A CASE STUDY OF A ONE-TO-ONE INITIATIVE AND IMPACT ON STUDENT ACHIEVEMENT AND EDUCATIONAL PRACTICES

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A CASE STUDY OF A ONE-TO-ONE INITIATIVE AND IMPACT ON STUDENT ACHIEVEMENT AND EDUCATIONAL PRACTICES

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A CASE STUDY OF A ONE-TO-ONE INITIATIVE AND IMPACT ON STUDENT ACHIEVEMENT AND EDUCATIONAL PRACTICES

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Presented to
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By

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Table of Contents

Acknowledgements iv

List of Tables vii

Abstract ix

Definition of Terms x

Chapter I 1

Introduction 1

Problem Statement 2

Rationale for the Study and / or Purpose for the Study 3

Research Questions 4

Limitations/Delimitations 5

Chapter II 6

Review of Related Literature 6

History of Technology in Education 6

Emergence of One-to-One in Education 8

Growth of Technology 11

Pedagogical Shift 17

Professional Development 22

Best Practices in Technology Integration 29

Summary of Literature Review 35

Chapter III 37

Research Design and Methodology 37

Participants 37

Selection/Sampling 37

Mixed Research Design 37
Instrumentation 39
Data Analysis 41
Methodology 42
Historical Change Audit Data 42
Professional Development 47
Implementation Launch 48
Supplemental Resources 49
Methods Summary 51
Chapter IV 53
Analysis of the Data 53
Student Achievement Results – Descriptive Statistics 53
Student Achievement Results – Inferential Statistics 57
Teaching Pedagogy Data 68
Professional Development 70
Random Teacher Interviews 72
Summary of Results 89
Chapter V 93
Conclusions and Recommendations 93
Summary - History of Research of One-to-One 93
Overview of Study 94
Teacher Perceptions of Impact of One-to-One 96
Pedagogy 98
Professional Development 99
Summary 100
Conclusions 101

Recommendations 107
References 111
Appendices 125
Appendix A – Informed Consent form used for prior Change Audit 125
Appendix B – Informed Consent form used for Random Teacher Interviews 126
Appendix C – Informed Consent form used to Conduct Case Study 127
Appendix D – Interview Questions for Random Teachers Selected 128

List of Tables

Table 1-English I Proficient and Advanced Results 54
Table 2-English II Proficient and Advanced Results 54
Table 3-Algebra I Proficient and Advanced Results 55
Table 4-Geometry Proficient and Advanced Results 55
Table 5-Algebra II Proficient and Advanced Results 55
Table 6-Biology Proficient and Advanced Results 56
Table 7-American History Proficient and Advanced Results 56
Table 8-American Government Proficient and Advanced Results 57
Table 9-ANOVA for English I Raw Data 58
Table 10-ANOVA for Algebra I Raw Data 60
Table 11-ANOVA for Geometry Raw Data 60

Table 12-ANOVA for Algebra II Raw Data..... 61

Table 13-ANOVA for Biology Raw Data 61

Table 14-ANOVA for American History Raw Data 62

Table 15-ANOVA for American Government Raw Data 63

Table 16-ANOVA for English I Free and Reduced Lunch Data..... 64

Table 17-ANOVA for English I IEP Data..... 65

Table 18-ANOVA for English II IEP Data..... 65

Table 19-ANOVA for Algebra I Free and Reduced Lunch Data 66

Table 20-ANOVA for Geometry Free and Reduced Lunch Data 66

Table 21-ANOVA for Biology Free and Reduced Lunch Data 67

Table 22-ANOVA for Biology IEP Data..... 68

Table 23-Classroom Observations of Technology Use for All Teachers..... 69

Table 24-Classroom Observations of Technology Use of EOC Exam Teachers..... 70

Table 25-Teacher Technology Professional Development Hours..... 71

Table 27-Interview Participant Demographics and Descriptive Statistics 73

Abstract

With the technology explosion of the twenty-first century, many schools have moved towards one-to-one to help their students gain as much access to technology as possible. One-to-one initiatives have been growing across the nation and especially in Southwest Missouri. This case study looks at a one-to-one implementation in a large high school in Southwest Missouri. The study addresses the questions of impact of the one-to-one implementation on student achievement based on the State End-of-Course Exams and shifts in teacher pedagogy.

The implementation of a one-to-one initiative is a complex task, seen by many educators as a major transformative initiative. As school leaders make the decision to go forward with a one-to-one implementation, major investments of time and money have to be made; in addition to this investment, when the access to technology is provided, there is an expectation of significant change within the teaching / learning process with potential impact on student achievement. While it is difficult to determine the exact influence specific changes will have on student outcome, it is important to know what processes will help with a successful implementation. This case study adds to the body of research concerning implementation procedures for one-to-one initiatives. The study also provides clarity to guide school decision makers in implementation procedures in which one-to-one initiatives can transform the educational environment and affect student achievement.

Definition of Terms

Digital Natives: Digital natives are people born or brought up during the age of digital technology and therefore familiar with computers and the Internet from an early age.

End-of-Course (EOC) Exam: EOC Exams are the State assessment given in the State of Missouri for high school students. Currently there are eight exams given at the end of the courses for high school students.

One-to-One: One-to-one programs are defined as one technology device for every student in the defined setting (class, grade level, school, or district). Students have access to the device at all times for their educational and personal use.

Pedagogy: Pedagogy is the science and art of education. It refers to the methodology or process of instruction, with a focus on teaching rather than learning.

Transformative technology: Transformational technology refers to students using technology in a way that transforms the learning process for the student and requires higher-order thinking. Cognitive demands are greater while using technology at a transformational level (Transformational Technology: Iowa Core and Authentic Intellectual Work).

Web 2.0: Web 2.0 is the term given to describe a second generation of the World Wide Web that is focused on the ability for people to collaborate and share information online. Over time Web 2.0 has been used to identify with Blogs, wikis, and other web services.

Chapter I

A Case Study of a One-to-One Initiative and Impact on Student Achievement and Educational Practices

Introduction

The purpose of this case study was to examine the impact of a one-to-one computing initiative at a high school located in Southwest Missouri by examining pedagogy, professional development, and student achievement as measured by state End of Course (EOC) Exam scores. During an interview at the beginning of the one-to-one implementation process, the Superintendent of the school district being studied indicated the rationale for implementing a one-to-one program in their district was to help prepare teachers and students for 21st century learning and give all students equal opportunity to thrive with technology regardless of socio-economic status (Superintendent, 2012). The review of literature is related to how one-to-one computing is impacting pedagogical decisions which, in turn, impact student achievement. A review of the history of student computing in education, and related themes are identified. The next section focuses on technology integration in schools and includes a review of barriers to technology integration. Hennessy, Ruthven, and Brindley (2005) wrote that the increased investment in technology infrastructure has not been matched by an investment in developing new ways of learning and teaching. The final section of the review of literature focuses on professional development, how professional development impacts one-to-one implementations, and examples of best practices in the integration of technology into education.

The case study includes data from a change audit conducted within the school being studied, teacher observations, archives of professional development, and analysis of EOC Exam scores. Scores prior to and including the 2012 spring EOC Exam scores served as the base line for the analysis. These scores were then analyzed in the spring of 2013 and 2014 to evaluate the impact the one-to-one initiative is having on student achievement at the school being studied. Data collected from the teacher evaluations from the 2013-2014 school year were analyzed to show how one-to-one is being implemented into the curriculum. An analysis of professional development offered by the district and taken by teachers was also gathered. Random teacher interviews were conducted to gain further insight to how one-to-one is being implemented in the classroom.

Problem Statement

The implementation of a one-to-one initiative is a complex task, seen by many educators as a major transformative initiative. As school leaders make the decision to go forward with a one-to-one implementation, major investments of time and money have to be made; in addition to this investment, when the access to technology is provided, there is an expectation of significant changes within the teaching / learning process with potential impact on student achievement. While it is difficult to determine the exact influence specific changes will have on student outcome, it is important to know what processes will help with a successful implementation. There is a lack of information on the actual impact of one-to-one initiatives on pedagogy and student achievement. There is a need for additional research to provide data for

those making decisions for one-to-one implementations. The study provides clarity for any schools making decisions about implementation of a one-to-one initiative.

Rationale for the Study and / or Purpose for the Study

Currently, a generation of digital natives is being educated in our public schools; therefore, technology is an important component in educating students today. Because of the cost of incorporating technology into schools, it is important to provide research that will make leaders aware of how the use of technology is impacting the educational environment and student achievement.

The researcher is currently the coordinator of the one-to-one initiative at the school being studied and wanted to look in depth at the impact the initiative is having on the educational environment and actual student achievement. The focus of the case study examines the impact of the one-to-one initiative on EOC Exam scores and compare scores to years prior to the implementation. The case study analyzes change in the overall EOC Exam scores and subgroup scores. The study collects data from classroom teacher observations to analyze the level technology is being utilized in the classroom. The study also examines the professional development offered and taken by staff as well as analyzed the implementation of the professional development in the classroom. The study includes summaries of teachers randomly selected and interviewed on various aspects of the one-to-one implementation.

Over the past several years, the number of one-to-one schools around the nation and, in particular the Southwest region of Missouri, has grown drastically. As school leaders have

initiated the move to a one-to-one environment, major investments of resources have been put into these initiatives. Although schools choose to become one-to-one schools for various reasons, all schools expect to see change with such a high-stakes initiative. It seems a reasonable expectation that providing individual access to technology will result in an educational transformation. This transformation would include teachers utilizing the technology in the classroom leading to transformative levels of instruction and student achievement to increase. However, study findings reveal a lack of evidence that transformational teaching is occurring in one-to-one schools. Although more and more research is being done on the subject, much of the research has been on schools that are in the beginning stages of their program and are qualitative studies which focus on teacher and student perceptions. Many of the studies which look at student achievement have been limited to small sample sizes and have only focused on certain limited aspects of a one-to-one program. The reported results from studies vary, and inconsistent results have been reported. In order to determine what is needed for a successful implementation; several areas such as infrastructure / hardware, professional development, and a shift in pedagogy of staff were examined.

Research Questions

Determining how and under what conditions implementing one-to-one initiatives impact student achievement and transforms the educational environment is an important leadership and policy focus for school district administrators.

- Has the implementation of a one-to-one initiative at the high school level had an impact on the EOC Exam scores?
- Has the implementation of a one-to-one initiative had an effect on teacher pedagogy?

Limitations/Delimitations

A limitation in this study was the data being used from the scores on the EOC exams. How seriously students take the test cannot be controlled and because the scores do not have a significant impact on them, the results may not end up being a true measure of how the one-to-one initiative is impacting student achievement. Another limitation concerns the data from the EOC Exam results. Since it will not be testing the same students, just the same courses and teachers of those courses, the results may not actually reflect the impact of the initiative, but instead the educational differences in specific grade levels. The bias of the researcher could also be considered a limitation because of the personal involvement in the school being studied. The final limitation is the method of data collection. The teacher evaluations were performed by different administrators. The administrators' evaluations are subjective regarding whether the technology use was transformative. The study is delimited to students and faculty at the school being studied in Southwest Missouri that includes grades 9-12.

Chapter II

Review of Related Literature

History of Technology in Education

Since it has evolved slowly over the last 60 years, one clear innovator is not obvious in the area of one-to-one computing. When the Soviet Union launched the Sputnik in 1957, American educators received their wake-up call. The federal government made money available for innovative approaches in math and science – such as using technology in the classroom (Johnstone, 2003; Keengwe, 2013; Brodzik, 2012). Experiments began when computers themselves were in their infancy, and the focus initially was concentrated in improving the efficiency of instruction. Then in the mid-1960s, there was a shift from trying to replace the teacher to using the machine as a new medium for learning to boost the intellect opportunity of the student (Johnstone, 2003, p. 14). Seymour Papert, a professor of mathematics at Massachusetts Institute of Technology, was an early proponent of this idea. He sparked a fire that motivated thousands of elementary teachers to try to bring technology to the classroom in the 1980s. However, their efforts mostly failed due to lack of hardware available to them for classroom use. According to Papert, the computer might be a powerful new type of pencil, but "what good is one pencil between thirty pupils?" (Johnstone, 2003, p. 15). Apple, Inc. responded to this challenge classroom teachers faced and contributed greatly to computing technology in the classroom by beginning to donate Apple 1 computers to schools starting in 1975. The big computer mainframes began to lose their dominance over academic research as

Apple continued this throughout the late 1970s (Murdock, 2007). By the early 1980s computer-aided instruction gained widespread acceptance in schools. It was during this period that drill and practice programs were first developed for exclusive classroom use even though hardware shortages continued to kept teachers from having enough computers for all students. Despite this shortage, by the 1990s computer usage shifted from being a relative rarity in American public schools to being present in some form in most school districts.

In the 1990s and 2000s, the big concern in education was the growing digital divide (Johnstone, 2003; Brodzik, 2012; Sauers, 2012). When concern over the digital divide began to emerge, educators became concerned about the gap between those individuals and communities that have, and those that do not have, access to information technologies and how that gap is impacting the education of students. In February 2002, the U.S. Department of Commerce released "A Nation Online: How Americans Are Expanding Their Use of the Internet," a study on computer and Internet use in America at that time. U.S. Census data for 2000 showed that 143 million Americans, or about 54% of the population, were using the Internet. The data also reported that Internet usage in the United States was growing by two million new Internet users per month, with Internet usage spreading across age, gender, ethnicity, race, education, and income lines thus showing a beginning of closing the digital divide gap (Dickard & Scheider, 2002). In 1997, the Teacher Leadership Project began in the state of Washington. It has since trained over 4,000 educators in the use of technology in the classroom. Similar programs began to spread across the United States. In the fall of 2002, under Seymour Papert's guidance, the

state of Maine became the first state to mandate laptop use for every student in its seventh-grade classes. This was the largest educational one-to-one initiative to this date (Johnstone, 2003, p. 16).

Since then, schools have slowly increased the amount of computing technology in classrooms. The ratio in the United States of students to computers with Internet access continues to decrease. In 1998, it was 12 students to one computer. By 2009, that ratio had dropped to 3.1 students to one computer (Wells, Lewis, & Green, 2006; Ferlazzo, 2014). There has been a tremendous growth in teaching with technology in schools in terms of equipment, Internet access, and training of teachers. While costs of computing technology hardware continues to decrease, the total costs of providing the mass computing technology still prohibits many of schools from fully implementing one-to-one programs. However, schools continue to find new ways to incorporate technology in the learning environment which in turn has led to the emergence of one-to-one initiatives.

Emergence of One-to-One in Education

Providing a personal computing device for every student is not a new idea. Research suggests that one-to-one computing will increase student achievement and engagement, provide differentiation, broaden learning in the classroom, enhance project based learning, and prepare students for tomorrow's workplace (Johnstone, 2003; Muir, 2003; Keengwe, 2013). The impact on student learning when a personal computing device is provided for each student has been studied by educational and technology leaders (Bailey et al., 2011).

Foundations in the late 20th century began to develop in order to help fund the massive cost of implementing these one-to-one projects in schools. Steve Jobs, Apple co-founder, stated in 2000 that "the digital tools were only just beginning to transform education" (ibid). However, prior to the mid-2000s, most studies performed on one-to-one initiatives showed the technology was having little to no impact on increasing student achievement (Cuban, 1986; Collins, 1991; Cuban, Kirkpatrick, & Peck, 2001; Johnstone, 2003; Warschauer, Knobel, & Stone, 2004). Kozma (2008) stated that educators across the nation continued to seek out methods of introducing students to the mass amounts of educational content-related information available with technology. As a result a heavy burden was placed on teachers as they prepared their students for the workforce of the 21st century.

Beginning one-to-one initiatives in the classroom had mixed reviews. One-to-one studies done prior to 2000 showed little or no impact on student achievement when computers were used in the classroom (Cuban, 1986; Collins, 1991; Cuban, Kirkpatrick, & Peck, 2001; Johnstone, 2003; Muir, 2003; Warschauer, Knobel, & Stone, 2004). Internet use was still growing during this time and technology was seen as a luxury and not a necessity. After 2000, there was a movement among schools across the nation to find ways to provide each student with a computing device (Johnstone, 2003). Maine was one of the first to provide one-to-one on a large scale when in 2002, laptops were issued to junior high school students. Since then, the Maine laptop project has distributed 39,000 laptops to all middle schools in the state (Muir, 2003). According to a follow-up study done in 2004 on the Maine laptop project, 75% of teachers and

70% of students felt the computers had helped teachers in adequately reaching their classroom objectives and students were learning with the addition of the computers in the classroom ("Maine laptop," 2006). Peckham (2008) completed an additional study of the Maine laptop project which indicated students had become better writers under the initiative.

