK framework.

Question 3: Organizational Characteristics

The participants in the study helped answer the third research question: How do teachers in a high school experience school-wide iPad implementation with relation to organizational characteristics the district provided such as technology training, professional development, technology support, proper controls/settings, teacher collaboration, etc.? Participants included the factors the district did well to prepare, support, and put them at ease during the 1:1 program. The potential factors that came out as trends involved having teacher choice and teacher-led PD and PLC sessions, adequate staffing, and gradual implementation communication. This investment calls the attention of building leadership and stakeholders who make the final decision to invest in personnel to help support your staff in a 1:1 iPad initiative. This study does not answer questions regarding student populations that are different from Gertrude, however, it could be an opportunity for future research.

Theoretical Implications

Findings in this study carry important theoretical implications for researchers engaged in the work of the TPACK framework, as well as school district officials who wish to develop and implement a successful 1:1 iPad Program. The theoretical contribution of this dissertation to the literature on TPACK and 1:1 school technology is
threefold. This research contributes (1) teacher input of a 1:1 iPad program and organizational characteristics a district can provide to enhance results of a 1:1 iPad Program, (2) more information about TPACK as a framework for successful technology integration, and (3) aspects of a 1:1 iPad Program that have the potential to change teacher practices and provide positive unexpected realities.

**Teacher Input**

This research establishes the classroom teacher as one of the main reasons for success or failure of 1:1 programs. The study contributes a common teacher voice in what a 1:1 iPad program can do for individual teacher practices and on what organizational settings or characteristics a district can provide to enhance the results of a 1:1 iPad Program. This research study provides specificity of a 1:1 iPad program with an in-depth look at teacher practices from the vantage point of teachers.

**TPACK**

From an academic perspective, the meaningful findings presented in this dissertation answer and reaffirm the call for successful technology integration with a TPACK framework. The use of existing TPACK protocol tools, such as the Technology Integration Observation Instrument (TIO), TPACK Interview Protocol (SRP), and some questions from various TPACK tools for the Interview Protocol, developed a comprehensive look at one schools experience with a 1:1 iPad Program. This adds to the research on how teachers view their TPACK levels with the phenomenology single-case study. The TPACK framework was reaffirmed as a successful pursuit of technology integration through this research on the success of the 1:1 iPad Program using a particular case (Gertrude), but within this case are four teachers.
The advancements in a TPACK framework can greatly assist schools looking into successful technology integration. Currently, schools separate the three components and try to develop them individually with their teachers, but schools should have discussions around the interconnectedness of the TPACK components. TPACK framework within professional learning in schools can help develop teacher’s technology integration. Staff that are trained within the TPACK model better understand the intricacies of weaving their pedagogy, content, and technology knowledge to leverage the best learning environment. TPACK can be used as effective technology integration with teacher education programs.

There are a number of models and frameworks that help explain technology integration, two of which are the TPACK framework and the SAMR model. Both models have value and are used widely in schools. The SAMR model focuses on what meaningful technology integration looks like, and the TPACK framework focuses more on the knowledge required to meaningfully integrate technology. The SAMR model can help teachers assess whether or not the technology tool is transforming the task to make the learning experience more meaningful. The TPACK model identifies what teachers need to know in order to understand how to integrate the technology.

Gertrude utilized the SAMR model of technology integration as a guide for their teachers. The SAMR model was designed to help educators evaluate technology use and make small shifts in lesson design to discover new ways for using technology as a tool for learning (Puentedura, 2006). The SAMR model has four categories of technology integration; substitution, augmentation, modification, and redefinition. Substitution is using technology as a direct tool substitute with no functional change. Augmentation is
also a direct tool substitute, with functional improvement. Modification is using technology that allows for significant task redesign. Redefinition allows for creation of new tasks and tasks that were previously inconceivable (Puentedura, 2006). The SAMR model can be used by teachers to assess their own learning of technology and the most productive use for that technology. The TPACK model provides educators with a framework that is useful for understanding technology’s role in the educational process.

1:1 iPad Programs

This study provides an in-depth look at an iPad Program having the potential to change teacher practices. This adds to the literature, as there is not a lot captured about teacher practices with iPads specifically. The study provides information for schools who may consider adding a 1:1 iPad program to improve teaching practices in a building. The results from Gertrude 1:1 iPad program could vary with a 1:1 laptop program, but the study reaffirms past research about 1:1 laptop programs can produce in terms of teacher practices. We now know that an iPad program produces similar results as that of laptop program. This study adds formative assessment to the fold of benefits that a 1:1 program can provide. Other studies of laptop-only technology have not shown informal assessment to be as important..