Through this process, there has been two main ways that have emerged for schools to implement one-to-one initiatives: bring-your-own-device and school-provided device. School districts can choose to allow students to use their own devices in school. This is known as bring-your-own device (BYOD). Because most school aged students typically have some type of technology that allows access to the Internet; this can be a cost effective way to make one-to-one a reality for schools on tight budgets (Engel & Green, 2011; Johnson, Adams & Haywood, 2011; Messinger et al., 2011). BYOD allows the opportunity for students to have access to technology during the school day in districts without the financial means to purchase a majority of the hardware. The other way to implement one-to-one is for the school to provide students with a school-owned device. Discussion about which one-to-one technology device to use for a school-owned device centers around laptop computers, a technology used since the 1990s, and tablet computers, a technology used since 2010 with the emergence of Apple's iPad. The introduction of iPad led to the development of millions of educational learning applications designed to help teachers with their curriculum (Guleck & Demirtas, 2005; Kozma, 2008; Özdemir, 2010; Messinger et al., 2011; Russell II, 2012).

Growth of Technology

Technology continues to grow in students' personal lives. Mobile phones tend to be the digital natives' primary method of technology computing. "Between late-2008 and mid-2011, mobile Internet usage among all adults grew from 37% in late 2008 to 63% in mid-2011. Some individuals have multiple mobile phones and devices. For instance, in the United States, a nation of 315.5 million people, there are 327.6 million mobile phone subscriptions" (Rainie, 2011). Purcell, Entner, & Henderson, (2010) completed a study showing young adults were the most significant users of technology through mobile devices. Recent studies have found nearly every teenager has a device that will connect to the Internet, and as many as 94% own a mobile phone (Rainie, 2011; Messinger et al., 2011, Russell II, 2012). Smartphone popularity among teens continues to grow. Mobile technology is advancing at a staggering rate. Studies showed in 2011, over 60% of teenagers either owned a Smartphone or had plans within six months to own one. When mobile technology is nearly doubling each year, smartphones continue to become more advanced (Johnson, Adams & Haywood, 2011; Kaku, 2011; Sandven, 2011). Students today now do a majority of their socializing through mobile technology devices instead of face-to-face.

The advances in mobile technology have seen rapid growth in the last ten years. At that time, mobile devices were only used to receive calls. Today, mobile devices are used for texting and connection to the Internet more than receiving calls. In 2009, Apple introduced the App Store, and by February 2012 users had downloaded more than 25 billion applications. In 2010,

Apple debuted the iPad; less than two years after that, more than 1.5 million of the devices were being used in education, including more than a thousand in one-to-one school settings. In January 2012 Apple announced a new product line aimed directly at the education market, textbooks for iPads (Herther, 2012). Companies such as Barnes & Noble and Amazon have also seen rapid advances in technology in order to compete in the mobile technology market. This rapid growth is a precursor to changes that will likely affect education in the forms of learning and teaching. Because of the eruption of online media in the past decade, the amount of time students are exposed to media has grown significantly (Rideout, Foehr, & Roberts, 2010). In the 1930s, school-age children spent a total of about 10 hours per week as consumers of mass media, which in that era was radio, movies, and records (Gutnick et al., 2011). By comparison, in the 2000s, school-age children spent over 10 hours a day consuming mass media, which includes the Internet, social media, music, and videos (Rideout, Foehr, & Roberts, 2010). Much of student's time is also spent multi-tasking by using multiple devices at the same time, such as listening to music through headphones while socializing on social networking sites. With the amount of exposure students have to technology and media outside of school, educators are finding that they must incorporate the same technology inside of school in order to keep students engaged (ibid).

Another factor that accelerates the rate of technology usage is the concept of 21st century skills. In a 2007 white paper summarizing the 21st century workplace, the U.S. Department of Labor Commission was assigned two different tasks: to determine the workplace skills that

would be needed in the coming 21st century, and to evaluate how well American schools were equipping students with these skills (Partnership for 21st Century Skills, 2007, p. 4). The CEO Forum School Technology and Readiness Report (2001) gave five recommendations to ensure the nation's investment in education technology improves student achievement and benefits education:

(a) make the development of 21st century skills a key educational goal,

(b) align student assessment with educational objectives and include 21st century skills,

(c) adopt continuous improvement strategies to measure progress and adjust accordingly,

(d) increase investment in research and development and dissemination,

(e) ensure equitable access to technology for all students (p. 3).

Proponents for one-to-one laptop programs in schools maintain that schools can meet the needs and interests of children better by using computing devices to provide a more engaging, meaningful, and relevant learning experience (Anderson & Sanders, 2004; Burns & Polman, 2006; Devaney, 2010; Jackson, 2004). Each district has to decide the best way to educate their students and their own philosophy of education driving that path. Penuel listed four goals that are most common for schools transitioning to a one-to-one program. Those reasons included improved academic achievement, increased equity, increased economic competiveness of a region, and /or transforming the quality of instruction (2006). Each of these reasons are of monumental interest in education today. There are also those that express concerns associated with one-to-one initiatives. "Some see providing one laptop for every student as a major

unneeded expense for the district and questions arise as to whether the benefits outweigh the costs. Even some who have implemented one-to-one programs later dropped them because they did not see positive results" (Hu, 2007).

Failing to determine how the technology will be used and what specific needs can be addressed from the use of computers in both the classroom and home is one of the biggest mistakes that stakeholders make when implementing one-to-one (Brodzik, 2010). In Pittsgrove Township, New Jersey, laptops were placed in the hands of students first without a plan to utilize them. The needed pedagogical changes and professional development were lacking in this district at the beginning of their implementation and thus failed to provide teachers with the support that they needed to use the laptops effectively. In the case of this district, a disconnect existed between what the laptop program provided and what the district and state required assessments tested (ibid). Therefore, while the pace of one-to-one laptop computer initiatives in schools across the country continues to grow, "simply having access to technology itself does not necessarily mean that students learn more or that they learn better regardless of how engaged they might be with the technology" (Donovan, Hartley, & Strudler, 2007). Providing the technology tools is important, but providing teachers with instruction for how best to utilize those tools in the classroom is essential (Donvan, Hartley, & Strudler, 2007; Brodzik, 2010; Messinger et al., 2011; Keengwe, 2013).

One innovative tool that districts implementing a one-to-one initiative can use to dramatically change instruction is electronic or digital textbooks. There is a continued push for

school districts to move towards being paperless and to provide supplements and textbooks in an electronic format. "Instead of using a traditional textbook targeted to one reading level, a student can access digital text that adapts to the needed reading ability. The days of carrying heavy backpacks filled with dated textbooks designed for a narrow range of ability and interest levels should end as students gain online access to every conceivable subject in a multimedia format that they can each understand and relate to" (Wise & Van Vuuren, 2007).

Crimaldi (2009) quotes Carla Crisafulli, a math teacher at Hopkinton High in Massachusetts where a one-to-one program has been implemented, who says:

> "Hitting the books is becoming a thing of the past, as more schools across the state implement virtual classrooms and equip students with laptops. If you look at a textbook it's very static." [Instead, she] will post homework assignments to moodle.org and use Jing to create lesson voice-overs. "We're going to be able to reach out via the Internet and make geometry come alive."

As the result of having a one-to-one laptop program, schools who purchase the additional electronic supplemental materials provide their students with the ability to see, hear and interact with any topic that they are studying in a format that is more personalized and allows for differentiation. U.S. Secretary of Education Arne Duncan urged educators in 2012 to move quickly to adopt digital textbooks and materials. Also in 2012, the Federal Communications Commission and the Education Department released a report, the "Digital Textbook Playbook," which provided a blueprint for schools to make the shift. Florida is one state that has taken a

step towards electronic supplemental resources by adopting legislation requiring districts to spend half their instructional-materials budgets on digital content by 2015-16 (Davis, 2013).

Students utilize mobile technology daily to create things, communicate with friends, and to help them learn. Teachers, however, have not been as successful in their ability to integrate this technology into their daily curriculum (Messinger et al., 2011). Mooresville Graded School District of North Carolina is considered one of the leading one-to-one school districts in the nation. Mooresville saw a 20% increase in the number of students who scored proficient in state assessments after the district moved towards one-to-one. District leaders emphasize that the technology was only part of that success. Mooresville also focused on changing the way teachers integrated the technology throughout the curriculum (Quillen, 2011). A majority of principals and district administrators cited, in a national survey conducted in 2010, that teachers' lack of technology skills was a primary factor preventing students from utilizing technology in the classroom (Project Tomorrow, 2011). "While the end result of the pervasiveness of mobile devices in society and its impact on learning cannot adequately be predicted, the style of teaching used before mobile devices will not work without some adaptation in a learning environment where nearly every student has mobile access" (El-Hussein & Cronje, 2010).

In recent years, studies suggest that technology in education is having a more positive impact as digital natives begin their education career. The use of computing devices in the classroom is showing increased learning and student motivation. There have also been a few studies that have shown students are earning higher standardized test scores when using that

technology in the educational environment, like in Mooresville, North Carolina. There is increasing evidence in literature that one-to-one is having a positive impact in education environments (Quillen, 2011; Keengwe, 2013). As districts consider ways to incorporate one-to-one computing, "it is important that we do not discount technologies that have not yet made a significant educational impact as not having the potential to do so" (Shuler, 2012, p. 7).

Pedagogical Shift

As the world changes so does education. Schools struggle to keep up with the ever changing world and how to keep that technology current. Schools are working on ways to integrate technology into the everyday curriculum and finding the budget for that technology. Necessary change arouses emotions, and when emotions intensify, leadership is key (Fullan, 2001, p. 1). At its core, one-to-one implementation is a system-wide decision that is typically made by a school administrator. For that reason, the decision whether or not to adopt a one-to-one program is essentially out of the hands of an individual teacher. However, the ways in which teachers use that technology can be analyzed through this framework. Within individual classrooms, teachers make the decisions regarding how they use technology and the frequency with which they use that technology. Many critics still believe that education is lagging substantially when it comes to technology use. A report from the U.S. Department of Commerce (2002) ranked education as the lowest of the ranked U.S. Industry sectors in technology intensive enterprise. When this report reviewed the history of technology in education, one common

problems was observed: great excitement introduced most technologies, but these technologies failed to ever get fully implemented or drastically change education.

Many educators have differing views on what technology integration is and what that integration looks like. Earle (2002) wrote "Integrating technology is not about technology - it is primarily about content and effective instructional practices" (p. 7). Other definitions vary, but most viewed integration as a way to use technology to enhance learning: "Technology integration is having the curriculum drive technology usage, not having technology drive the curriculum" (Dockstader, 1999, p. 73). Unfortunately, the prevailing public perception simply sees instructional technology as a synonym for computer technology (Earle, 2002). Earle went on to note that such a misunderstanding has been part of the problem with technology integration because the focus has been on access to hardware as opposed to pedagogy (ibid). Even as the amount of technology in schools has increased drastically in recent years, true integration of technology has lagged. Many school leaders and policymakers have focused their conversations on the technology itself rather than also focusing on ways the technology can be used to transform schools. Because of this disconnect, how technology has been integrated in schools has been greatly impacted (Bhatta, 2008; Dockstader, 1999; Earle, 2002).

Information and communication technologies have brought new possibilities to the education sector. Unfortunately they have also placed more demands on teachers. Teachers now "have to learn how to cope with computers in their classrooms, how to compete with students in accessing the enormous body of information--particularly via the internet and how to use the

hardware and software to enhance the teaching / learning process" (Hooker, 2008). Because of these issues, many implementation programs have only focused on helping teachers learn the basics in managing technology in the classroom. Bhatta indicated that unless teachers are "fully comfortable with new approaches to teaching inherent in technology integration, providing students with computers and educational content alone will have limited impact on the teaching and learning process" (2008). Teachers understanding that technology-based education only changes their role, is essential. There is a need to develop teachers' thinking to more of a "critical judgment to ensure that teachers are not limited by their current understandings and experiences of digital technologies as a somewhat intimidating new dimension to their classroom practices" (Papert, 1994). There is a need for teachers to be "provided with opportunities to reflect on their practice as they make use of the technologies so that they can become active generators rather than passive consumers of knowledge" (Butler & Leahy, 2003). Teachers must be empowered to teach transformatively through professional development. Shifting this pedagogy in teachers is essential for a successful implementation (Papert, 1994; Butler & Leahy, 2003; Bhatta, 2008).

One of the largest barriers to integrating technology in education is there simply has not been an emphasis on teaching and learning when new technology has been introduced (Sauers, 2012). The increased investment in "technology infrastructure has not been matched by an investment in developing new ways of learning and teaching" (Hennessy, Ruthven, & Brindley, 2005). Teachers have consistently been given the technology for their classrooms with minimal

basic technology training. Because many of the technology initiatives have been top down policy initiatives, true change has also been slow. Teachers have not had input in the decision-making process and therefore have not fully understood or supported the change. "When teachers' theories about teaching and learning are not taken into account, technology integration can be greatly hindered" (Mumtaz, 2000).

Technology integration is also influenced by the climate in which teachers work. The teams that teachers work with and the culture of those teams can have a great influence on their technology integration (Hennessy, Ruthven, & Brindley, 2005). The subject area in which a teacher teaches can also have an impact on how technology is used. Hennessy, Ruthven, and Brindley (2005) reported that the "book-dominated" culture of English is a factor in resistance of English teachers using new technologies. One of the most comprehensive reviews of the literature on the barriers of technology integration was conducted by Hew and Brush in 2006. Their study reviewed research between 1995 and spring of 2006. Hew and Brush discovered 123 different barriers to technology integration. They were then able to classify those barriers into six main categories: (a) resources, (b) knowledge and skills, (c) institution, (d) attitudes and beliefs, (e) assessment, and (f) subject culture. These categories are listed in the order by the frequency with which they were found. Each of the 123 different barriers falls into one or more of the six categories (ibid).

As schools 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. Even in many classrooms where technology is used, it is not being used in ways that most benefit students. Although research emphasizes technology use that supports inquiry, collaboration, and reformed practice; many teachers tend to use technology for presentation software, learner-friendly web sites, and management tools to enhance existing practice (Harris, Mishra, & Koehler, 2009). "Effective integration of technology is the result of many factors, but the most important factor is the teachers' competence and ability to shape instructional technology activities to meet students' needs. Teachers may know their content and pedagogy, but when it comes to technology, teachers often learn along with students" (Gorder, 2008).

Computer technology is an effective way to widen educational opportunities, but teachers are not using technology as an instructional delivery system. Bauer and Kenton's research found that teachers were highly educated and skilled with using technology, but teachers were not integrating technology on a consistent basis in the teaching and learning process (2005). Other studies also indicate that teachers want to use technology and have adequate technical skills, but they are deficient in the knowledge of how to integrate that technology into their teaching (Ertmer, 2005; Gorder, 2008). It is important for teachers to know how to use technology in meaningful ways in the learning process and why the technology is essential for technology integration to work. Integrating technology in the classroom is a complex process that includes (a) learning the technology, (b) using technology in the teaching and learning process, and (c) integrating technology to enhance student learning (Dockstader, 1999).

Professional Development

Education pedagogical changes require staff development activities. In order for changes to be affected in the classroom, additional technical and pedagogical support is necessary. Professional development programs should include all staff who are going to contribute to the implementation of the intended changes – school principals, teachers, technical and administrative support personnel. Apart from the students themselves, teachers and school leadership are the main agents of change at the school level (Hooker, 2008). Professional development has been found to have a direct impact on the success of a one-to-one program (Drayton et.al., 2010; Shapley et.al., 2010; Keengwe, 2013).

Having a clear set of guidelines on expectations in the classroom during technology integration is important. One model shown to be effective with technology integration is the TPaCK model, which refers to a combination of technology (T), pedagogy (P), and content (C) knowledge (K). The TPaCK model stresses not only the importance of understanding each of the three components but also the significance of understanding the relationships and interactions between the components (Harris, Mishra, & Koehler, 2009). This combination can be difficult for some educators. Teachers may possess appropriate content or pedagogical knowledge, but then not have an understanding of technology. Or they may possess an understanding of technology, but then not have an understanding of how to incorporate that technology into their curriculum. With that lack of technology or pedagogy knowledge, these teachers are unable to intertwine the two together. Helping teachers gain a basic understanding of technology may be

an appropriate way to help teachers begin the integration process. In order to help teachers gain basic skills, teachers need research-based training, opportunities to practice skills, access to technology tools, and support from leadership (Dawson & Rakes, 2003; Harris, Mishra & Koehler, 2009; Keengwe, 2013).

There have been other studies that have found interesting results in regards to technology use in classrooms. One study indicated that there is a strong positive relationship between teacher's use of technology in the classroom and the constructivist practices in the classroom (Rakes, Fields, & Cox, 2006). This is an important relationship for school leaders to take into consideration when creating professional development. Encouraging and providing resources to develop a more constructivist approach may help teachers use technology in more meaningful ways. It may also help them genuinely change how they think about teaching and learning (ibid).

One question that has to be asked in a one-to-one implementation is how self-efficacy can be improved. Ertmer and Ottenbreit-Leftwich (2010) identified numerous ways the literature revealed self-efficacy could be increased. Those strategies included:

(a) Giving teachers time to play and explore technology

(b) Focusing new uses on immediate needs

(c) Starting with small successful experiences to enhance confidence

(d) Time working with peers who are knowledgeable about technology

(e) Providing access to suitable models who use technology appropriately

(f) Participating in a professional learning community

(g) Designing professional development programs that are within the context of teachers' ongoing work (p. 261-262).

Professional development can be seen as one of the most important components for any initiative. Unfortunately, in a review of the literature on technology professional development, Lawless and Pellegrino contended that the overall research was weak (2007). "The biggest challenge is helping teachers develop the expertise required to harness the power of technology. The challenge goes beyond the lack of teachers' technology skills and involves critical issues related to teachers' pedagogy and beliefs towards technology" (Mouza, 2008). Teachers may not possess the experience and expertise needed to effectively deliver educational services using these technologies. Therefore, one of the first considerations involved in changing an education system to integrate computer-based approaches into the classroom and beyond, is ensuring that everyone knows how to operate the equipment and how to utilize it to achieve the established goals (ibid).

Hew and Brush (2006) found three significant factors for effective professional development related to technology integration. The first factor identified was a focus on content. This is sometimes a controversial topic when leading professional development. Many educators believe professional development should focus on integrating technology and not on basic technology skills. However, Hew and Brush's review, reinforced the idea that teachers must have some basic knowledge about technology in order to be able to effectively implement that

technology in their classroom (Hew & Brush, 2006). Other studies have also found that teachers did not fully understand the value of technology integration until they had developed basic technology skills (ibid). The second factor in successful professional development, according to Hew and Brush, is having opportunities for practical application during teacher training (2006). This factor is not unique to technology integration, and is a strategy embraced by many educational leaders.

The final component Hew and Brush identified was that professional development had to be highly consistent with teacher needs. When schools move to a technology rich environment, it is natural to want and expect major changes quickly (Hew & Brush, 2006). However, implementing change incrementally may be a more effective way to ensure true change. When you implementing change slowly, it gives teachers the ability to become comfortable with the technology they are implementing. As teachers continue to become more comfortable, they will begin to incorporate more technology since they experienced success in the classroom. "When technology is involved, beginning with relatively simple uses may be a more productive way to change teacher behaviors than expecting teachers to use technology to achieve high-end instructional goals immediately" (Ertmer, 2005). The apprehension that teachers feel with any new initiative can take away from the success of that initiative. If teachers and school leaders have an understanding that change is expected incrementally, the long-term benefits may increase. Technology initiatives are no different; in order to continue to improve technology use,

developing professional learning communities (PLCs) around technology may be an effective tool (ibid).

The concept of building support teams certainly is not unique to technology, and many schools have embraced PLCs as an effective way to move initiatives forward. Hughes, Kerr, and Ooms (2005) recommend that schools establish technology inquiry groups, which are a particular type of PLC. Developing content specific PLCs can help teachers learn to use technologies that are most appropriate for their content area and collaboration can encourage an increase in utilizing technologies throughout the curriculum. Through the lens of the TPaCK framework, PLCs can be an effective way to address each of the three main components of TPaCK (Sauers, 2012).

Embedded professional development is essential for success in any new initiative. Massachusetts Legislature's Report of the Special Commission on Educational Technology found that "an absolutely critical element for success includes serious, embedded professional development for teachers and those preparing to become teachers to learn how to integrate technology to transform their teaching strategies" (2004). In order to ensure that the professional development is appropriate and adequate for the needs of teachers tasked with implementing and administering a one-to-one laptop initiative, the report provided the following guidelines: Relevant professional development must

(a) be practice-centered, field-based, and job-embedded (i.e. not single-shot, pullout training outside the school),

(b) significantly change teaching practices and student learning opportunities in technology-rich (one-to-one) environments,

(c) support teachers in providing hands-on learning activities; emphasizing higher-order thinking skills; linking to strong assessments; and undertaking classroom-focused professional development,

(d) address more than simply the needs of "technology use," but include programming aimed at boosting the subject matter knowledge, good pedagogy, engagement, and leadership skills of teachers,

(e) adopt the philosophy of 'just-in-time' versus 'just-in-case' professional development methods,

(f) help to develop undergraduate and graduate courses in colleges and universities in ways to change teaching and learning through use of technology (Massachusetts Legislature, 2006).

Brodzik came to the conclusion that the professional development scenario envisioned by the Massachusetts Legislature promotes an educational vision where staff has time to collaborate with each other and receive help from outside resources (2012). Brodzik suggests a constructivist approach to education where the end goal for student products are in mind and instruction is geared to their successful completion and also advocates for flexible and reflective professional development (ibid).

In addition to being flexible and reflective, effective teacher preparation in a technology-based environment requires adequate training. Information technology literacy, child-centered interactive teaching, and integration of technology-based instruction in child-centered interactive teaching are three areas that will help provide adequate training (Bhatta, 2008). Bhatta noted that the most necessary task is making teachers technology literate, with the greatest challenge being the integration of technology-based instruction (ibid). Studies indicate that technology integration is something that school districts are still struggling with when implementing one-to-one initiatives into their schools (Sauers, 2010; Brodzik, 2012; Keengwe, 2013).

In a technology integrated environment, the teacher's role changes. A change agenda "in which the technology is fully integrated into the learning process" constitutes a complex pedagogical scenario where "the teacher's role will be altered fundamentally" (Noss & Pachler, 1999). When making recommendations for large scale one-to-one implementations, Hooker concurs that teacher professional development programs should "not be planned as singular interventions where teachers are simply exposed to opportunities for tinkering with the new technology. Instead, there needs to be a continuous cycle of exploration, reflection, discussion, application, and knowledge building through which teachers grow professionally, and their students gain deeper knowledge" (2008). The classrooms of a fully integrated initiative become more student-centered and the teacher plays more of a facilitator role.

Best Practices in Technology Integration

There is an abundance of educational theories on what are best practices in integrating technology into the one-to-one classroom. As investments in and presence of technology in schools increases and the novelty fades, the focus is changing from adoption of hardware and gadgets to the provision of effective and consistent use of technology in the classroom. As technology becomes less expensive, it is increasingly available for schools. As a result, the decision for school districts becomes how they should be adopting technology, not should they be adopting technology (Sauers, 2012; Keengwe, 2013). As teachers achieve these desired higher levels of technology integration in their lessons, technology should become a tool for meaningful learning activities (Salomon & Perkins, 1996). However, this has been a slow process as many schools are still struggling with how to afford the technology on a large scale. Coyle, Meredith and Newman (2011) reported evidence supporting this higher level of use, noting that students' receipt and understanding of information was enhanced with the integrated use of technology. Technology rich instruction is more than just lowering the ratio of computers to students. In the past, most classroom technologies are used as learning tools, not as dynamic methods to present and represent significant concepts (Keengwe & Kidd, 2010).

In studies where the technology integration is being deemed as successful, teachers' lesson plans identify appropriate learning standards, allow for differentiated instruction, and include some form of formative assessment. The technology tools most frequently integrated into lesson plans to help with this include both digital and video cameras, clickers (or some type of

quick response system) for formative assessment, Web 2.0 tools and integration of white-board technology for demonstrating, modeling, and evaluating (Keengwe, 2013). Newman, Coyle, and McKenna found that teachers successful in technology integration are using the technology for more than just tools used to practice and drill (2013). Successful teachers are using the mobile technologies to enhance their lessons by providing students with new entry points and opportunities to interact with the content. These teachers are also focusing their professional development on applying this specialized technology to enhance existing content and to provide new methods of assessment, not as an alternative mode of presentation. Most importantly, teachers having success at integration are using current technology for student use by asking them to explore and create tangible evidence of their knowledge. Administrative support allowing lesson preparation and peer collaboration among teachers is also important for teachers to share their solutions to barriers, and help to generate novel methods of integrating new technology into their pedagogy (ibid).

Teachers who are successful in implementing the technology have learned the new computer-based tools, but they have also learned new approaches to teaching. Recent education developments in many schools and countries have seen a shift from traditional delivery toward more student-centered, facilitated, and constructivist models in which the teacher is the guide, not just instructing. These new collaborative approaches in which teachers and pupils are co-learners have shown to be effective. Focus is increasingly on participation and negotiation rather than direction and instruction, giving students opportunities to act as nontraditional mentors

providing support to other students and to teachers. This collaborative approach can give students new insights and greater independence as learners while offering students who may not previously have excelled at school the opportunity to be the experts, acting as mentors to their peers and to their teachers (Fadel, 2010; Keengwe, 2013).

In order for teachers to achieve technology integration that targets student learning, teachers needed knowledge that allows them to;

(a) identify the technologies needed to support curricular goals,

(b) clearly state how the tools will be used to help students meet and demonstrate those goals,

(c) allow students to use applicable technologies in all phases of the learning process,

(d) select and use the appropriate technologies related to their own professional development areas (Cennamo, Ross and Ertmer as cited by Ertmer and Ottenbreit-Leftwich, 2010).

Helping develop a high self-efficacy with technology for teachers can also be a powerful way to help them implement technology in their classrooms (Bauer & Kenton, 2005; Ertmer and Ottenbreit-Leftwich, 2010).

Technology has forever changed not only what we need to learn but the way we learn. National standards have been developed and redefined in order to help teachers incorporate technology into the curriculum. The International Society for Technology in Education (ISTE) developed the National Education Technology Standards (NETS) which are standards of

excellence and best practices in learning, teaching and leading with technology in education. The benefits of using the NETS include the following:

(a) improving higher-order thinking skills, such as problem solving, critical thinking and creativity,

(b) preparing students for their future in a competitive global job market,

(c) designing student-centered, project-based and online learning environments

(d) guiding systemic change in our schools to create digital places of learning

(e) inspiring digital age professional models for working, collaborating and decision making (2012).

The NETS include specific standards for students, teachers, administrators and coaches. This is beneficial as each role is different and should have technology standards that reflect those differences.

Another set of technology standards was developed by the Partnership for 21st Century Skills. To help practitioners integrate skills into the teaching of core academic subjects, the Partnership developed a unified, collective vision for learning known as the Framework for 21st Century Learning. This Framework describes the skills, knowledge and expertise students must master to succeed in work and life; it is a blend of content knowledge, specific skills, expertise and literacies. Twenty-first century skills implementation focuses on the development of core academic subject knowledge and understanding among all students. Those who can think critically and communicate effectively must build on a base of core academic subject knowledge

(Framework for 21st Century Learning Student Outcomes, 2009). These skills promote an understanding of academic content at much higher levels by weaving the 21st century interdisciplinary themes into core subjects. They contain learning and innovation skills including: creativity and innovation, critical thinking and problem solving, and communication and collaboration. They recognize that effective citizens must be able to exhibit a range of functional and critical thinking skills such as: information literacy, media literacy and information, communications and technology literacy. Finally, they focus on life and career skills. They state it is important to obtain the ability to navigate the complex life and work environments in the globally competitive information age by requiring students to pay rigorous attention to developing adequate life and career skills (ibid).

The final set of national standards that contain technology integration are the Common Core State Standards (CCSS). The Common Core Standards focus on in-depth student technology use by specifically mentioning technology within the standards:

(a) W.4.6. With some guidance and support from adults, use technology, including the Internet, to produce and publish writing as well as to interact and collaborate with others; demonstrate sufficient command of keyboarding skills to type a minimum of one page in a single sitting.

(b) RI.8.7. Evaluate the advantages and disadvantages of using different mediums (e.g., print or digital text, video, multimedia) to present a particular topic or idea.

(c) SL.11-12.2. Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data.

(d) SL.11-12.5. Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.

The Common Core Standards do not suggest novel technology use as a way to engage students, but rather requires learners to make complex decisions about how, when and why to use technology. Having students incorporate technology this way will also require teachers to make those complex decisions on how to use technology (Common Core State Standards, 2010).

The common theme amongst all of these standards is the integration of the technology throughout the curriculum and not just the use of technology at the basic levels. Teachers who are integrating technology throughout the curriculum are having the most success according to various studies, so it is critical for schools implementing one-to-one programs to make sure that professional development is provided not only to show teachers the basic how-to of technology, but also helps teachers shift pedagogy allowing for integration throughout their curriculum (Bhatta, 2008; Ertmer & Ottenbreit-Leftwich, 2010; Fadel, 2010: Keengwe, 2013).

Summary of Literature Review

Change is a double edged sword. Change can be a relentless pace, yet when things are unsettled, new ways are found to move ahead and to create breakthroughs not possible in stagnant societies (Fullan, 2001, p.1). When initiating change, there is usually a mixture of negative and positive terms associated with it (Bhatta, 2008; Fullan, 2001; Keengwe, 2013). On one side people associate change with fear, anxiety, loss, danger, and panic. On the other side, they associate it with exhilaration, risk-taking, excitement, and energizing improvements.

As the world changes so does education. Schools struggle to keep up with the ever changing world and how to stay current. Many schools are working on ways to integrate technology into the everyday curriculum and finding ways to budget for that technology. For teachers and students to utilize technology in an efficient and effective manner and to fully take advantage of the benefits of using technology to improve the education of students, three components must be present. There must be access to technology, (the hardware, software, and infrastructure), professional development opportunities must be provided for teachers in the use and integration of the technology, and on-going technical support is needed to maintain the systems (Schaff, 2005; Bhatta, 2008; Keengwe, 2013).

Even though it seems that one-to-one initiatives are newly emerging, the literature shows that technology in education has been shown to have had a tremendous impact since the early 20th century (Papert, 1994). Schools have been implementing one-to-one initiatives for almost 15 years, and teachers who are successful in implementing the technology are using new

approaches to teaching pedagogy, not just incorporating technology. For a successful implementation there has been a move away from traditional delivery and toward more student-centered, facilitated, and constructivist models, in which the teacher is the guide (Fadel, 2010; Keengwe, 2013). National standards have also been adopted for technology that supports this approach and encourages the integration of the technology throughout and asks students to make decisions on when and how to use that technology (Framework for 21st Century Learning Student Outcomes, 2009; Common Core State Standards, 2010; National Educational Technology Standards, 2012).

Chapter III

Research Design and Methodology

Participants

The participants in this case study are students in grades 9-12 and teachers at a high school located in Southwest Missouri. In 2012, there were 1,502 student enrolled in grades 9-12 at the school being studied. In 2013 there were 1,488 students enrolled in grades 9-12 at the school being studied. In 2014 there were 1,508 students enrolled in grades 9-12 at the school being studied. In 2013 there were 109 full-time teachers receiving professional development and being evaluated at the school being studied. In 2014 there were 110 full-time teachers receiving professional development and being evaluated at the school being studied.

Selection/Sampling

Students enrolled in courses at the school being studied that take the EOC Exam will be evaluated on the basis of those scores. All students who are enrolled in these courses and take the EOC Exams are included in the study. Full-time teachers at the school being studied who received professional development and are being evaluated with classroom walk-through evaluations are included in the study.

Mixed Research Design

The study began with a discussion of the historical aspects of the one-to-one implementation for the school district being studied from the beginning of the implementation process. The research will discuss the process from the early planning stages and how decisions

were made. It will then move through the process of getting the physical environment and hardware ready for implementation as well as professional development offered to staff. Finally, there will be a focus on issues that emerged after implementation and the processes used to work through those issues.

The research was conducted by gathering the specific data scores on the EOC Exams from Questar and the Missouri Department of Elementary and Secondary Education. The scores were then compared from 2012-2014 and data disaggregated to evaluate impact of introducing the one-to-one initiative throughout the curriculum. The teacher observation forms from the 2013-2014 school year were also gathered to analyze the data to indicate the level of technology being utilized in the classroom curriculum. The researcher then analyzed the high school students EOC Exam scores from 2012-2014 to see the impact the one-to-one initiative is having on student achievement. The researcher was also interested in the impact on various special categories of students. Specifically the subgroups of free and reduced lunch and Individual Educational Plan (IEP) students' results were disaggregated to see if the one-to-one initiative has had an impact on these groups of student achievement scores.

Data was also collected from professional development logs. The professional development offered and taken by teachers since the implementation of one-to-one was gathered and analyzed as well as the teacher observations to determine if one-to-one technology was being integrated throughout the curriculum.

Finally, interviews were conducted with teachers randomly selected. The teachers were asked what they look for in professional development, how one-to-one has changed their classroom, and what effects they feel their teaching with one-to-one is having on student achievement and engagement.

Instrumentation

EOC Exams are the standardized tests that Missouri students have to take at the High School level. The school being studied gives the EOC Exam in all eight courses offered: English I, English II, Algebra I, Geometry, Algebra II, Biology, American History, and Government. Using these exams as the instrumentation for the study helped to provide an overall picture of how the initiative is doing throughout the school being studied in the core classes.