From a teacher perspective, district officials should realize teachers are one of the most influential factors associated with an iPad program, and they must invest in the human capital of training them. School administration must provide training, time, personnel, and communicate patience in integration. It was something of a surprise that teachers wanted that communication piece about using the devices in time.
Waves of Computer Technology

As noted in Chapter Two, computer technology can be developed for an intended purpose, and then can contribute exponentially more. This movement towards technology use is happening more and more with our digital age and devices being created for multiple purposes. However, the 1:1 iPad programs generally have four goals: 1) Improving academic achievement, 2) increasing equity of access to digital resources, 3) increasing economic competitiveness, and 4) transformation in quality of instruction. All of these aims are worthy end goals. The fourth goal summarizes the potential to change teacher practices in a positive way. However, teacher feedback and collaboration do not fall into one of the four goals. 1:1 iPad Programs continue to raise the standard of excellence in teacher capacity.

This study thus provides support for a 1:1 iPad program potentially providing teacher practice changes in a positive manner. Additionally, the TPACK conceptual framework needs to be a part of professional learning for districts implementing a 1:1 program in place of SAMR or other models that focus on the components individually or simply the technology alone. A 1:1 program can have numerous benefits and often some positive unexpected realities. Table 5.1 is a condensed version of Table 2.1 from Chapter two. The table highlights the unexpected reality of a 1:1 program.

<table>
<thead>
<tr>
<th>Device</th>
<th>Intent</th>
<th>Unexpected Reality</th>
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<tr>
<td>1:1 programs</td>
<td>1) Improving academic achievement, 2) increasing equity of access to digital resources, 3) increasing economic competitiveness, 4) transformation in quality of instruction.</td>
<td>Potential to change teacher practices?</td>
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Implications for the Field

Schools and teacher preparation programs need to facilitate student learning around teaching with technology. First-year or beginning teachers have a steep learning curve as it is (Borman & Dowling, 2008), and teacher preparation programs need to provide learning that assists future teachers or beginning teachers to provide instruction with technology. This training could reduce the attrition of teachers, and potentially improve the rate of teacher turnover.

Chapter one discussed the stakeholders that could benefit from this study. School leaders and school board members are the ones who begin the conversations about starting a building with a 1:1 initiative. As a result of this research, school leaders can see and hear about the positive changes and potential to change teacher practice that a 1:1 iPad program could bring. Parents and voters could seek support and provide information to their communities on the benefits of a 1:1 iPad program with this study if the town is taking it to a vote. Additionally, teachers can get a “in the trenches” viewpoint on how iPads have helped their peers. Teachers could also communicate what organization characteristics their building should adhere to when implementing a 1:1 iPad Program. Maybe most importantly, students who have access to this study could advocate for their own learning and promote a 1:1 iPad program with the potential benefits it could bring.

This research identified goals that Gertrude developed prior to having their 1:1 iPad implementation. In the following section, implications for Gertrude are addressed, but these implications can be applied to other school districts and stakeholders. Most of the goals Gertrude listed, are goals that are similar to other schools’ 1:1 goals.
Student motivation

Ideally, a teacher in a 1:1 iPad program improves his/her teacher practices because of the device, while improving student engagement and motivation. Meanwhile the device alone improves student motivation, which should improve teacher practices as well. Feedback from participants in this study suggested that student motivation was enhanced by the presence and use of iPads. This puts researchers at odds as to what came first—whether it was the change in teacher practices that engaged students or the device that engaged students. However, this research provides evidence that they are all interconnected and influence each other in different ways. TPACK is not looking at concepts in isolation, but rather, how they are connected and the relationships from each. Students’ engagement levels may be influenced by the iPads alone, but this pre-engagement helps teachers teach in ways that only further student engagement and motivation.

Wagner and Compton (2012) are proponents of the idea that school is a game the innovation generation knows they have to play in order to “graduate,” but they do it with as little effort as possible. Thus, student engagement and motivation can be key in teachers getting their all from their students. Student engagement means a great deal for teachers. Teachers are leading students that are more eager to learn. This makes their job more manageable. Teaching is never easy, but it is easier to be one’s best for students who are willing and engaged than if they are unengaged.

Student motivation was a goal for the Gertrude CSD iPad Program (2012) and has proven to have that potential within 1:1 implementation (Bebell & Kay, 2010). All of the participants brought up student motivation or excitement because of Gertrude’s 1:1 iPad
Program. As described in Chapter 4, participants’ feedback supported the research noting that 1:1 programs improved student motivation. Schools around the US are filled with students who seem to be pessimistic towards school, so if a device can influence a student’s perception on his or her education, it can be deemed worthy. It would be interesting to see if 1:1 devices influence student populations that are at risk of dropping out.

Students are not more engaged merely because there is technology present, but they do seem to be engaged due to a change in teacher practices. Teachers are able to do more when their students are optimistic about the learning (De Frondeville, 2009; Snyder, Cheavens, & Sympson, 1997). There were minimal classroom management situations during observations, which could be a result from the engaged work. Participants talked about students being more motivated and engaged with the iPad program.

**Teacher success**

Gertrude CSD (2012) had the goal of improving teaching and learning through the 1:1 iPad program, and 1:1 programs have been shown to have the potential to improve lesson planning and generate a positive change in teacher practices (Greaves et al., 2010; Dawson, Cavanaugh, & Ritxhaupt, 2006; Roman, 2003; Zheng et al., 2016). The evidence strongly suggested that a teacher in a 1:1 iPad program improves his/her lesson planning and achieve teacher success because of the device.

All of the participants shared the belief that they have improved lesson planning because of Gertrude’s 1:1 iPad Program. The participants felt their teaching practices have changed with a more productive group work learning environment rather than lecture-based teaching. The teachers talked about having their students create and
analyze, which are both higher on the new Bloom’s taxonomy (Huitt, 2011). As described in Chapter 4, participants’ feedback supported the research noting 1:1 programs improved lesson planning. Teacher feedback has proven to be a great influence on student learning (Hattie, 2009). Teacher success through this technology could be a valuable weapon in the fight against losing good educators.

The 1:1 iPad program can provide teachers with success and additional support. Teacher success can build and develop teacher efficacy. The 1:1 investment in teaching and learning can support our teachers and mitigate against teacher attrition. The 1:1 iPad program has the power to increase teacher collaboration within the right context, which can also aid in the needs of our teachers as they learn and grow from one another.

**Increase in equity**

Gertrude CSD iPad Program (2012) had a goal of eliminating the digital divide as a part of their 1:1 implementation of iPads. Research suggests that 1:1 programs can increase equity (Penuel, 2003). Participants in the study initiated comments on how the iPads helped increase student equity while teaching with iPads. All of the participants believed there is equitable access with the 1:1 iPad program. The program provides students access to an iPad at all times for research, make-up work, or resources that were not available to all students prior to implementation. Additionally, all of the teachers said they gained resources and tools with the 1:1 iPad program. This includes ways to reach students that may have slipped through the cracks prior to the 1:1 iPad implementation. Participants talked about being able to help these students out who need the most help.
Recommendations for Future Research

Evaluating any educational reform or initiative is difficult because of all the variables in education. Most programs do not occur in isolation of others and the differences in teachers and students each year challenges researchers. Administrators want results quickly from new programs, but it is hard to determine validity and reliability from programs with ever-changing variables. This is no different with 1:1 iPad programs, and sometimes trying to determine the worth of a program is difficult, especially after only a year. However, this research into the lived experiences of teachers in the Gertrude 1:1 program strongly suggests that the program has great potential to impact teacher practices such as collaboration, formative assessment, and more constructivist teaching. Additionally, the Gertrude program was four years in on 1:1 implementation, so it was easier to determine that success. The participants were also able to share what the district did well to help prepare and support them throughout the iPad program.

This study examined Gertrude High School’s (10-12) 1:1 iPad program in regard to teacher practices. Further studies at Gertrude and other schools should account for the many variables that each school year could potentially bring. If Gertrude pursues additional 1:1 programs in other school buildings, it should be noted that different buildings could have different results with younger students and different teachers. The school buildings’ goals and methods could be different as well. However, the methods would likely remain, as the teachers at Gertrude High School confirmed that the
implementation process was fairly effective. The author would recommend Gertrude taking the feedback from the participants for future implementation as well.

This research will continue with 1:1 iPad programs around the United States in order to get equal representation from teachers at schools that are considered 1) urban; 2) rural; and 3) suburban. Additionally, future studies might be able to better identify what factors need to be present at each of the school types throughout the 1:1 iPad program. Future participants could share what factors or processes could have been present in order to better support them. Student perceptions of the 1:1 programs and how they believe the programs influenced teacher practices or their learning would also be of interest.

Participants in this study were all from the same school, but no participant was a beginning (one to five years) teacher. Additionally, all of the participants were female. It may be possible to recruit more balanced samples from the faculty. A diverse population of participants and diverse settings may provide more information about 1:1 iPad Programs and teacher practices. Additionally, different themes could be identified through a more diverse population of participants and settings.