Missouri has given benchmark exams to students since the 1980s. They transitioned from the MMAT to the Missouri Assessment Program during the 1990s. This came after Grade Level Expectations (GLEs) were implemented and all schools in the state were expected to incorporate these standards into their curriculum. Beginning in 2007, these Grade Level Expectations were revised and became known as the 2.0 version. With this version, the expectations at the High School level were changed to Course Level Expectations (CLEs). At this time, there was a transition from giving one comprehensive benchmark test at the High School level to giving individual EOC Exams. Phase I included one EOC Exam in each core area: English II, Algebra I, Biology, and American Government. Phase II was optional and

included additional courses of: English I, Geometry, Algebra II, and American History. In early 2014, Missouri's Department of Elementary and Secondary Education changed dramatically how they were implementing the newly adopted Common Core Standards and how students at the High School level would now be assessed. The only required EOC Exams would be the original four of English II, Algebra I, Biology and American Government and all juniors would be required to take the ACT starting in the 2014-2015 school year. The remaining EOC Exams would be optional for schools who wished to continue to give those assessments.

The Missouri Assessment Program at the High School level is currently administered by Questar Assessment Incorporated. Questar provides K–12 assessment solutions for states that are accurate and reliable. They have an experienced team of certified Project Managers, leading Psychometricians, and former state assessment directors. Questar partnered with Missouri to determine assessment goals and requirements and created a custom program designed to best achieve those goals. Questar provides online access to the Missouri EOC Exams.
The questions on the EOC Exams have all been piloted for validity and have been found to be reliable. The questions currently cover the Course Level Expectations which currently is the standard state mandated curriculum for these courses.

The EOC Exam score data was chosen as the instrument to use in this study because it was an existing instrument that had already been through validity and reliability testing. It is currently given to all students who take these courses in High School, and the results were easily accessible. Because it covers the required curriculum standards, it is a good indicator of student

achievement and how that achievement is affected with the implementation of the one-to-one initiative. The results can also be disaggregated by the specific subgroups and helped the researcher to disaggregate the data to indicate if there were particular subgroups in the curriculum where the one-to-one initiative is having an impact.

The school being studied had a principal-created teacher observation form already in place to evaluate teachers' classroom performance. Part of that teacher observation form included an area to track technology use in the classroom. This tool was chosen to use in this study because it was existing data that could be analyzed to indicate the level to which teachers were using technology in the classroom.

Data Analysis

The one-way analysis of variance (ANOVA) is used to determine whether there are any significant differences between the means of three or more independent (unrelated) groups. An independent one-way ANOVA was conducted. It was two-tailed and data was used over a three year period in order to draw inferences about any differences in student scores before, during and after the implementation of one-to-one in the classrooms. The level of significance was significant at $p < .05$. Because the data is comparing the independent groups with three years of results, an ANOVA is the best statistical model to use for this study to determine if there is significance. Data collected from historical observations before and during implementation was compared to professional development taken and student achievement on EOC exam scores. Data from interviews with teachers randomly selected was collected and analyzed.

Methodology

Historical Change Audit Data

One-to-one computing requires putting a technology device into the hands of every student. Research suggests that one-to-one computing will increase achievement, increase student engagement, enhance project based learning, overall broaden learning in the classroom, and prepare students for tomorrow's workplace (Jackson, 2004). A philosophy of education drives the path that each school district takes as the district decides the best way to educate their students. During an interview at the beginning of the one-to-one implementation process, the Superintendent of the school district being studied indicated the rationale for implementing a one-to-one program in their district was to help prepare teachers and students for 21st century learning and give all students equal opportunity to thrive with technology regardless of socio-economic status (Superintendent, 2012). Recognizing each student as a unique individual, the school district being studied believes that education should provide an opportunity for optimal student development and that through education; the opportunity exists for students to discover, achieve, and succeed (District CSIP Plan, 2009, p. 5).

In 2009, the school district being studied set goals to provide consistent technology to improve teacher communications and to provide consistent hardware to improve student accessibility (ibid, p. 35). The Superintendent of the district being studied, was part of Ozark Educational Research Initiative (OERI) a research, evaluation, and development organization in Southwest Missouri whose primary purpose is to improve, promote, and disseminate educational

research by conducting studies and program evaluations. With the development of this organization came collaboration among member school districts and the Institute for School Improvement (ISI). With the assistance of Missouri State University, a network of educational researchers and educators were united throughout Southwest Missouri (Ozarks Educational Research Initiative, 2012). According to the Associate Superintendent at the beginning of the implementation, as part of this initiative conversations took place about moving towards a one-to-one environment in schools (2012).

The school district being studied decided to work towards this initiative by putting grade books and work orders online and trained staff how to use these. Next, projectors were mounted in all classrooms and several Mimio devices—portable interactive whiteboards—were purchased and training given to staff on using the devices. Then, the district being studied began to send teams of teachers and administrators to various school districts that had implemented one-to-one programs and started to look at how they might move towards implementing one-to-one in their own district. During the 2011-2012 school year, plans were made to start an implementation process for the 2012-2013 school year. The District Technology Committee, made up of all district stakeholders, met and revised the District Technology Plan to reflect the move to one-to-one at the high school level and one-to-two in grades Kindergarten through Eighth (District Technology Plan, 2012). The plan also included that all teachers in the school district would receive laptop computers in August of 2012, and all high school students in grades 9-12 would receive laptop computers in January of 2013.

In order to reach this goal, a timeline was created by the Associate Superintendent outlining all of the steps that needed to take place in order for this to be successful (2012). Prior to implementation, the school had a simple technology usage agreement. Policies had to be rewritten to reflect the move from a standard technology usage agreement for students who were periodically using school computers while at school, to adoption of specific policies and procedures for students who were going to take responsibility of utilizing a school computer they would have in their possession at all times and could take home. It was important that the policies listed specific procedures for situations that would arise with the students having the ability to take the computers home. Policies were updated and reflected the procedures of computer usage. In mid-November 2012, several parent meetings were held to go over procedures and policies as well as digital citizenship issues. The timeline also took into account the wireless infrastructure—RFP—that had to be constructed, testing of possible devices, and professional development needed to be ready for a January 2013 dissemination to students.

Various studies were conducted in order to choose the best device for the district. According to the Associate Superintendent, by February of 2012, netbooks, laptops, iPads, Android tablets, MacBook Air, and ChromeBooks had all been evaluated (2012). The committee had created an evaluation tool that helped evaluate the possible devices based on what they wanted the devices to do: Write papers, search the internet, create presentations, run applications or programs, EOC testing, collaboration, and reading of eBooks. The faculty was surveyed and 72.2% felt a laptop computer would be the best tool to implement into the

classroom (ibid). The committee then evaluated four different devices. The final decision was to purchase the HP SpectreXT Pro 13.3" UltraBook. Each device had Windows 7 Professional, a self-maintainer program, 3 year warranty, and the school custom image laser etched on the top. A total of 2,100 units were ordered: 430 for faculty and staff, 1,620 for students, and 50 extra for growth and repair.

The UltraBooks had the "always-on" feature, which allows the computer to instantly turn on when it is opened. A protective carrier called the Infocase was decided on because of its rigid frame, soft foam sleeve, and rip stop nylon shell offering an enhanced level of crush and drop protection while also being built for this style of UltraBook (District Technology Integration Coordinator, 2012). There were 2,100 cases ordered with the school emblem and school name embroidered on the outside of the case to help deter theft.

Once the device and case were selected and ordered, conversations shifted to how to manage the implementation. DyKnow Monitoring software was selected for teachers to monitor what students were doing on their devices. The program allowed teachers to open and close applications by taking remote control of student devices. This software also allowed for teachers to send a poll, chat with students, and allowed teachers to broadcast and transfer files to student devices. A system configuration manager was also key to a successful implementation. A system configuration manager is needed to allow for applications and profiles to be pushed out to student computers so that each computer did not have to physically be touched whenever changes needed to be made. Microsoft System Center Configuration Manager was chosen for

the system configuration manager as it aligned the client compliance and remediation capabilities needed while also featuring Endpoint Protection, where the entire client infrastructure could be managed and protected in a single solution. According to the Director of Technology Integration, this configuration manager also integrated well with K12 in the cloud (K12ITC) where all district active directory information would transfer easily into the configuration manager to keep student accounts up to date (2012). It was very important for ease of management to find a program that would allow for automatic updates utilizing the student information system (SISK12) and active directory program that the district was using (ibid).

Targus Port Replicators were purchased to create dual video docking for the staff. This was the only docking station to offer enhanced speed and power associated with the USB 3.0 that the UltraBooks used. This dock ensured quick and easy setup and provided a place for all necessary peripherals (ibid). A Microsoft wireless keyboard and mouse were also purchased for each teacher receiving the port replicator.

The infrastructure of the high school was completely rewired and updated with Aruba Networks to accommodate the additional devices. Wireless access points were place in every other classroom and the computers had a dual band wireless card to allow for fewer dropped signals on the Aruba Network. This network is designed for educational campuses and the number of devices that the district would be connecting. The computers were handed out to students for a trial run in December of 2012 to test the network access and bandwidth. It had been decided that additional bandwidth would be purchased prior to the test, but the test

solidified the need for the additional bandwidth. The district went from 100MB bandwidth connection to 250MB bandwidth connection that was upgraded right before implementation at the beginning of January 2013. After the end of the second full year, the decision was made to increase the bandwidth again to 500MB prior to the beginning of the 2014-2015 school year. Weekly meetings were held with all key administrators and technicians in November and December of 2012 to ensure as much as possible a successful student dissemination.

Professional Development

The District Technology Plan (2012) contained goals and strategies for professional development for the teachers prior to the one-to-one implementation (pp. 22-24). The professional development academy in August of 2012 addressed professional development for one-to-one by focusing on technology integration into the curriculum. There were also professional development opportunities scheduled throughout the fall of 2012 that focused on how to implement the new technology into the classrooms. A total of 206 professional development hours in the area of technology were offered to teachers during the 2012-2013 school year. 109 Teachers participated in 1,430.5 total hours of professional development in the area of technology. Teachers were asked to start with the basics of creating a website as a common location to direct students and parents to. According to the building Principal, for the first semester, teachers were expected to be familiar with their website, Google Documents—as a way to collaborate with students—and the DyKnow Monitoring software (2012).

Professional development was continued during the 2013-2014 school year in the area of technology. 169 hours of professional development were offered in the area of technology. 110 teachers participated in a total of 948 hours that involved technology integration. The topics arranged from basic website development to introducing students to blogging.

The school being studied also hired an Instructional Technology Coach at the beginning of the 2012-2013 school year. This new position was created to help teachers have someone to collaborate with on a regular basis about how to incorporate the technology into their curriculum. The Instructional Technology Coach was a certified teacher who had experience with utilizing technology in the classroom. The coach regularly offered professional development as well as scheduled sessions weekly during department plan periods. She was also available on an as needed basis for teachers who were struggling with a technology incorporation issue.

Implementation Launch

The school being studied decided to self-insure the computers. In order to accomplish this, an annual technology usage fee of $50.00 was charged per student that was used to cover the cost of insuring replacement devices for lost, stolen, or damaged computers. However, this fee was $25.00 for the 2012-2013 school year since students were not getting the computer until 2nd semester. Students who could not afford the usage fee were allowed to work five hours per semester after school to cover their fee. The work would allow students to have some ownership and responsibility towards the computer. There were 20 students who did the work program the first semester and 25 students for the second year. The money collected from the usage fee was

pooled into a fund to help with repair and replacement costs of damaged computers. The technology support staff received training to be certified as HP technicians in order to be able to self-maintain the computers which saved both time and money. However, because there were some design defects with the device, HP honored a three year warranty on parts for cracked screens and broken hinges. There were 431 screens cracked and 745 hinges that had to be repaired in just the 2013-2014 school year.

A help desk area was built by the woodworking classes at the school being studied. Work tables and a receiving desk were built by the students as well as rolling storage carts for the laptops when not being used by students. The student computers were configured in mid-October of 2012. Juniors and seniors were able to pick up their computers on January 3, 2013 and freshman and sophomores were able to get their computers on January 7, 2013. By February of 2013, 96% of students in grades 9-11 were participating in the program and 76% of students in grade 12 were participating in the program. This number far surpassed what had been predicted for the first semester of the initiative. During the 2013-2014 school year, 96% of students in grades 9-12 participated in the program.

Supplemental Resources

An agreement with Glencoe textbook company was made for the first year to pilot e-textbooks by teachers who wanted to participate in the pilot. The English department, Social Studies department, one math teacher, two science teachers, and three health teachers all participated in the pilot for the first year. Teachers piloted with 30 licenses per teacher in order

to establish if that number would be sufficient for all of their students. This was important as there was not a budget to completely update to e-textbooks for all students. After the pilot, the six year e-textbook licenses were purchased for the American History textbooks that were used for both 9th and 10th grade students as well as the Health classes and the one math class. There were 35 licenses purchased per teacher instead of the piloted 30. This number allowed for there to be enough licenses per class with some of the larger classes. Neither the English department nor Science teachers incorporated the books that they piloted after the pilot ended. The total cost for the e-textbooks purchased was $19,867.05.

Prior to implementation, Discovery Education was purchased for the entire building and Turn-It-In.com for two International Baccalaureate (IB) teachers. Discovery Education continued to be purchased for the entire building, and Turn-It-In.com was then purchased for the entire building after the first two years. Blackboard was purchased for the IB and online classes only prior to implementation. No decision had been made to expand Blackboard to the entire student body at completion of the case study. MyBigCampus services were included as part of the filter that the school district purchased prior to implementation. At the conclusion of the case study, this service had not been launched for all teachers.

The District Technology Plan was revised in the spring of 2014 to establish a budget allowing for a rotation schedule to replace the computers. The plan also allows funds to purchase sample devices to place in the hands of students to evaluate a year prior to the replacement rotation beginning. This was an important component to the initiative because the

original device chosen did not prove to be as durable for teenage students to carry around. The rotation schedule will allow for devices to be replaced after four years of use and will replace a grade level each year.

Methods Summary

The overall one-to-one implementation process moved very quickly in the district being studied. It was helpful that the district being studied had been at the forefront of technology in the classroom with all teachers having projectors and document cameras in individual classrooms. Having that technology in place allowed for the district to be able to start towards the next step. Discussions first started towards one-to-one in the 2011-2012 school year and laptops were issued to students in January 2013.

The infrastructure was completely redone over the summer of 2012 to prepare for the implementation. Hardware and software were purchased over the summer and fall of 2012 for the execution of one-to-one during the second semester of the 2012-2013 school year. Policies were rewritten to reflect the additional student possession of school purchased computers. Professional development sessions were offered to help prepare teachers for the shift that would occur in the classroom with students all having access to a computer. The district continued to offer support and professional development to help teachers utilize the computers throughout their curriculum with the hiring of an Instructional Technology Coach. By the end of the second year, 96% of students in all grade levels were participating in the one-to-one initiative. Budgets

reflected continued support of the initiative through supplemental materials and a rotation schedule for the replacement of the devices.

The case study analyzed the one-to-one implementation impact through student achievement and teacher pedagogy. EOC Exam results were analyzed for student achievement. Teacher evaluations, professional development analysis, and teacher interviews were used to analyze teacher pedagogy.

Chapter IV

Analysis of the Data

This purpose of this case study was to determine the impact the implementation of a one-to-one initiative on student achievement and teacher pedagogy in a high school in Southwest Missouri. In this chapter, findings are presented in three different sections. The first section will cover the student achievement results as based on the state EOC Exam. The second section will describe the teaching staff data including classroom observation and professional development results. The final section will address the random teacher interviews conducted.

Student Achievement Results – Descriptive Statistics

The participants in this case study were students in grades 9-12 and teachers at a high school located in Southwest Missouri. In 2012, there were 1,502 student enrolled in grades 9-12 at the school being studied. In 2013 there were 1,488 students enrolled in grades 9-12 at the school being studied. In 2014 there were 1,508 students enrolled in grades 9-12 at the school being studied. The End of Course (EOC) Exam scores showed increases in some areas and decreases in others. EOC Exam score results will be presented in several variations. The first set of data will cover a basic overall subject score based on proficient and advanced percentages as those scores are considered passing by DESE. The base score for each of the areas is an average of scores from 2009 – 2012. The numbers listed are the percentage of students that received proficient and advanced on the spring EOC Exam for that subject.

The first overall subject area is English Language Arts. There are two EOC Exams given in this area. The English I scores increased from an average of 69.5 to 72.5 in 2013 and 75.2 in 2014 for an overall growth of 5.7. The English II scores increased from an average of 80.5 to 82.1 in 2013 and 82.8 in 2014 for an overall growth of 2.3.