Further studies could look at student achievement data with a 1:1 iPad program versus a five-year average of scores prior to implementing the iPads. However, as mentioned, it is difficult to determine causality. A more valuable account could be different perspectives on teacher practices. Future studies could interview students and administrators on the potential changes in teacher practices. Some teachers’ own accounts of their personal perceived changes in teacher practices may not be fully realized, so it would be beneficial to hear from other stakeholders about how teacher practices have changed.
One-to-one iPad programs are likely to change and evolve in education. iPads could cease to exist. However, Apple® has a history of developing “generations” of its products as needs and the market evolve. Although this study did not evaluate the various types of 1:1 initiatives, it could provide information to support any 1:1 program having the potential to change teacher practices. The author’s interest in the iPads was due to their ease of use and questions regarding their ability to create products. As noted above, further research needs to be conducted that investigates the link between teacher practices and the different demographics of 1:1 iPad programs.

Stakeholder Implications

Teacher

This study investigated Gertrude teachers’ perceptions of how the 1:1 iPad Program changed teacher practices. The participants’ meaningful feedback should give current school leaders confidence and leverage to consider 1:1 programs. Obviously, these devices empower students, but it is important to consider the potential investment these programs can be for our teachers.

The following themes were established from the participants:

- Teachers were excited about the 1:1 iPad program and teaching (reigniting their career passion).
- Teachers felt they were more efficient with the 1:1 iPad program.
- Teachers reported an increase in formative assessment.
- Teachers talked about how they collaborate with the 1:1 iPad program.

The author considers communication about teacher collaboration very important as it improves every human experience (Carnegie, 1986). Additionally, a teacher who is
excited about an iPad program can improve satisfaction in his/her job duties. This should improve teacher efficacy levels and perhaps improve attrition rates of teachers. Most people desire more time in their day in order to complete tasks or to-do lists. Teachers often feel the need to take their ‘work’ home. Teachers may question their choice of profession as stress starts to mount. Attrition rates are near 8% in the US, with even higher percentages for Title 1 Schools (Sutcher, Darling-Hammond, & Carver, 2016). Preventing teacher attrition so that all children receive high-quality instruction is essential in a 21st-century economy for the success of individuals, as well as for society as a whole. If a 1:1 iPad program can reignite teachers’ passion, make their job more efficient, and provide them additional resources, then the positives outweigh potential negatives.

Participants in this study were asked open-ended questions about when their district implemented iPads, but nothing specifically about teachers working together or collaborating. Half of the teachers brought up how they collaborate as a result of the iPads. Teachers who work toward a common goal, share, and grow professionally together will develop better practices (Ronfeldt et al., 2015).

Teacher collaboration is imperative for teachers and students. The aim for teacher collaboration should be to keep great teachers in the field, and working at bettering teacher practices. Teachers need to know they do not have to do it all by themselves. There is help out there and all parties benefit from teachers who collaborate. It is easy to get caught in the trap of walking into a classroom, shutting the door, and teaching “your” students.

However, we know an effective teacher is someone who wants to grow in the profession with and through collaboration. For example, one study found that “Students
showed higher gains in math achievement when their teachers reported frequent conversations with their peers that centered on math, and when there was a feeling of trust or closeness among teachers” (p. 33, Leana & Pil, 2006). In other words, collaboration was a significant predictor of student achievement gains above and beyond teacher experience or ability in the classroom.

Participants using the technology with the 1:1 program for four years has opened up a space where teachers feel comfortable collaborating. Context has been described as a central component to the TPACK framework (Koehler & Mishra, 2008). The context of the program and of teachers working together displayed beautiful moments when technology helped teachers formatively assess, collaborate, and change their practices in the moment. Teachers were adapting their pedagogy and content in ways that honored the students in the moment and were using technology to assist their instruction.

**Student**

This study investigated Gertrude teachers’ perceptions on how the 1:1 iPad Program changed teacher practices, but numerous participants brought up student-level factors observed from the teacher’s perspective. These themes were developed with the open-ended questions that had little to do with students. The participants’ meaningful feedback should give current school leaders confidence and leverage to consider 1:1 programs with concrete evidence from teacher perceptions.

The following themes were established from the participants:

- Teachers reported student excitement with the iPad program.
- Teachers reported an improvement in student accountability and organization with the iPad program.
• Teachers reported having real world experiences for students.

• Teachers felt students had better retention with the iPad program.

Teacher practices should improve with an increase in student excitement, accountability and organization, and retention (ability to retain information). Student retention of information could arise from the use of iPads—or from changes in teacher practices toward a more constructivist approach (Prince, 2004). This means our students are able to collaborate and think critically, which allows them to synthesize seemingly disconnected pieces of information in new ways (Pink, 2005). These benefits and others may be good reasons for teachers to continue to advocate for 1:1 programs because there is more student ownership.

TPACK and teacher practices

This study investigated Gertrude teachers’ perceptions about how the 1:1 iPad Program changed their teacher practices. The participants’ meaningful feedback should give current school leaders further resources to consider when thinking about 1:1 programs and the importance of teacher practices.

Teacher practices were shown to improve with all of these themes. The participants explained how the technology can be used to build on their existing knowledge of content or pedagogy. Additionally, the teachers may not be aware of how much their teacher practices have developed and improved as they have made gradual improvements over the years with the iPad program. The potential growth for teachers can benefit schools because they are the most important variable in the classroom that affects student learning (Marzano, 2003).
Our school systems can still be “stuck” in a factory model of education, where we try to reach the masses and push students through what we expect of them. Sometimes this model forces us to rush the individual student, while teaching becomes more about getting through the content rather than the individual learning of each student. A 1:1 iPad initiative certainly will not cure all educational woes, nor is that its intent. However, observations and interviews repeatedly yielded date from teachers that 1:1 iPad implementation helped them focus on student learning and helped them with formative assessment. This is one theme that emerged and can be gleaned from such a program.

In Chapter 2, themes were identified regarding technology in education and “unexpected results.” The different waves of education displayed the emergence of technology has changed education dramatically—but often because a device has produced something other than what it had been developed to produce. Gertrude CSD (2012) identified seven goals they included in their 1:1 Initiative vision: 1) Enhancing student engagement; 2) Enhancing teaching and learning; 3) Becoming good digital citizens; 4) Using digital tools for academic and personal learning; 5) Differentiating instruction; 6) Eliminating the digital divide; 7) Embracing 21st Century learners with Iowa Core 21st Century Technology Skills: create, collaborate and communicate. These are common goals for schools implementing a 1:1 program. The importance of formative assessment can be inferred as a theme related to the goal of improving teaching and learning. The impact of iPads has been abundant in this particular category of teaching and learning.
Future Implementation

Gertrude High School committed to certain protocols for their 1:1 iPad implementation. Some of the themes were established to better support the teachers at the high school. Participants in the study discussed what Gertrude did well to help support them throughout the program. Additionally, participants shared what Gertrude could have done better to help support them during the iPad program. An added note: this information can be relevant to all districts and schools considering 1:1 iPad programs.

Gertrude CSD was interested in feedback that was comprehensive, so all themes were presented from participants regardless of the amount of times topics were present. This information is also of value for any district who is considering a 1:1 program. The following comments came out during the interviews as positive implementation factors:

- Continue PD sessions (Teacher-led and teacher choice).
- Provide iPad headquarters and staffing.
- Provide teachers with device prior to roll-out (future implementations).
- Semester roll-out (Devices given to students in January 2013).
- App Consistency (using the same apps in all classes).
- Communicate gradual implementation use from administration.
- Communicate via email about new apps.
- Moodle site assistance (website to help teachers).
- Pilot Program (Teachers were able to pilot iPads the year prior).
- Commitment and Organization.
Summary

This chapter included findings from the study, outlined stakeholder implications, and made some recommendations for future research as well as recommendations for further implementation within the Gertrude Community School District. Furthering this study for a more diverse population and getting detailed accounts from teachers and administrators regarding the implementation of 1:1 iPad Programs with specific attention to teacher practices will promote and improve 1:1 initiatives.

This study concluded that Gertrude’s 1:1 iPad program at the high school seemed to promote positive changes in teacher practices. Participants’ overwhelming response was that teacher practices increased overall with constructivist approaches, lesson planning, formative assessment, and collaboration. The teachers in the study were able to clearly identify and describe the benefits of having the iPad in their classroom with implications for teachers, students, teacher practices, and school/organizational benefits. The teachers reported overall that they felt better as teachers because of the device and program.

This study fills a void in the research regarding 1:1 iPad initiatives and practices. This is only the start of a pattern of comprehensive studies that could examine the potential of 1:1 programs to empower teachers to improve their teacher practices. Collections of studies are needed in the area of retaining teachers with the growing attrition rate of American Teachers. America cannot afford not to invest in our teachers. Teachers are more willing to work hard when they feel respected and appreciated, but, most importantly, supported through technology.
REFERENCES

AEA 267. (2013, October 14). State 1to1 list: Public. Retrieved from
https://docs.google.com/spreadsheet/pub?key=0AuAggYj7wskedE5heDRGNzNnRGVDdXpuVFBxaEJhcVE&single=true&gid=0&output=html


Bergmann, J., & Sams, A. (2012). *Flip your classroom: reach every student in every class every day*. Eugene: ISTE.