Table 1-English I Proficient and Advanced Results

Year	Proficient and Advanced Percentage
Baseline Average from 2009	69.5
2013	72.5
2014	75.2
Total Growth	5.7

Table 2-English II Proficient and Advanced Results

Year	Proficient and Advanced Percentage
Baseline Average from 2009	80.5
2013	82.1
2014	82.8
Total Growth	2.3

The next area is Mathematics. There are three EOC Exams given in this area. The Algebra I scores increased from an average of 72.8 to 75.7 in 2013 and 76.9 in 2014 for an overall growth of 4.1. The Geometry scores increased from an average of 65.7 to 79.5 in 2013 to 88.1 in 2014 for an overall growth of 22.4. The Algebra II scores increased from an average

of 74.3 to 91.6 in 2013; however, they decreased to 84.3 in 2014 leaving an overall growth of 10.0.

Table 3-Algebra I Proficient and Advanced Results

Year	Proficient and Advanced Percentage
Baseline Average from 2009	72.8
2013	75.7
2014	76.9
Total Growth	4.1

Table 4-Geometry Proficient and Advanced Results

Year	Proficient and Advanced Percentage
Baseline Average from 2009	65.7
2013	79.5
2014	88.1
Total Growth	22.4

Table 5-Algebra II Proficient and Advanced Results

Year	Proficient and Advanced Percentage
Baseline Average from 2009	74.3
2013	91.6
2014	84.3
Total Growth	10.0

Science is the next EOC subject area examined. Biology is the only EOC Exam given in this subject area. Biology increased from an average of 77.9 to 89.1 in 2013; however, it decreased to 81.2 in 2014 leaving an overall growth of 3.3.

Table 6-Biology Proficient and Advanced Results

Year	Proficient and Advanced Percentage
Baseline Average from 2009	77.9
2013	89.1
2014	81.2
Total Growth	3.3

The final subject area is Social Studies. There are two EOC Exams given in this subject area. American History increased from an average of 53.0 to 61.9 in 2013; however, it decreased to 59.7 in 2014 leaving an overall growth of 6.7. American Government increased from an average of 55.4 to 64.2 in 2013 and 75.3 in 2014 for an overall growth of 19.9.

Table 7-American History Proficient and Advanced Results

Year	Proficient and Advanced Percentage
Baseline Average from 2009	53.0
2013	61.9
2014	59.7
Total Growth	6.7

Table 8-American Government Proficient and Advanced Results

Year	Proficient and Advanced Percentage
Baseline Average from 2009	55.4
2013	64.2
2014	75.3
Total Growth	19.9

Even though there was a decrease in three of the subject area results from 2013 to 2014, all eight areas increased overall from the beginning proficient and advanced average percentage to the 2014 proficient and advanced percentage.

Student Achievement Results – Inferential Statistics

To determine if these increases were significant, further deeper analysis of student achievement data was needed. The EOC Exam data was exported from Questar in an Excel file and imported into IBM Statistical Package for the Social Sciences (SPSS) software to run the data analysis. The one-way analysis of variance (ANOVA) best determines whether there are any significant differences between the means of three or more independent (unrelated) groups. Tukey's Honest Significant Difference (HSD) test was then performed to further differentiate the significance between the years.

Using the raw score data from the spring 2012, spring 2013, and spring 2014 EOC Exams, an independent one-way ANOVA was conducted. It was two-tailed and data was used

over a three year period in order to draw inferences about any differences in student scores before, during and after the implementation of one-to-one in the classrooms. The level of significance was significant at $p < .05$. Even though the overall proficient and advanced percentages increased over the three year period for all subject areas, only seven of the areas showed significance at $p < .05$ level.

In the area of English Language Arts, two EOC Exams are given. English I raw score data did not show a significance at the level of $p < .05$. The mean score did grow from 27.61 in 2012 to 28.01 in 2013 and finished at 27.78 in 2014. However, the significance was only at a .663 level. When Tukey's HSD test was performed, there was no significance shown between any of the years. English II raw score data did show a significance of $p < .05$. The mean score increased from 25.74 in 2012 to 29.15 in 2013 and decreased to 29.08 in 2014. The significance was at the .000 level. When Tukey's HSD test was performed, significance was shown between 2012-2013 and 2012-2014 at .000. There was no significance shown between 2013-2014 at .981. This indicates that even though there was no significance between the last two years, the overall growth did show significance.

Table 9-ANOVA for English I Raw Data

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	33.903	2	16.952	.411	.663
Within Groups	48008.451	1163	41.280		
Total	48042.354	1165			

p = n.s.

Table 10-ANOVA for English II Raw Data

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	2915.087	2	1457.544	45.830	.000*
Within Groups	36859.905	1159	31.803		
Total	39774.992	1161			

Note. *=$p < .001$

In the area of Mathematics, Algebra I raw score data did show a significance of $p < .05$. The mean score did grow from 23.07 in 2012 to 24.76 in 2013 and ended at 25.67 in 2014. The significance was at a .000 level. When Tukey's HSD test was performed, significance was shown between 2012-2013 at .010 and 2012-2014 at .000. There was no significance shown between 2013-2014 at .238. This indicates that even though there was no significance shown between the last two years, the overall growth did show significance. Geometry raw score data did show a significance of $p < .05$. The mean score increased from 26.33 in 2012 to 28.32 in 2013 and 29.92 in 2014. The significance was at the .000 level. When Tukey's HSD test was performed, significance was shown between 2012-2013 and 2012-2014 at .000. Significance was shown between 2013-2014 at .009. This indicates a significance between every year in the comparison even though it was stronger in the first two and overall. Algebra II raw score data did show a significance of $p < .05$. The mean score increased from 28.33 in 2012 to 31.17 in 2013

and 29.33 in 2014. The significance was at the .000 level. When Tukey's HSD test was performed, significance was shown between 2012-2013 at .000 and 2013-2014 at .005. There was no significance shown between 2012-2014 at .191. This indicates that the overall growth was not significant because of the decrease from 2013-2014 scores, there was significance between the first two and last two years, however the last two years significance was a reflection of a decrease in the mean score.

Table 10-ANOVA for Algebra I Raw Data

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1101.360	2	550.680	10.769	.000*
Within Groups	48525.783	949	51.134		
Total	49627.143	951			

Note. *=$p < .001$

Table 11-ANOVA for Geometry Raw Data

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1789.506	2	894.753	25.401	.000*
Within Groups	27581.361	783	35.225		
Total	29370.866	785			

Note. *=$p < .001$

Table 12-ANOVA for Algebra II Raw Data

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	928.041	2	464.020	13.802	.000*
Within Groups	21247.304	632	33.619		
Total	22175.345	634			

Note. *=$p < .001$

In the area of Science, Biology raw score data did show a significance of $p < .05$. The mean score did grow from 25.95 in 2012 to 42.11 in 2013 and finished at 39.49 in 2014. The significance was at a .000 level. When Tukey's HSD test was performed, significance was shown between 2012-2013, 2013-2014, and 2012-2014 at .000. This indicates a strong significance between all years in the comparison even though the final year significance reflected a decrease in the mean score from the previous year.

Table 13-ANOVA for Biology Raw Data

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	58833.198	2	29416.599	457.006	.000*
Within Groups	74345.200	1155	64.368		
Total	133178.398	1157			

Note. *=$p < .001$

In the area of Social Studies, the American History raw score data did show a significance of $p < .05$. The mean score did grow from 23.51 in 2012 to 25.72 in 2013 and finished at 24.95 in 2014. The significance was at a .000 level. When Tukey's HSD test was performed, significance was shown between 2012-2013 at .000 and 2012-2014 at .005. There was no significance shown between 2013-2014 at .206. This indicates that there was significance between the first two years and the overall growth, but no significance between the last two years. American Government raw score data did show a significance of $p < .05$. The mean score decreased from 28.52 in 2012 to 27.54 in 2013 but then increased to 29.08 in 2014. The significance was at the .013 level. When Tukey's HSD test was performed, the only significance was shown between 2013-2014 at .010. This indicates that the only significance was found between the last two years of the study.

Table 14-ANOVA for American History Raw Data

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	923.395	2	461.697	12.013	.000*
Within Groups	42237.415	1099	31.803	38.433	
Total	43160.809	1101			

Note. *=$p < .001$

Table 15-ANOVA for American Government Raw Data

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	426.669	2	213.335	4.346	.013*
Within Groups	52125.096	1062	49.082		
Total	52551.765	1064			

Note. *=$p < .05$

The researcher was also interested in the impact of one-to-one on EOC Exam scores of various subgroups. Free and reduced lunch students and IEP students were the two largest subgroups, so those specific subgroups were chosen for further analysis. The student demographic data was exported from the student management system (SISK12) that the school uses. The demographic data was only available for current students, so the three year span was not as complete for the junior EOC Exams given since those students who tested in 2012 had already graduated. The data was then merged in an Excel file with the EOC Exam results data from Questar and imported into SPSS for analysis. The subgroups showed less significance at the $p < .05$ level than the overall groups. The results in this chapter will only discuss those subgroups that showed significance at the $p < .05$ level.

The results for students enrolled in the English I course who were also on free and reduced lunch showed significance at the $p < .05$ level. This subgroup increased the overall mean from 25.81 in 2012 to 32.15 in 2014. The significance level was .001. When Tukey's HSD test was performed, significance was shown between 2013-2014 and 2012-2014 at .001.

This indicates that the last two years and overall growth showed significance even though the first two years did not. The results for students enrolled in the English I course who were also IEP students showed significance at the $p < .05$ level as well. This subgroup increased their mean from 21.00 in 2012 to 36.00 in 2014. The significance level was .002. Tukey's HSD test was not performed for this subgroup's raw score because at least one group had fewer than two cases. The results for students enrolled in the English II course and were also IEP students showed significance at the $p < .05$ level. This subgroup however, decreased their mean going from 21.65 in 2012 to 17.41 in 2014. When Tukey's HSD test was performed, significance was shown between 2013-2014 at .009 and 2012-2014 at .028. There was no significance shown between 2012-2013. This indicates that there was an overall significance even though there was no significance between the first two years and it was not as strong as the last two years significance, however that significance was with a decreasing mean score.

Table 16-ANOVA for English I Free and Reduced Lunch Data

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	747.833	2	373.916	7.325	.001*
Within Groups	11485.058	225	51.045		
Total	12232.890	227			

Note. *=$p < .001$

Table 17-ANOVA for English I IEP Data

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	521.072	2	260.536	6.587	.002*
Within Groups	2570.811	65	39.551		
Total	3091.882	67			

Note. *=$p < .01$

Table 18-ANOVA for English II IEP Data

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	366.736	2	183.368	5.670	.005*
Within Groups	2555.069	79	32.343		
Total	2921.805	81			

Note. *=$p < .01$

In the area of Mathematics, the results of students enrolled in the Algebra I course who were also on free and reduced lunch showed significance at the $p < .05$ level. However, the overall mean for this subgroup decreased from 23.98 in 2012 to 18.69 in 2014. The significance level was .000. When Tukey's HSD test was performed, significance was shown between 2013-2014 and 2012-2014 at .000. There was no significance shown between 2012-2013. This indicates a strong significance between the last two years and growth overall even though there was no significance the first two years, however it was a significance reflected in the decrease of

the mean score. The results of students enrolled in the Geometry course who were also on free and reduced lunch showed significance at the $p < .05$ level as well. This subgroup increased their mean from 26.12 in 2012 to 28.98 in 2014. The significance level was .026. When Tukey's HSD test was performed, significance was only shown between 2012-2014 at .029. This indicates that there is only significance between the overall growth and not in between the individual years. It is interesting to note that two of the three overall decrease in scores throughout the study were amongst free and reduced lunch students in Mathematics courses.

Table 19-ANOVA for Algebra I Free and Reduced Lunch Data

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1441.988	2	720.994	14.991	.000*
Within Groups	9715.456	202	48.096		
Total	11157.444	204			

Note. *=$p < .001$

Table 20-ANOVA for Geometry Free and Reduced Lunch Data

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	254.577	2	127.289	3.736	.026*
Within Groups	5519.023	162	34.068		
Total	5773.600	164			

Note. *=$p < .05$

In the area of Science, students enrolled in the Biology course and were also on free and reduced lunch showed significance at the $p < .05$ level. This subgroup increased their mean from 25.93 in 2012 to 37.32 in 2014. The significance level was .000. When Tukey's HSD test was performed, significance was shown between all years. Significance was .000 between 2012-2013 and 2012-2014 at .000. The significance was at .017 between 2013-2014. This indicates significance between all years of the study even though it was not as strong between the last two years. Students enrolled in the Biology course and were also IEP students showed significance at the $p < .05$ level as well. This subgroup increased their mean from 22.21 in 2012 to 25.70 in 2014. The significance level was .000. When Tukey's HSD test was performed, significance was shown between 2012-2013 at .000 and 2012-2014 at .002. There was no significance shown between 2013-2014. This indicates even though there was no significance between the last two years, there was significance between the first two and overall growth.

Table 21-ANOVA for Biology Free and Reduced Lunch Data

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	9537.618	2	4768.809	71.081	.000*
Within Groups	18449.778	275	67.090		
Total	27987.396	277			

Note. *=$p < .001$

Table 22-ANOVA for Biology IEP Data

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1610.881	2	805.441	11.749	.000*
Within Groups	5278.806	77	68.556		
Total	6889.688	79			

Note. *=$p < .001$

The final subject area subgroups studied was Social Studies. Even though overall students raw scores showed significance at the $p < .05$ level, neither subgroup in this subject area showed significance at the $p < .05$ level.

Teaching Pedagogy Data

In 2013 there were 109 full-time teachers participating in professional development and being evaluated at the school being studied. In 2014 there were 110 full-time teachers participating in professional development and being evaluated at the school being studied. The first area to be studied concerning the staff was the classroom observations. The school being studied had a principal-created teacher observation form already in place to evaluate teachers' classroom performance during the 2013-2014 school year. Part of that teacher observation form included an area to track the level of the use of technology in the classroom. The choices to select were Literacy Level (where technology is something to learn), Adaptive Level (where

technology is optional), Transforming Level (where technology is essential) and technology use was not observed.

The classroom observations showed that when looking at all teachers in the building, 45.70% of the time during the classroom observations technology use was not observed. The Literacy Level was observed 3.64% of the time for all teachers. The Adaptive Level was observed 24.17% of the time for all teachers and the Transforming Level was observed 26.49% of the time for all teachers. When separating the data out to include only the teachers of EOC Exam courses, the data showed that 36.06% of the times during the classroom observations the EOC Exam teachers were not using technology. The Literacy Level was observed 2.46% of the time for EOC Exam teachers. The Adaptive Level was observed 31.97% of the time for EOC Exam teachers and the Transforming Level was observed 29.50% of the time for EOC Exam teachers. During classroom observations, EOC Exam teachers were utilizing the one-to-one technology in some form 9.64% of the time more than the average of all teachers.

Table 23-Classroom Observations of Technology Use for All Teachers

Technology Utilization Level	Percentage of Teachers
Literacy Level	3.64
Adaptive Level	24.17
Transforming Level	26.49

Technology Use Not Observed	45.70
Total Using Technology at Some Level	54.30

Note. Data collected during 2013-2014 school year

Table 24-Classroom Observations of Technology Use of EOC Exam Teachers

Technology Utilization Level	Percentage of Teachers
Literacy Level	2.46
Adaptive Level	31.97
Transforming Level	29.51
Technology Use Not Observed	36.06
Total Using Technology at Some Level	63.94

Note. Data collected during 2013-2014 school year

Professional Development

The case study also examined the amount of technology-focused professional development teachers attended during the first two years of the one-to-one implementation. During the 2012-2013 school year, teachers participated in a total of 1,430.5 hours of technology professional development. During the 2013-2014 school year, teachers participated in a total of 948 hours of technology professional development. The individual teacher professional development data revealed that 80.91% of teachers participated in fewer total hours of

technology professional development during the 2013-2014 school year than they did in the 2012-2013 school year.

Table 25-Teacher Technology Professional Development Hours

School Year	Technology PD Hours
2012-2013	1,430.50
2013-2014	948.00
Total Difference Between Years	-482.50

Note. Data collected from District Professional Development logs

Learning technology was the area of professional development predominately focused on by teachers. The most attended professional development courses taken were the following:

- Blackboard Training
- Google Docs-Basic
- Google Forms: Creating Assessments that Grade Themselves
- LearningExpress Library to the Rescue
- Navigating Windows 7 and MS Office 201 on Your New Laptop
- Pinterest for Beginners
- Presentation Tools to Enhance Instruction
- Recording Your Lessons for the Classroom & Beyond!
- Rockstar Google Sites

- So My Students Have Laptops…Now What?
- Technology Vision
- Creative Ways of Grading in Google Docs
- Discovery Education, Mining the Internet
- Setting Up Your Classroom with Google
- Extreme Website Makeover
- Take Your Classroom to the Next Level with DyKnow

The majority of these professional development trainings involved learning basic instructional technology and Web 2.0 skills that teachers could work towards incorporating into their lessons.