Hofer, Mark J.; Grandgenett, Neal; Harris, Judi; and Swan, Kathy, "Testing a TPACK-Based Technology Integration Observation Rubric" (2011). Book Chapters. 10. http://publish.wm.edu/bookchapters/10


Maughan, S., Teeman, D. and Wilson, R. (2012). What Leads to Positive Change in Teaching Practice (NFER Research Programme: Developing the Education


www.hippasus.com/rrpweblog/.../SAMRandTPCK_AnIntroduction.pdf


http://baywood.metapress.com/link.asp?id=972t6qv475615511


APPENDIX A: IRB APPROVAL

Institutional Review Board
Office for Responsible Research
Vice President for Research
1138 Pearson Hall
Ames, Iowa 50011-2207
515-294-5566
FAX 515-294-4107

IOWA STATE UNIVERSITY
OF SCIENCE AND TECHNOLOGY

Date: 6/17/2014
To: Eric Shafer
805 SE 12th St
Grimes, IA 50111

CC: Dr. Joanne Marshall
N229D Lagomarcino

Dr. Jan Beatty
N131 Lagomarcino Hall

From: Office for Responsible Research

Title: A Qualitative Study on Perception of 1:1 iPad Programs Regarding Teacher Efficacy Levels

IRB ID: 14-301

Study Review Date: 6/18/2014

The project referenced above has been declared exempt from the requirements of the human subject protections regulations as described in 45 CFR 46.101(b) because it meets the following federal requirements for exemption:

- (2) Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey or interview procedures with adults or observation of public behavior where
  - Information obtained is recorded in such a manner that human subjects cannot be identified directly or through identifiers linked to the subjects; or
  - Any disclosure of the human subjects’ responses outside the research could not reasonably place the subject at risk of criminal or civil liability or be damaging to their financial standing, employability, or reputation.

The determination of exemption means that:

- You do not need to submit an application for annual continuing review.
- You must carry out the research as described in the IRB application. Review by IRB staff is required prior to implementing modifications that may change the exempt status of the research. In general, review is required for any modifications to the research procedures (e.g., method of data collection, nature or scope of information to be collected, changes in confidentiality measures, etc.), modifications that result in the inclusion of participants from vulnerable populations, and/or any change that may increase the risk or discomfort to participants. Changes to key personnel must also be approved. The purpose of review is to determine if the project still meets the federal criteria for exemption.

Non-exempt research is subject to many regulatory requirements that must be addressed prior to implementation of the study. Conducting non-exempt research without IRB review and approval may constitute non-compliance with federal regulations and/or academic misconduct according to ISU policy.

Detailed information about requirements for submission of modifications can be found on the Exempt Study Modification Form. A Personnel Change Form may be submitted when the only modification involves changes in study staff. If it is determined that exemption is no longer warranted, then an Application for Approval of Research Involving Humans Form will need to be submitted and approved before proceeding with data collection.

Please note that you must submit all research involving human participants for review. Only the IRB or designees may make the determination of exemption, even if you conduct a study in the future that is exactly like this study.

Please be aware that approval from other entities may also be needed. For example, access to data from private records (e.g., student, medical, or employment records, etc.) that are protected by FERPA, HIPAA, or other confidentiality policies requires permission from the holders of those records. Similarly, for research conducted in institutions other than ISU (e.g., schools, other colleges or universities, medical facilities, companies, etc.), investigators must obtain permission from the institution(s) as required by their policies. An IRB determination of exemption in no way implies or guarantees that
APPENDIX B: TEACHER CONTACT

To High School Teachers:

My name is Eric Shafer, and I am a teacher at the Johnston 8/9 Middle School. Currently, I am in the process of writing my dissertation at Iowa State University. My driving research question explores whether or not technology (iPads) has a perceived impact on teacher practices. Your assistance would help me gain valuable information from teachers at the high school level.

Through a one-hour phone interview, classroom observations, pre-observation forms, I will be gathering information on your experiences within a 1:1 iPad program. I am interested in how you view yourself as a teacher when the students have the devices.

Please be aware that participation is voluntary. You can end participation at any point. No information will collect identifying data to link information to you.

Thank you for taking the time to read and think about this survey. This will greatly assist my research efforts; it is my hope that a small group of teachers choose to participate and we can dig deep. If you have any questions about this letter or the research project in general, please feel free to email me at eric.shafer@johnston.k12.ia.us or call me at (515) 480-0131. I am happy to answer any of your questions. I would like start setting up the individual interviews so please contact me through phone or email to set up a time that is most convenient for you.

Sincerely,
Eric Shafer

We can also use www.doodle.com to find a specific day that works to set up a meeting.

Together Everybody Accomplishes More
APPENDIX C: INFORMED CONSENT

Teacher Practices
INFORMED CONSENT FORM for RESEARCH Study of 1:1 iPad Programs on teacher perceptions of their practices.

Principal Investigator: Eric Shafer (eric.shafer@johnston.k12.ia.us) I am conducting a research study to hear the lived experiences of teachers within 1:1 iPad programs in regards to their teacher practices.

INFORMATION: In this study, you will be asked to participate in an hour-long interview with questions regarding practices, 1:1 implementation, and implementation processes.