Random Teacher Interviews

Since the success of a one-to-one implementation will rely heavily on teacher participation, interviews were used to investigate and analyze the one-to-one implementation process with teachers. Participants were questioned about professional development, best practices in the classroom, and effects of one-to-one on student achievement and engagement. Participants' perception of the implementation and their role in that process was seen as an integral part of this case study. All interviews were conducted in person by the researcher. Interviews were audio recorded and transcribed. All interview participants were asked the same set of questions. The random names were selected by printing out an alphabetical list of all teachers evaluated and selecting every seventh teacher. This random selection process generated a total of 17 teachers as possible interview participants. Twelve of these 17 teachers agreed to

participate in the interview process. There were three English teachers, one Math teacher, one Science teacher, two Social Studies teachers, one Fine Arts teacher, two Practical Arts teachers, and two Special Education teachers that participated in the interviews. Of the 12 teachers, seven had a Bachelor's Degree, four had a Master's Degree, and one had an Educational Specialist. Eleven of the 12 teachers had tenure and nine of the interview participants had more than 10 years of teaching experience. The average percentage of observations using technology at the adaptive or transformative level by the interview participants was 77.6%. The total of technology professional development hours taken by interview participants during the 2012-2013 school year was 260.65 and the total for the 2013-2014 school year was 133.

Table 26-Interview Participant Demographics and Descriptive Statistics

Participant Number	Subject Area Taught	Total Years' Experience	Educational Degree	Adaptive Observation Percentage	Transformative Observation Percentage	Tech PD 13	Tech PD 14
1	Social Studies	19	M.S.	100	0	31	9
2	Special Education	21	Ed.S.	100	0	23.5	21
3	Social Studies	7	B.S.	0	67	47.75	26
4	Practical Arts	32	B.S.	75	0	24.5	12
5	Practical Arts	21	B.S.	25	75	18.5	12

6	Science	19	M.S.	33	33	4	7
7	Math	11	B.S.	0	75	11	8
8	English	12	B.S.	33	33	31	9
9	Fine Arts	16	B.S.	0	50	3	4
10	Special Education	1	B.S.	100	0	n/a	5
11	English	7	M.S.	67	33	54.5	0
12	English	13	M.S.	33	0	12	20

Question 1: What types of technology tools / activities are you utilizing in the classroom consistently? How many different technology tools do you implement during one lesson? Teachers listed several different tools and activities that they were utilizing in their classroom consistently to collect assessment data such as quizzes on Scantron, ExamView, Flubaroo, and data collection with sensors. Other popular activities being utilized by teachers included various presentation software, blogging, communication websites such as Today's Meet and Poll Everywhere, YouTube, Google Docs / Drive, Evernote, Khan Academy, and BlendSpace. The teachers' individual website and DyKnow Monitoring were the two tools that teachers cited utilizing the most to help with the one-to-one implementation.

Interviews revealed that teachers were excited about the opportunities that one-to-one brought to the classroom. "We can now take virtual fieldtrips and go to places like the Grand

Canyon and students can hang their head over it without ever having to leave the classroom" (Interview 1; from this point forward will be identified as *I1*).

> Students can now do research on the topics we are going to study before I introduce the lesson. This gives them some background knowledge before I go into the lesson so we can have better-rounded classroom discussions (*I4*).

> I can now do more project based assignments…for example I just had a student complete a final project where they did a film. They couldn't have done that without one-to-one (*I11*).

There was a general excitement amongst the teachers about the opportunities that having the laptops in the classroom allowed for in their curriculum.

Teachers found that they did not have to use a lot of different technology tools with the one-to-one, they just had to utilize ones that worked well and helped students think deeper. On average, teachers stated that they used two to three technology tools per one lesson.

> I don't have to do a lot of bells and whistles with one-to-one…students can find that on their own. What I do have to provide is a project that allows them the creativity to do their own thing while asking for higher order thinking processes….the rest just falls into place because they are excited and think of things I never would have imagined (*I11*).

> I may offer more tools for students to choose from, but individually they typically only use one to two in a lesson. It doesn't take a lot [of tools] once they find the one that works for them. The key is offering several options so they can choose the one that they like. When they have that choice in the process, they work harder with less (*I3*).

This is a key discovery as teachers also indicated they were concerned prior to the one-to-one implementation that they would have to know and do a lot of different Web 2.0 tools / activities.

Question 2: Describe your typical class period – the flow of the class and how you integrate one-to-one. In what ways has your teaching style (pedagogy) changed throughout this year?

Teachers indicated in answering this question that one-to-one implementation has helped them better organize their classes. A majority of the teachers stated they have students' complete bell-ringer activities on their laptop to work on while the teacher takes role and performs beginning of class activities. Notes and lecture materials were then easily sent through Google Drive or the DyKnow Monitoring Software. After the notes and lecture was complete, the teachers then indicated that some type of synthesizing activity was used to culminate the material. Various activities were mentioned by teachers to help with that culmination process from web quests to internet research to producing a final product. One hundred percent of the teachers interviewed indicated that they use the laptops to assess students. This was done either formatively or just as a quick gauge of student knowledge.

> How my class flows depends on the class. With my upper level seniors, I do more project based assignments and they typically choose what works best for them to complete the assignment. With my sophomores, I have to be more structured because they tend to need it (*I8*).

> With my [special education] students, the laptops have allowed our class time to be more focused on what they need to be working on instead of me or them spending time tracking teachers down to find out the assignments they need to complete. Students can start class by looking up their grades in SIS and see what assignments they are missing then going to teacher's websites to get the assignment information all right from my classroom (*I2*).

The consensus was that the laptops did not have to be used the entire class period, but a majority of the teachers typically used one-to-one in some form daily.

For more than half of those interviewed, pedagogy has shifted. "I have seen my pedagogy change some as I've tried different techniques such as backward design and flipping

the classroom since my students now have access to the technology" (*I8*). "I am a believer now that for some students, the ability to do the flipped classroom is quite valuable" (*I4*).

> The biggest change I've noticed is it opens up a whole new world. I'm able to incorporate things into my lessons that I haven't been able to before because of access….Students having this access has allowed me to not lecture as much and have students find and share the important information (*I1*).

> My pedagogy has gotten way more informal. It has become more student driven so it's less about me and what I teach and more about them and what they can do or can learn. So while I am still giving them the information that I want them to have, they are doing more individual type stuff with that information (*I3*).

Teachers that felt they did have a shift in their pedagogy mentioned that after the first year, stated they focused their professional development on areas that would help them with differentiation and higher-order thinking skills instead of the specific technology skills.

However, some teachers stated that the one-to-one implementation had not changed what they do in the classroom. These teachers stated it was simply nice that they do not have to schedule computer lab access for quizzes or other assignments. "I haven't changed my teaching style other than the fact that they are using the laptop to take a quiz" (*I12*).

> I haven't changed my pedagogy in the classroom. The laptops aren't really beneficial to my area of teaching…..However; we have changed how we communicate to parents and students by putting all of our documents and communication online on our website. They can get access to it at school or home and this has cut down on a lot of wasted paper" (*I9*).

The teachers that indicated they had not shifted their pedagogy were only participating in technology professional development that demonstrated how to perform specific Web 2.0 activities or tools according to professional development logs. Based on answers to a question

asked later in the interview process, these teachers were not incorporating as much technology because they did not feel that the tools they had learned about were relevant to what they taught.

Question 3: How do you decide what technology to incorporate into your lessons?

Teachers indicated that they incorporate technology into their lessons based on their comfort level and their assessment of their particular student groups. None of the teachers indicated that they felt they incorporated technology for technology sake and anything they incorporated had a purpose to the lesson or they did not use it. "A lot of how I decide what to use is based on what is available electronically" (*I10*). "I incorporate technology based on where we are at and whatever is available…when there is something I get to in my lesson that technology fits into, then we will pull that up and use it" (*I6*).

> I usually incorporate what I am more comfortable with. The problem with implementing a new tool is that you have to take the time to go over that tool with them….When we did a BlendSpace activity for the first time, I had to spend a good part of the class period teaching them how to use that. Then because of filtering issues they were having with the site, we had to find some work-arounds to finish the project. If I had just given it to them without taking that time to teach, they wouldn't have done it. And if we have problems with it, I am less likely to use it again (*I3*).

> I don't try to create a situation where I can be like 'Hey, I'm going to use this random technology thing' I usually look at what my objective is for my lesson, what I want my students to be able to get out of this and then find the tool that I can best understand and something that the kids can best understand….You have to stop, assess where you are at, what is working and what isn't and adjust – just like any other teaching technique (*I1*).

> This is the area I feel the weakest in, knowing the best way to do something. It seems like now there are 10 different ways for me to deliver an assignment as a Math teacher….and you ask yourself what is the best way to do that? That is something I don't have an answer for yet. Hopefully five years from now I'll have a better answer (*I7*).

Teachers did indicate that they tried ideas and activities out themselves prior to the lesson. If they struggled getting the activity to work the way they wanted, they did not use it with the students. Teachers were very concerned with the class time wasted when the technology did not work and wanted to avoid that if possible.

Question 4: Where do you get ideas for new technology?

Teachers indicated they learn about new technology tools from many different sources. Those sources indicated the most were professional development, technology conferences, online searches, Twitter, Blogs they follow, Pinterest, and collaboration with other teachers. "I get a lot of my stuff off of Pinterest and Twitter…the EduTech and Psychology users I follow have a lot of ideas I like to try, but most of my stuff comes from Pinterest" (*I3*). "I've gone to several different technology conferences where I have gotten ideas from and I watch a lot of tutorials I found by searching on Google for things I want to know more about" (*I1*).

> I tend to rely a lot on just searching. I use Twitter and educational blogs a lot because I like being plugged in and it helps me get new ideas. My students are also a great resource for new ideas, when I say here are some of the things I think matter for this unit or activity they are the ones that come up with new and great ideas on how to achieve that (*I11*).

"I mostly get my ideas through other teachers and collaboration" (*I7*). "I have done a lot of research myself, especially when there is something coming up that I know I'm going to have to know about that I'm not as familiar with" (*I4*). Teachers indicated through the interview questions that they have begun to rely less on professional development and look for ideas and activities on their own and through collaboration within their departments.

Question 5: While implementing one-to-one, how do you assess student learning? How has your assessment process changed since the adoption of one-to-one?

Most of the teachers indicated they still use the standard quiz to assess student learning. Some stated they do try to use the technology at times to speed up data collection by using Flubaroo, a Google script which allows for easy online grading, or Scantron to have students take the quiz. Other teachers indicated that they had started to use some standards based grading and look for online options that have assessment pieces as part of the services. These teachers started to incorporate some of that into their lessons during the 2013-2014 school year.

> I usually assess in an old school fashion with taking a quiz. I have done some Flubaroo stuff, but the problem with that is you have to go back and analyze that so you can go back and reteach if it is needed and that is where I get bogged down with the process. But usually if we are using some type of tool that is distracting, I can just tell by their engagement if it is working or not (*I3*).

> I use the information through our [department] formative testing and I also come up with checklists for the various objectives in a unit of things I want them to accomplish. I have everything in a spreadsheet that I share with students so they know how they are doing on the particular things I want them to get from that unit. Having one-to-one has made it easier to move to more standards based grading at the high school level (*I1*).

> There are a lot of online programs I now use that students have login information to that allows me to track their progress and differentiate at the same time. Online quizzes allow me to project results and have us look at a class what we aren't getting and go back over it. It is so much faster than 'trading and grading' done in the past and has more authenticity to it (*I7*).

Assessment processes is one of the most available technology tools available to teachers, but is one that was not being utilized as frequently as other Web 2.0 tools, according to the teacher interviews.

The majority of teachers interviewed indicated that they have not changed much with formal assessment at this point in the implementation process. "I haven't changed my assessments since students have had their laptops, but I do use Scantron now to give the assessments making it easier to grade" (*I*4). However, two teachers did indicate that their whole philosophy has shifted and assessment is part of that shift. These teachers have started moving their curriculum to project based learning where the assessment checks are frequent, but not in a quiz form.

> I am assessing more and doing less busy work. But I don't know if that is specifically because of one-to-one or if that's because of my teaching style and what I am learning as I go through my teaching career. I'm giving them bigger assessment tools like ongoing projects instead of worksheets and quizzes (*I3*).

> Definitely it has changed, and I feel for the better. Philosophically I am against just having assessments that focus on [Depth of Knowledge (DOK)] level one. I'm struggling right now and working through that process. I've been against that for a long time and one-to-one has been one more nail in that coffin. My thinking is let's focus on DOK level three and four as a community (myself and my students) shared goals decision, I think if the project is set up well, DOK one objectives kind of comes along with that. So it forces them to go back and learn the DOK one items that are needed to cover the DOK three and four goals. So I am very project based (*I11*).

These two teacher's EOC Exam scores are among the highest for their departments. Other data indicates that their professional development time shifted to more curriculum based strategies, even though they were utilizing technology a majority of the time in their classrooms. According to data analyzed, those who have started to shift assessment practices with their pedagogy are also having positive student achievement results.

Question 6: What evidence do you see in the classroom that lets you know one-to-one is impacting student achievement / engagement?

Only one of the teachers addressed the impact of student achievement. That teacher indicated that the writing process was better because it was easier for students to easily edit assignments. "I find that my writing assignments are better because it isn't as much of a chore to go back and edit since students have their laptops" (*I1*). However, all of the teachers stated they felt it was impacting student engagement. Teachers felt the laptops are a tool that allow students a broader view and because they are finding the information themselves instead of having it given to them, they become more engaged and have shown improvement in recall skills. "Students having access to the world at their fingertips leads to curiosity and not taking everything that the teacher says at face value" (*I1*). "They can look anything up in a moment's notice" (*I3*). Several teachers indicated that higher level students were more likely to go and investigate things they were curious about and one-to-one was encouraging more independent learning. Teachers stated that they noticed a huge increase in skill level from the students having access to the computers during class and that the students were excited to use them and learn in the classroom.

> The students are more apt to be engaged in class. I also see that the computers are a tool that they can use to think bigger. However, they are not so concerned with what I am telling them anymore over what they can find themselves, whether that is true or false. There needs to be consistent policing of this going on and I'm not sure that is happening (*I3*).

> When it comes to engagement…students are doing above and beyond now what I could have forced them to do even if I tried….They are spending countless hours on [projects] because they are excited. They care about it and think they are doing something of value or merit; they want it to be quality. You cannot force that, there is no way to compel someone to that…so one-to-one allows for that because it is allowing us to do those things in the room and that's compelling them to work beyond (*I11*).

> I notice that high level students are more likely to go investigate something they are curious about. And I'm also noticing that my lower level students are starting to use it to help them

> with concepts they are struggling with or don't know how to do. They'll just do an internet search or go to Khan Academy and try to figure it out. Which is encouraging independent learning, which is spectacular (*I7*).

Teachers overall indicated that they could let students be more independent the higher the level was. Independent learning worked well with the honors students and upper classmen because of their motivation. There was consensus through the interviews that there had to be more structure with the non-honors and underclassmen. However, teachers did indicate these students were more engaged than they had been prior to the one-to-one implementation.

One negative impact that teachers have noticed since the implementation is that students were more easily distracted. When students could easily access the technology, it was easier for them to become distracted from the lesson. "Some students simply could not handle the temptation of so easily gaining access to entertainment on their laptops" (*I6*).

> Using the technology to allow students to take notes is something they seem to like. A lot of teachers now teach from the back of the room so they can see the screens to make sure students stay on task. But I don't like to do that, I like to be in front of them so I can see their faces. However, now I don't know what it is they are doing on the laptops and I can't have my laptop in front of me so I can have DyKnow up and monitor them that way. I know a lot of students are more easily distracted now and may not be taking as good notes as they did with paper and pencil because they aren't doing as well [academically]. When all they had in front of them was their book and paper to write on, there was less temptation to become distracted (*I4*).

> It makes it harder to keep them on task. You have the gamers that use their flash drives to play in class while you are teaching the lesson. Then they aren't paying attention and you end up having to reteach to them because they are confused (*I5*).

The distraction for students was a common concern that continued to come up. The teachers did not have suggestions on a solution to this issue, but felt strongly that student distraction needed to be addressed.

Question 7: What do you look for when choosing professional development? How do you decide from that professional development what to incorporate into your lesson plans?

Teachers indicated that they considered a variety of aspects when choosing what professional development courses to attend. The most common was making sure the professional development was relevant to their classroom and something that they could easily learn and apply to their classroom with students. Teachers also stated that they wanted something that would help them be a better teacher for the students. Some stated they looked at the description and who the instructor of the professional development was. One teacher stated that they have moved away from choosing technology professional development. They felt they could figure the basic technology activities out for themselves, and had begun looking for more educational philosophy and curriculum based professional development.

> I'm particularly driven by educational philosophy. The tech stuff, I can figure that out. I want solid educational philosophy and really great curriculum that I think is born out of that. Then I'm more comfortable finding or seeking out ways that allows technology to enhance that (*I11*).

> I look for who is teaching it first, next I look for something I am interested in and don't know as much about. However, I do feel we are required to do a lot that I don't feel is beneficial for me (*I7*).

> I look for the things to help me technology wise. That is an area I feel I need to know more about so I can figure out ways it will help engage students more (*I5*).

A common theme that developed was the teachers were not as interested in the technology professional development during the second year of implementation. They felt they could find some of those types of tools and activities on their own and wanted to spend professional development time working on how to make things in their classroom work better.

When deciding what techniques to incorporate into their lesson plans from the professional development they have received, most teachers indicated they incorporated activities they felt would motivate students. They also would incorporate activities that they felt would be easily picked up by students. Teachers would incorporate things that they felt they would not have to spend a lot of time trying to teach the technology aspect to students and could focus more on the content of the lesson. "I incorporate whatever seems exciting or things I think the students will find compelling, things that I think will bring out the best in the environment" (*I11*). "If I think something is going to catch a student's eye and pull them in, then I will incorporate it" (*I7*). "Sometimes I go to something and think this will be great, but I go back to my classroom and try it and it doesn't work the way I thought it would and I realize that I didn't pick up as much as I thought I had because it was thrown at us so fast (*I6*). "It took me a second session of some of the things I wanted to learn before it sunk in and I felt like I had it enough to use it" (*I5*). Teachers indicated that they were attracted to the "cool" factor of a professional development course, but they could not figure out how to incorporate some of those tools and activities into their lesson plans.

Question 8: On a scale of 1-10, with 1 being "not at all" and 10 being "100 percent," how do you rate the quality of professional development you received prior to, and during implementation of one-to-one?

The average on this scale was a seven. Most teachers indicated that they had not attended anything that was not needed prior to the implementation. Some teachers stated that they felt it was a quick implementation and they did not have enough time with the computer themselves prior to students receiving them in the classroom. These teachers stated that they wanted to be able to have the opportunity for more professional development before they had to teach students with the computers. However, others stated they felt like there was too much professional development and they just wanted to be able to have access to the computer to become more familiar with it. One teacher did indicate that a lot of the professional development was at a low level and there was no application to the classroom situation. This teacher felt that the faculty was divided into two groups – those who wanted higher level technology instruction and those who did not. "I almost like no training, I like to be able to go play and then have someone available to help me if I get stuck on something" (*I7*).

> Personally I felt prepared, but I was very excited to do it anyway. However, a lot of teachers-quality teachers-I think still felt in the dark…they felt it was a sink or swim [situation]. One thing that did help those teachers was having the new position of the Instructional Technology Coach. She really helped those that felt they were sinking (*I11*).

> I'd rate it adequate, the problem comes in as I coach two sports, there are only so many sessions offered and a lot of them are after school when I am coaching. That is something that needs to be addressed if they want coaches to be able to do these things (*I5*).

> I think it is a dizzying array of too much and it is hard to make decisions when everyone is dabbling in a lot of different things. It's been tough to know which one is best for myself and my students. However, [our Instructional Technology Coach] has been a great help in figuring some of that out (*I8*).

Overall, teachers indicated that the school district did a good job with the professional development offered prior to and during implementation. There were plenty of opportunities for teachers to learn the basics of what was needed for the one-to-one implementation and the school hiring an Instructional Technology Coach was instrumental in helping teachers really incorporate technology into their curriculum.

Question 9: On a scale of 1-10, with 1 being "not at all" and 10 being "100 percent," how do you rate your ability to apply the professional development you received prior to and during implementation of one-to-one?

The average to apply professional development received on a scale of one to ten was a six. Teachers rated their ability to apply the professional development lower than the professional development available to them. Some teachers indicated that if they tried something they had learned and it did not work well the first time they tried it, they did not try it again. One teacher stated that he did not end up applying some of the professional development received because it was taken first semester when students did not yet have access to their computers, and he forgot about it by the time the students received their computers second semester (*I7*).

> Some things I do well and some things I do bad. I can't always think of ways to apply what they are showing us to what I am doing in my class or it was too long before students had their laptops to try it out. The website though, is one that I have applied and has really been helpful (*I6*).

Most teachers did state that they tried to implement things learned in professional development and they continued to incorporate those which worked well. Those which did not, they abandoned. "I've tested a lot of things and some of them I've abandoned and some I have adopted into my plans" (*I8*). "[Sessions] look intriguing, but aren't easily applied to my courses, so I need to find ways that I can better implement some of them" (*I5*).

> I'm pretty ready to [apply professional development I received], but details is one of my primary weaknesses as a teacher. I don't like to provide students with details and I tend to be more abstract and I'd have students telling me 'I need more details' which led to some problems with applying some of the ideas (*I11*).

Overall, teachers seek out and participate in professional development. Teachers indicated that they would appreciate having access to more professional development on how to incorporate technology into their lesson plans and curriculum. Learning the mechanics of the technology is valuable, but most felt comfortable with that aspect after the first year of implementation.

Teachers were asked at the end of the interview if there was anything they would like to add that they felt the questions did not cover. Several exceptional comments came from this open ended question. Two common themes identified were technology was only a tool, and there needed to be some consistency amongst what is considered best practices in the classroom.

> If the content is already good, if the curriculum is really strong, technology will enhance it. I have found first hand that when I have something that is weak-I didn't develop it enough or think it through enough- then technology also enhances the weaknesses of that assignment. If I'm asking questions too simple, immediately that is revealed with technology. You can tell when they are engaged in my lecture and I know if they are playing a racing game or Angry Birds that I am not asking tough enough questions. As a teacher you have to ask yourself the tough question of what do I need to be doing differently or what do I need to mix up if on the whole my students aren't engaged. I go back to looking at myself and how I learn. If I am at home working on something, how

> do I work best-working for 90 minutes without a break, or do I need to get up and move around some-and how much do we structure our classes towards that. I think [with one-to-one] we need to reevaluate how we organize their time (*I11*).
>
> If there were less overwhelming of materials, of just throwing it out there, and more structured of picking three to four best practices and working with just those as an entire staff, it would be less frustrating for not just the teacher, but the [students] on having to learn so many different things (*I8*).
>
> I think we need that suite of basics that are required for all teachers. There needs to be some things that are considered best practices and all teachers are expected to do them (*I3*).

Overall, teachers felt positive about the one-to-one implementation process. "I am looking forward to the future as those people retire that are being resistant to the technology, and I see us growing exponentially in our performance as a school" (*I7*). Teachers have been able to expand their curriculum and adjust to technology issues have made as needed.

Summary of Results

The results showed that during the implementation of one-to-one at the high school being studied student achievement has increased on the EOC Exams given. Overall, all eight of the EOC Exam scores increased in the proficient and advanced categories based on the average scores from 2009-2012. Further analysis showed that EOC Exam scores increased in seven out of the eight areas tested at a significance level of $p < .05$. The one area that did not show a level of significance of $p < .05$ overall, English I, did show an increase significance at the $p < .05$ level for both free and reduced lunch and IEP students. Algebra I free and reduced student data did show a level of significance of $p < .05$, however the student mean was decreasing instead of

increasing. Algebra II free and reduced student data and English II IEP student data are the only other areas where the mean raw score decreased overall instead of increasing.

According to teacher classroom observation forms, teachers were incorporating the technology from the one-to-one implementation into the curriculum more than half of the time. A majority of that was at the literacy and adaptive levels, however transformative technology incorporation had been observed 26.49% of the time overall and 29.51% of the time with EOC Exam teachers. The technology professional development taken by teachers dropped by almost 500 hours from the 2012-2013 school year to the 2013-2014 school year. This professional development had mainly been at the basic level and had not focused on how to fully integrate it throughout the curriculum, something which several of the teachers mentioned wanting more opportunities to learn about.

The teachers who were interviewed indicated that they were utilizing the one-to-one technology into their classrooms on a consistent basis. Overall, teachers interviewed felt that one-to-one was helping them do more in the classroom and students were comfortable with using the technology. Teachers incorporated activities they were comfortable with and felt their students would be able to do easily into their lessons. Teachers received their ideas for incorporating new technology by collaborating with other teachers, professional development, Twitter, Pinterest and other educational sites. A majority of the teachers interviewed had not changed how they assess students since the implementation of one-to-one. Some teachers had added technology features that helped them get assessment data quicker, but had not changed

their overall assessment style. Teachers had noticed an increase in student engagement since the implementation of one-to-one, but had not noticed themselves much of an impact on student achievement.

Teachers indicated they have begun to transition from wanting professional development on basic technology tools and activities to wanting more professional development on pedagogy and curriculum. Professional development received prior to and during the implementation received an average of seven. Teachers felt it was a satisfactory variety of what was needed for a successful implementation. However, the ability to apply the received professional development into the classroom rated an average of six. Not being able to incorporate the techniques right away, and not seeing how the techniques applied to their classroom were two of the main reasons teachers stated for not incorporating the techniques into their curriculum. One suggestion made by teachers interviewed to improve upon the implementation was to not focus as much on the technology, but more on curriculum. Another common suggestion was to find three to four basic best practices for all teachers to use throughout the building.

> One-to-one has been a game changer. That doesn't mean it doesn't have some problems, it does. There have been some struggles, but we couldn't do a fraction of the things we are doing without their ability to be online and create. It's very hard to create without technology and those resources and creating is where they learn (*I11*).

The results are promising for school districts interested in implementing one-to-one. In the time since the one-to-one implementation began, overall student achievement increased and teacher pedagogy has begun to shift. This case study has added to the body of research on one-to-one

initiatives and shown that overall, there has been a positive impact in the school being studied during the time of the one-to-one implementation.

Chapter V

Conclusions and Recommendations

This chapter presents a summary of the study findings. The findings and conclusions from the case study are presented from the format in which data were interpreted. A discussion of the conclusions is also presented. The chapter concludes with recommendations from the study and topics for future study.

Summary - History of Research of One-to-One

Technology has been visible in schools in the United States since after the launch of Sputnik by the Soviet Union in the late 1950s. Various means have been used to obtain a ratio of one student per one computer in the last several years. Despite the growing popularity of one-to-one programs in schools across the country, many of these initiatives focused on perceptions and lacked an adequate assessment of the effects on education. According to Penuel (2006), a 2001 analysis of laptop initiatives sponsored by the U.S. Department of Education determined that only 19 studies had specifically evaluated the outcomes associated with these initiatives. "Researchers concluded at that time that there was too little research-based evidence to determine whether such programs were effective, because the overall methodological quality of the studies was weak" (Penuel, 2006).

The situation had not improved much in the years following the Penuel study of 2001. According to Grimes and Warschauer (2008), a review of 30 studies on one-to-one programs

published or presented at conferences between 2001 and 2005 also failed to identify a significant number of outcome studies that were systematic or methodologically rigorous. The research prior to 2005 typically provided only general information concerning the types of devices that were chosen to use, the effects on the technology skills of students, or surveys on perceptions of how laptops affect learning (Grimes and Warschauer, 2008).

More recent studies regarding one-to-one laptop programs and student learning have started to emerge (Keengwe, 2013; Keengwe & Kidd, 2010; Project RED: The Research; Weston & Bain, 2010). These more recent studies have begun to examine results related to student outcomes and the use of laptops. These studies serve to accompany the substantial literature that demonstrates the effects of a one-to-one laptop program on the learning aspects of the educational experience (Brodzik, 2012).

This case study adds to the more recent body of research by examining a one-to-one implementation process at a large high school in Southwest Missouri. The purpose of this study was to examine the impact of a one-to-one computing initiative at the school being studied by analyzing both student achievement as measured by state End of Course (EOC) Exam scores and teacher pedagogy.

Overview of Study

The case study involved a thorough analysis of the one-to-one implementation in the school being studied. Included in the study was historical information from a change audit conducted prior to and during initial implementation that explained in detail the planning and

implementation process. The study was a mixed methods design in which both quantitative and qualitative data was collected. This study looked at student achievement based on EOC Exam scores obtained from DESE and Questar. The data was gathered and analyzed for overall students and subgroups of free and reduced lunch and IEP students. The results were recorded for both a general proficient and advanced status and raw score significance. An independent one-way ANOVA was conducted to determine significance. It was two-tailed and data was used over a three year period in order to draw inferences about any differences in student scores before, during and after the implementation of one-to-one in the classrooms. The level of significance was significant at $p < .05$.

Overall, student achievement increased in the school being studied after the one-to-one implementation according to state EOC Exam results. The overall proficient and advanced status increased in all eight of the EOC Exam subject areas from the average of scores prior to 2012 to the 2014 scores even though there was a slight decrease in some of the areas tested from 2013 to 2014. Additional analysis revealed seven of the eight EOC Exams showed a level of significance $p < .05$ with the mean raw score showing improvement. The results for students enrolled in English I, Algebra I, Geometry, and Biology who were also free and reduced lunch all showed a level of significance of $p < .05$. In these courses, English I, Geometry, and Biology all had raw mean scores that improved. Algebra I had raw mean scores that declined. The results for students enrolled in the English I, and Biology courses who were also IEP students all showed a level of significance of $p < .05$ with raw mean scores that improved. The results for students

enrolled English II who were also IEP students also had a level of significance of $p < .05$, however their mean raw scores declined.

Teacher data was collected through teacher classroom observations, professional development data, and interviews. The study showed that teachers were utilizing the one-to-one in their classroom curriculum in some form a majority of the time. Teachers of EOC Exam courses were observed using the technology 9.64% more than the overall teacher average. The technology level used by teachers was more at the adaptive level than transformative level, and there was a noticeable decline in total hours of technology professional development from the first year of implementation to the second year of implementation. Interviews revealed teachers finding basic technology ideas and methods through their own means as a possible factor.

Teacher Perceptions of Impact of One-to-One

Teacher interviews determined there was a positive perception of the one-to-one implementation in the school being studied. Common themes that emerged from the interviews were teachers felt one-to-one was a tool to help enhance their curriculum and there was a need for established best practices to be put into place. The interviews revealed that teachers were excited about the opportunities that one-to-one brought to the classroom. According to the teachers, students can now easily research on the topics presented in class and several teachers have moved to more project based assignments because of one-to-one. Teachers found that they did not have to use a lot of different technology tools with one-to-one, they just had to utilize

ones that functioned well and helped students with higher order thinking skills. On average, teachers stated that they used two to three technology tools per one lesson.

Teachers indicated that one-to-one implementation has helped to better organize their classes. A majority of the teachers stated they have students' complete bell-ringer activities on their laptop to work on while performing record keeping tasks. Notes and lecture materials are easily sent through various software programs allowing for the students to be organized as well. Activities teachers mentioned utilizing to expand on their lectures and course materials ranged from web quests to internet research to producing a final product. One hundred percent of the teachers interviewed indicated that they used the laptops to assess students, but a majority had not changed their assessments. Assessments were done either formatively or just as a quick gauge of student knowledge. The consensus was that the laptops did not have to be used the entire class period, but a majority of the teachers stated they typically used one-to-one in some form daily.

According to the teacher interviews, perceptions were one-to-one was impacting student engagement. Only one of the teachers addressed the impact of student achievement stating she felt the writing process had improved because it was easier for students to edit assignments. Teachers felt the laptops were a tool allowing students a broader view and encouraging independent learning. "Students having access to the world at their fingertips leads to curiosity and not taking everything that the teacher says at face value" (*I1*). "They can look anything up in a moment's notice" (*I3*). Several teachers indicated that they are more likely to allow more

freedom with higher level students because those students are more motivated. The consensus was the lower level students and underclassmen needed more structure. Teachers revealed they noticed a huge increase in skill level from the students having access to the laptops during class and that the students were excited to use and learn in the classroom. Interviews also revealed that technology assessment processes were not being utilized as frequently as other Web 2.0 tools.

Pedagogy

According to teacher interviews, a shift in pedagogy has begun throughout the building. "I am a believer now that for some students, the ability to do the flipped classroom is quite valuable" (*I4*). One teacher commented that her pedagogy has become more informal and "it has become more student driven so it's less about me and what I teach and more about them and what they can do or can learn" (*I3*). However, some teachers stated that the one-to-one has not changed what they do in the classroom. "I haven't changed my teaching style other than the fact that they are using the laptop to take a quiz" (*I12*).

One notable discovery the data revealed was those who considered their pedagogy to have shifted were taking more curriculum and philosophical based professional development. Those who did not consider their pedagogy to have changed were taking more of the basic technology skills professional development. These same teachers indicated that at times it was difficult to see how these skills applied to their courses and did not incorporate a lot of those tools and activities into their curriculum. Teachers also stated that they tried ideas and activities

out themselves prior to the lesson. If they struggled getting the activity to work in the desired way or felt it would be too confusing to students, the activity was not used with the students. Teachers were very concerned with the class time wasted when the technology did not work and wanted to avoid that if possible.

Professional Development

Teachers revealed they gather ideas to incorporate into their lessons from a variety of sources. "I mostly get my ideas through other teachers and collaboration" (I7). "I have done a lot of research myself, especially when there is something coming up that I know I'm going to have to know about that I'm not as familiar with" (I4). Teachers indicated through the interview questions that they have begun to rely less on professional development for technology ideas and more on their own research and collaboration within their departments. The professional development logs support these statements by showing a decline of almost 500 total hours in technology professional development participated in by teachers from the first year of implementation to the second year of implementation.