RISKS: No foreseeable risks or discomforts are expected from your participation in this study. Interview data will be summarized and no data will be identifiable by your name. In addition, I will provide participants with transcriptions from interviews to check accuracy.

BENEFITS: Findings from this study will be used to identify the potential benefits and advantages of technology in the classroom, as well as the importance of teacher practices. By identifying best practices, supportive materials, professional development activities, and tools that can be developed to further support teaching and learning via the use of a 1:1 iPad Program.

CONFIDENTIALITY: The information in the study records will be kept strictly confidential. Interview data will be stored securely in password-protected electronic documents. No reference will be made in oral or written reports, which could link you to the study. School districts and individual participants will use pseudonyms.

CONTACT: If you have questions at any time about the study or the procedures, you may contact the ISU Compliance and Ethics Hotline through an online report or by calling 515-294-7119. Reports may be anonymously submitted. If you feel you have not been treated according to the descriptions in this form, or your rights as a participant in research have been violated during the course of this project, you may contact Dr. Joanne Marshall at (515)-229-7900.

PARTICIPATION: Your participation in this study is voluntary; you may decline to participate without penalty. If you decide to participate, you may withdraw from the study at any time without penalty and without loss of benefits to which you are otherwise entitled. If you withdraw from the study before data collection is completed your data will destroyed at your request.
APPENDIX D: TEACHER INTERVIEW PROTOCOL

Interview Protocol

Date/Time:
Place
Interviewee:

Interview Protocol (IP) (This will occur at least once each participant)

1. How many years of teaching do you have and in what areas have you taught?

2. When your district implemented iPads, what was that like for you?

3. Could you tell me about your preparation when you were in the process of integrating iPads?
   a. What preparation helped you the most? Why?

4. Could you tell me about your planning procedures when you were in the process of integrating iPads?
   a. What planning helped you the most? Why?

5. How often do you use iPads in your lessons?

6. How have you used iPads to teach your subject?

7. Did you need to redesign your lessons after you decided to use iPads?

8. What did you like about using iPads in your classroom?

9. How have iPads supported your way of teaching?

10. How would you describe your attitude toward instructional technology in regard to its role in education as an instructional tool?

11. What worked and did not work using iPads in your instruction?
    a. How were the adjustments made?
    b. How did you know that it worked and/or did not work?

12. How or in what ways have you participated in training that targets the use of instructional technology by your school?

13. What knowledge has helped you improve the use of iPads in teaching and learning?

14. What skills have helped you improve the use of iPads in teaching and learning?

14a. Tell me a story about using the iPads in your classroom.
    a. What particular situation stands out in your experience?
15. What areas of your TPACK (The TPACK framework looks at the relationships between technology, pedagogy, and content) have changed and how?
   a. Technological knowledge? Knowledge about certain ways of thinking about, and working with technology, tools and resources.
   b. Pedagogical knowledge? Teachers’ deep knowledge about the processes and practices or methods of teaching and learning.
   c. Content knowledge? “Teachers’ knowledge about the subject matter to be learned or taught.
   d. Technological Pedagogical Knowledge? “An understanding of how teaching and learning can change when particular technologies are used in particular ways. This includes knowing the pedagogical affordances and constraints of a range of technological tools as they relate to disciplinarily and developmentally appropriate pedagogical designs and strategies” (Koehler & Mishra, 2009).
   e. Pedagogical Content Knowledge? “Consistent with and similar to Shulman’s idea of knowledge of pedagogy that is applicable to the teaching of specific content. Central to Shulman’s conceptualization of PCK is the notion of the transformation of the subject matter for teaching. Specifically, according to Shulman (1986), this transformation occurs as the teacher interprets the subject matter, finds multiple ways to represent it, and adapts and tailors the instructional materials to alternative conceptions and students’ prior knowledge. PCK covers the core business of teaching, learning, curriculum, assessment and reporting, such as the conditions that promote learning and the links among curriculum, assessment, and pedagogy” (Koehler & Mishra, 2009).
   f. Technological Content Knowledge? “An understanding of the manner in which technology and content influence and constrain one another. Teachers need to master more than the subject matter they teach; they must also have a deep understanding of the manner in which the subject matter (or the kinds of representations that can be constructed) can be changed by the application of particular technologies. Teachers need to understand which specific technologies are best suited for addressing subject-matter learning in their domains and how the content dictates or perhaps even changes the technology—or vice versa” (Koehler & Mishra, 2009).
   • g. Technological Pedagogical Content Knowledge? Underlying truly meaningful and deeply skilled teaching with technology, TPACK is different from knowledge of all three concepts individually. Instead, TPACK is the basis of effective teaching with technology, requiring an understanding of the representation of concepts using technologies; pedagogical techniques that use technologies in constructive ways to teach content; knowledge of what makes concepts difficult or easy to learn and how technology can help redress some of the problems that students face; knowledge of students’ prior knowledge and theories of epistemology; and knowledge of how technologies can be used to build on existing knowledge to develop new epistemologies or strengthen old ones” (Koehler & Mishra, 2009).
h. Or perhaps student engagement, lesson planning, etc.) Students were more active participants with the iPads. And/or your ability to lesson plan improved knowing you had the device.