Teachers indicated that they considered a variety of aspects when choosing what professional development courses to attend. The most common was making sure the professional development was relevant to their classroom and something that they could easily learn and apply to their classroom with students. A common theme that developed was teachers were not as interested in the basic technology professional development during the second year of implementation. They felt they could find those types of tools and activities on their own and

wanted to spend professional development time working on how to make things in their classroom work better. Teachers rated the professional development received prior to and during implementation high, but indicated their ability to apply that professional development was not as strong. Factors contributing to the lower rating for application ranged from the techniques not applying to that teacher's courses to the gap in time from the training to when students had access to the laptops.

One negative impact teachers indicated since the one-to-one implementation was that students were more easily distracted. When students could easily access the technology, it was easier for them to become distracted from the lesson. "Some students simply could not handle the temptation of so easily gaining access to entertainment on their laptops" (*I6*). Additional questions revealed that there was concern with how to keep students on task moving forward with one-to-one. Professional development will be a way to address these concerns.

Summary

In summary, teachers felt positive about the one-to-one implementation at the stage it was currently at in the school being studied. Common themes that emerged from the interviews were teachers felt one-to-one was a tool to help enhance their curriculum and there was a need for established best practices to be put into place. After utilizing one-to-one, teachers have begun to use the technology to expand on their curriculum and teacher evaluations and interviews indicated the teachers were slowly shifting their pedagogy to reflect the higher order thinking one-to-one allows. The thirst for best practices was unexpected as teachers had been given the

freedom to incorporate the technology they were comfortable with. The desire for guidelines of best practices that all are required to use is notable to schools planning for a one-to-one implementation.

The results of the study are encouraging for schools interested in a one-to-one initiative. EOC Exam results showed student achievement has increased overall since the one-to-one implementation. Teacher evaluations and interviews also indicate that pedagogy has begun to shift to incorporating one-to-one at a transformative level. The results of this case study added to the body of research already completed on one-to-one implementations by indicating positive impacts within the district during the time of implementation. The EOC Exam results data showed a significant positive impact on student achievement based in seven out of the eight exams given. The data was not as conclusive on the effect on teacher pedagogy, but does indicate teachers will continue to shift their pedagogy.

Conclusions

Overall, there were two main reasons why the one-to-one laptop initiative was implemented in the school being studied. First, there was a need to prepare students for the 21st century. The school being studied wanted to ensure their graduates were prepared for post high school with the computer and technological skills needed to be successful in college or the work force. Second, the one-to-one initiative was intended to provide learning opportunities regardless of student socio-economic status. It was the desire to ensure all students had access to

computers and technology, not just those whose families were at an economic level to afford computers and technology.

The results of the case study indicate that the reasons the school being studied had for implementing one-to-one were being addressed. EOC Exam data revealed that student achievement had increased since the implementation of one-to-one in the school being studied. Issuing computers at the school being studied provided the opportunity for 21st century learning to 21st century learners and findings suggest that students were more engaged in learning when using the computers. Additionally, the data showed increases in some EOC scores for students, regardless of student socio-economic status since the implementation of one-to-one.

There are three main themes concerning professional development that emerged from this case study. The themes that emerged from the study were 1) the division between two types of teachers – those who were concerned with basic technological implementation, such as the physical implementation process, and those who self-navigated beyond the basic technological implementation to search out relevant pedagogy for their particular content area or student need, 2) the time needed to process and practice the professional development and 3) the need for relevant professional development. The data from this study supported the findings of Donovan, Harley, and Strudler (2007), who identified the importance of professional development in a successful one-to-one implementation. Donovan, Harley, and Strudler found that teachers faced significant challenges as they prepared for teaching in one-to-one classrooms (2007). The

qualitative data from this case study revealed that appropriate professional development enhanced the implementation process.

Recent research indicates in order to employ a viable curriculum that prepares students for the 21st century workforce, teachers must change instructional practices from a teacher-centered traditional instruction to a student-centered constructivist instruction. Professional development must be provided that includes methods of effective technology integration that will enhance the outcome of student learning. This case study found that teachers were clearly in two camps – those who were comfortable self-navigating the basic technology themselves and wanted training in instruction to move to a more student-centered curriculum, and those who were not comfortable with technology and wanted the basic technology training. Data from the qualitative portion of this study indicates professional development should be provided for both camps during the implementation process. However, it is also important to provide additional help to those in the faction simply seeking the basic technology. In order for them to move towards the faction that is comfortable self-navigating the technology aspect and seek out the instructional professional development, they must first feel comfortable with the basic technology. This can be accomplished with a technology self-assessment, use of an Instructional Technology Coach, or setting specific goals through teacher evaluations on expectations throughout the curriculum.

Technology standards need to be incorporated throughout the curriculum in a one-to-one environment. The NETS Standards and the Skills for the 21st Century Learner developed by the

Partnership for 21st Century Skills call for technology, information literacy, and higher-order thinking skills. Teacher interviews in this study indicated that the Instructional Technology Coach employed by the school was instrumental in helping teachers resolve ways to incorporate technology into the curriculum of their one-to-one classroom. Most teachers are not as familiar with these specific skills and standards as they are the standards required for their course curriculum. Conversely, information technology specialists are trained to repair computers and to know the inner workings of technology, but they do not always understand the intricacies of curriculum and pedagogy. Collaboration between an Instructional Technology Coach and the classroom teacher can provide opportunities for co-creating innovative and resourceful learning environments that are strong in the areas of curriculum, instruction, and technology.

The second theme to emerge throughout this study was teachers' need of time to process professional development they receive. Collier claims that professional development for teachers integrating technology is an ongoing process (2001, p. 61). She also claims that in order for teachers to apply their knowledge, they need a vision of technology in the learning process, hands-on experience, accountability to apply the technology, and support to assess and refine their instructional approaches (ibid). Data shows that professional development needs to be on-going throughout a one-to-one implementation. Teachers need to have that additional time and support to try things out, process through the activities with colleagues, then adjust for future lessons. Professional development should be matched to fit teacher's needs, both in difficulty and amount of time required to implement. At the beginning of the one-to-one implementation,

the trainings need to include activities easy enough to implement quickly. Further into the implementation process, the trainings should start to incorporate more complex technology as well as aspects of pedagogy and curriculum.

The third theme to emerge is that professional development provided must be relevant to provide a meaningful classroom experience. Twenty-first century learning involves technology that presents educators with challenges and opportunities to educate students to their highest potential. If the technology is not effectively integrated into instruction, it will not produce better learners or learners who are prepared to meet the demands of society after graduation (Tolmie, 2001). Student learning is at the center of any technology integration. Teachers in this study referenced hesitance in using technology that they did not feel was relevant to their curriculum. If the teachers can move beyond being fearful of trying new ideas and allowing students to show teachers new ideas, the classroom can become a meaningful learning atmosphere. Penuel's research found that programs that include students helping with technology issues provides the students with scenarios to solve problems they will experience in the world of work and using students to help with technical support issues in the classroom should be a part of a one-to-one laptop program's design (2006).

Making sure the students were on-task was a concern many of the teachers expressed during teacher interviews. Although this school purchased a program entitled DyKnow Monitoring that allows teachers to monitor and control student computers, the process was reported as being cumbersome and teachers had to look at their computer screens to monitor

what each student was doing during class time. This concern can be addressed by providing professional development on utilizing higher order thinking skills and creativity to keep students engaged. If students find activities in the classroom engaging and meaningful, they will not be tempted to go to gaming or social media sites. Inan and Lowther's research supports students learn more when technology is used as a learning tool where students use it to solve problems, create products, and communicate or share their findings with others (2010, p. 138). Providing training for teachers to learn how to do this will challenge teachers to challenge their students with technology that has a positive impact on student learning.

Technology tools have had a profound impact on our society, but using that technology in the classroom is a complex and challenging task (Groff & Mouza, 2008). Planning is the key to a successful one-to-one implementation. Planning from the infrastructure, bandwidth, hardware, software, and professional development all need to be extensive from the beginning of the process. Several important aspects of the one-to-one laptop initiative are noted:

- Infrastructure planning is key to ensure minimal problems upon implementation.
- Computers are only a tool, a focus on professional development is very important.
- Professional development needs to start with basics of the technology, but move quickly to pedagogy in order to provide teachers with higher-order thinking skills to keep students engaged and less likely to be tempted to move off task.
- Pedagogy is important. A good teachers is a good teacher. They can teach and students will learn whether they are using technology or not.

- The one-to-one program can provide technological access equally to lower and upper socio-economic classification.
- An Instructional Technology Coach can provide a resource for teachers to collaborate with to learn the basics, and create innovative and resourceful learning activities.
- Incorporating three to four best practices for all teachers to implement in the classroom will lead to consistency and establish an expectation.
- Continued budgeting is essential. Technology budgets need to be in place past the initial implementation that include supplemental resources and a replacement process.

Recommendations

Incorporating technology into the educational setting is essential in the 21st century. Technology continues to be more prevalent in the lives of all citizens. The world students are a part of today is constantly changing. The access to technology outside of the classroom increases daily. School districts are trying to incorporate technology resources through one-to-one implementations. It is important for school administrators to plan accordingly prior to a one-to-one initiative. Fullan (2001) advocated for a successful education reform in a one-to-one implementation, instruction needs to be the focus. Therefore, it is important that teachers receive professional development that reflects on instructional practices and not just basic technology.

The one-to-one initiative facilitates the teacher meeting diverse learning needs of students. One-to-one can becomes an equalizing force when the laptops are distributed and overall EOC Exam results from this study indicate an increase in some areas in scores for free

and reduced lunch and IEP student subgroups. Thus, allowing for all learners to be on equal footing in terms of the equipment they have access to. The historical change audit revealed extensive policies are needed to address the myriad of issues that arise with a one-to-one initiative. The audit also revealed that time and money must be spent to properly prepare the infrastructure for the increase in technology usage prior to one-to-one implementation, then must also have an on-going budget for replacement devices and electronic supplemental materials and subscriptions. The random interviews indicated there was some disconnect between teachers and administrators during the initial implementation planning process. Teachers felt unsure of the expectations in using technology in the classroom and the PD offerings did not always reflect material the teachers felt were relevant to their needs. Having visionary leaders modeling and guiding the implementation will be vital for the continued growth of one-to-one initiatives.

This case study supports the research that according to Jackson suggests that one-to-one computing will increase achievement, increase student engagement, enhance project based learning, overall broaden learning in the classroom, and prepare students for tomorrow's workplace (2004). The following recommendations are made for schools considering one-to-one initiatives based on the analysis of the data, the findings, and conclusions from this case study.

a. School districts need to start the planning process early and involve all stakeholders in that process as early as possible. A successful implementation depends on having a detailed plan and process to implement that plan.

b. In order for a one-to-one initiative to effect instruction, professional development must start with the basic technology trainings, but move quickly into pedagogy and curriculum. This will move students towards the higher order thinking skills associated with transformative technology learning and help with the issue of student distraction from having the computing device.

c. School districts should establish three to four best practices for all teachers to use at the beginning of an implementation. It is important to clearly explain expectations so teachers are aware of these from the beginning of the initiative.

d. A transformative rubric should be adopted by the school prior to implementation to clarify for teachers and administrators the expectations of transformative technology.

e. Teachers in a school preparing for a one-to-one implementation would benefit from taking a self-reflection assessment to better guide individual and group professional development.

On the basis of this study's findings and conclusions, the following recommendations for further study are suggested:

a. This study should be replicated in other one-to-one schools to examine student achievement results and teacher pedagogy over a longer period of time. Examining state exam scores in one-to-one schools five to ten years after implementation would give a more accurate indication if one-to-one is truly affecting student achievement and teacher pedagogy.

b. It would be beneficial to examine teacher observations and perceptions of pedagogy in the pre-implementation phase, as well as the post-implementation phase of a one-to-one process to gain more insight into actual shifts in pedagogy.
c. A more in-depth mixed design study should be conducted to analyze student gains throughout the one-to-one process in addition to student achievement.
d. A more in-depth qualitative study should be conducted to define the school administrator's role in creating the vision and sustaining the implementation of a one-to-one initiative.

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Appendices

Appendix A – Informed Consent form used for prior Change Audit

Informed Consent

This interview is part of a required project for the Educational Advocacy Course at Southwest Baptist University Educational Doctorate program. The interviewer (Amy E. Ramsdell) intends to interview stakeholders in the district on their perceptions related to a proposed or current change initiative. The results should be helpful to participants as they will have access to a generated report that will be provided to the Superintendent of the District noting strengths and opportunities uncovered through the interviews and through documents reviewed. The developed project will also note possible recommendations for implementing these changes more effectively. The lead professor on this assignment is Dr. Pam Hedgpeth, Assistant Professor at Southwest Baptist University. Southwest Baptist University Educational Doctorate students conducting this project include: Amy Ramsdell, Wendell Fuimaono, Ben Arnett, Jennifer Tilley, Cathy Robinson, Tim Garber. Participation in the project is strictly voluntary. A participant may withdraw at any time or have questions answered about the project by contacting [redacted] Participant identity is confidential and no statement will be attributed to any individual or institution.

Consent Form

I hereby grant permission to the students named above to use my comments (either verbatim or paraphrased, but kept confidential) for this classroom project.

Signed: _____ Date: _____

(Person giving Release)

Signed: _____ Date: _____

(Interviewer)

Appendix B – Informed Consent form used for Random Teacher Interviews

Informed Consent

This interview is part of research for Amy E. Ramsdell's Dissertation at Southwest Baptist University Educational Doctorate program. The interviewer (Amy E. Ramsdell) intends to interview teachers as to their perceptions of utilizing technology in the classroom. The results should be helpful to participants as they will have access to the final paper that will summarize the interviews. The advisory professor on this is Dr. Nancy Colbaugh, Assistant Professor at Southwest Baptist University. Participation in the project is strictly voluntary. A participant may withdraw at any time or have questions answered about the project by contacting [redacted] Participant identity is confidential and no statement will be attributed to any individual.

Consent Form

I hereby grant permission to the student named above to use my comments (either verbatim or paraphrased, but kept confidential) for this Dissertation.

Signed: _____ Date: _____

(Person giving Release)

Signed: _____ Date: _____

(Interviewer)

THIS PROJECT HAS BEEN REVIEWED BY THE SOUTHWEST BAPTIST UNIVERSITY RESEARCH REVIEW BOARD FOR RESEARCH AND RESEARCH-RELATED ACTIVITIES INVOLVING HUMAN SUBJECTS (417) 326-1659.

Appendix C – Informed Consent form used to Conduct Case Study

Informed Consent to Conduct Case Study

This Case Study is part of research for Amy E. Ramsdell's Dissertation at Southwest Baptist University Educational Doctorate program. The researcher (Amy E. Ramsdell) intends to conduct a thorough case study on the one-to-one implementation at your school. The results should be helpful to participants as they will have access to the final paper that will summarize the implementation process and analyze student achievement and teacher incorporation. The advisory professor on this is Dr. Nancy Colbaugh, Assistant Professor at Southwest Baptist University. Participation in the project is strictly voluntary. Any questions about the project can be answered by contacting [redacted] Participant identity is confidential and no identifying information will be attributed to any individual without prior consent.

Consent Form

I hereby grant permission to the student named above to conduct a case study of the one-to-one implementation at Ozark High School for this Dissertation.

Signed: _____ Date: _____

Principal

Signed: _____ Date: _____

Amy E. Ramsdell, Researcher

THIS PROJECT HAS BEEN REVIEWED BY THE SOUTHWEST BAPTIST UNIVERSITY RESEARCH REVIEW BOARD FOR RESEARCH AND RESEARCH-RELATED ACTIVITIES INVOLVING HUMAN SUBJECTS (417) 326-1659.

Appendix D – Interview Questions for Random Teachers Selected

Interview Questions for Teachers Implementing One-to-One in the Classroom

- What types of tools / activities are you utilizing in the classroom consistently?
    - How many different technology tools do you implement during one lesson?

- Describe your typical class period – the flow of the class and how you integrate one-to-one.
    - In what ways has your teaching style (pedagogy) changed throughout this year?

- How do you decide what technology to incorporate into your lessons?

- Where do you get ideas for new technology?

- While implementing one-to-one, how do you assess student learning?
    - How has your assessment process changed since the adoption of one-to-one?

- What evidence do you see in the classroom that lets you know one-to-one is impacting student achievement / engagement?

- What do you look for when choosing professional development?
    - How do you decide from that professional development what to incorporate into your lesson plans?

- On a scale of 1-10, with 1 being "not at all" and 10 being "100 percent," how do you rate the quality of professional development you received prior to, and during implementation of one-to-one?

- On a scale of 1-10, with 1 being "not at all" and 10 being "100 percent," how do you rate your ability to apply the professional development you received prior to and during implementation of one-to-one?