16. What interests you about using technology in the classroom?

17. Describe what your school has done to prepare you or support you with the 1:1 iPad implementation?

18. How do you integrate the students' use of iPads in your lesson delivery?

19. How have you experienced support in using iPads in the classroom?
   Support (defined): any assistance from building or district personnel to assist in implementing the iPads in your classroom. This could be individual, group, or professional development assistance.

20. How have you experienced barriers in using iPads in the classroom?

21. When you first started with this 1:1 iPad implementation how do you perceive that you were supported by the district or building?
   a. What types of opportunities for learning about iPads have you been presented with?
   b. What types of opportunities for learning about educational technology have you been presented with?
   b. How have these opportunities been presented (lecture, hands-on, video)
   c. How frequent are the opportunities?
   d. Have these opportunities been mandatory or voluntary?
   e. Can you describe something that you learned from one of the trainings that you implemented in the classroom?
   f. Can you describe something that affected your teaching and engaged students in their learning?
   f. How could the learning opportunities be made better?
   g. In an ideal situation, how do you feel you would best learn how to integrate iPads into your teaching practice?

22. What more can you tell me about your experiences with iPads in relation to your teacher practices?
APPENDIX E: SELF-REPORTED PROTOCOL

TPACK Interview Protocol* (SRP or Self-Reported Protocol)

(Teacher will self-report this form to me prior to observation with follow-up questions occurring via email).

LESSON DESCRIPTION:

1) Describe the content and/or process topic(s) for the lesson.

2) Describe the student learning goals/objectives addressed in the lesson. (These will not necessarily be state or national standards. Participants should describe these in their own words.

3) Describe your students (e.g. grade level, and specific learning needs/preferences).

4) Walk me through the lesson/project as it unfolds in the classroom.

5) What educational technologies (digital and non-digital) did you use and how did you and/or your students use them?

6) Describe any contextual information (e.g. access to a computer lab, materials and resources available; particular departmental/school-wide initiatives) that influenced the design or implementation of the lesson/project.

TPACK-SPECIFIC QUESTIONS:

7) How and why do the particular technologies used in this lesson/project “fit” the content/process goals?

8) How and why do the particular technologies used in this lesson/project “fit” the instructional strategies you used?

9) How and why do the learning goals, instructional strategies, and technologies used all fit together in this lesson/project?
Appendix F: TECHNOLOGY INTEGRATION OBSERVATION INSTRUMENT (TIO)

Technology Integration Observation Instrument

Observer ___________________________ Teacher ___________________________ Date ___________________________
Grade Level(s) __________ Subject Area(s) ___________________________
Primary Learning Goals ___________________________

Directions:
We have tried to key the components of this instrument to different aspects of teachers’ knowledge for technology integration. Please note, however, that the instrument is not designed to assess this knowledge directly. It is designed to focus upon the use of technology integration knowledge in observable teaching. Please record the key curriculum topics addressed, instructional strategies/learning activities observed, and digital and non-digital technologies used by the teacher and/or students in the lesson.

<table>
<thead>
<tr>
<th>Curriculum Topic</th>
<th>Key Instructional Strategies/Learning Activities</th>
<th>Digital &amp; Non-Digital Technologies</th>
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What, if anything, do you know about influences upon what you have observed in this lesson? Examples might include students’ learning needs, preferences, and challenges; access to technologies; cultural, language and/or socioeconomic factors.
<table>
<thead>
<tr>
<th>Instructional Use</th>
<th>4</th>
<th>3</th>
<th>2</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Using technologies effectively for instruction)</td>
<td>Instructional use of technologies is maximally effective in the observed lesson.</td>
<td>Instructional use of technologies is effective in the observed lesson.</td>
<td>Instructional use of technologies is minimally effective in the observed lesson.</td>
<td>Instructional use of technologies is ineffective in the observed lesson.</td>
</tr>
<tr>
<td>Technology Logistics</td>
<td>Teachers and/or students operate technologies very well in the observed lesson.</td>
<td>Teachers and/or students operate technologies well in the observed lesson.</td>
<td>Teachers and/or students operate technologies adequately in the observed lesson.</td>
<td>Teachers and/or students operate technologies inadequately in the observed lesson.</td>
</tr>
</tbody>
</table>

Comments:

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