ABSTRACT OF CAPSTONE

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The Graduate School

Morehead State University

April 29, 2014

INSTRUCTIONAL TRANSFORMATION: HOW DO TEACHING AND LEARNING CHANGE WITH A ONE-TO-ONE LAPTOP IMPLEMENTATION?

Abstract of capstone

A capstone submitted in partial fulfillment of the
Requirements for the degree of Doctor of Education in the
College of Education
At Morehead State University

By

John C. Branch IV

Williamson, West Virginia

Committee Chair: Dr. John H. Curry, Assistant Professor

Morehead, Kentucky

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A one-to-one computing initiative was implemented at high school in rural southern West Virginia in 2011. The program was implemented with limited time for planning and professional development. Teachers had to anticipate the implications the innovation had for instructional transformation and the impact the laptops would have on the learners. The case study discussed in this paper used qualitative data to describe a transformation catalyzed by the laptop program to instructional strategies and pedagogy, teacher and student use of technology, the processes of instructional planning and professional preparation and the impact on the learning environment and the learners. The researcher sought to answer the question, "What changes to instructional strategies occur following a one-to-one implementation in a high school?"

KEYWORDS: One-to-one; instructional strategies; technology integration; teacher-centered; learner-centered

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DEDICATION

This capstone is dedicated to teachers who embrace innovation and those who press past their comfort zones to create engaging learner-centered experiences for 21st century students. It is also dedicated to a new generation of learners, who are acquiring a valuable skill set for inquiry, collaboration and problem solving, increasing their potential for success in a changing world.

ACKNOWLEDGEMENTS

This three-year journey has enriched my personal and professional life. I am grateful to the leadership of the Morehead State University College of Education for establishing an Ed. D. pathway, which allowed me to delve deeper into my passion for innovation and creating rich learning experiences for students. I recognize the sacrifices made by my family and the encouragement and prayer they offered, which enabled me to reach my goal. I also wish to thank my colleagues who have inspired me. Finally, I am grateful to Dr. John Curry for giving me valuable guidance and for challenging me to succeed.

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CHAPTER ONE

Introduction/Background of the Study

A consolidated high school located in rural southern West Virginia consists of 400 students in grades 9-12 and has an attendance area encompassing a large geographic footprint across mountainous terrain. Many students live up to 30 miles from the school and travel by school bus, for up to one hour each way.

Poverty rates for the school are at nearly 70% and most of the working-population is employed in the mining and timber industries. Since 2011, numerous mine closings have contributed to high unemployment for the area.

The value of education for the region has not been high. According to the U.S. Census Bureau (2012), fewer than 70% of adults have a high school diploma and fewer than 10% earned a bachelor's degree or higher. The recent graduation rates for this high school also are a concern. In 2010, the school reported 32 dropouts, with most of these students citing dislike of the school experience. It should be noted, however, interventions following the 2010 school year have led to a 50% decrease in the number of dropouts for each of the following two school years (WV Achieves, 2012).

Student achievement has been well below state averages, with fewer than 40% of students showing proficiency in math and fewer than 50% of students showing proficiency in reading and language arts. ACT scores are an exception, with percentages being closer to state averages (WV Achieves, 2012).

Lack of appropriate technology and adequate teacher preparation for its use, described by Ertmer (1999) as “first-order barriers,” is a problem for many schools. Access to educational technology, however, has not been an issue for the school. Since 2009, every classroom in the school had been equipped with technology bundles, which included a teacher laptop, an interactive whiteboard, a document camera, and a mounted data projector. Although some professional development was given by the school district as to the technical use of the devices, and to some extent, instructional application, use of the technology varies from classroom to classroom from frequent or daily use to occasional use to no use.

In 2012 the school participated in the launch of a one-to-one computing initiative for the district’s two high schools. The school district agreed to purchase laptop computers for all of the nearly 1200 students attending the two schools and to upgrade the subject school’s infrastructure, including expanding bandwidth and installing wireless access points. Although the inception of the program had its origins in the district leadership, and although the funding for the initiative came from Federal and local funds, each school was given the task of determining a plan for the implementation, which would include optimizing the use of the devices for effective delivery of instruction and enhancing learning in classrooms. The initiative followed an implementation schedule, which allowed for the distribution of laptop computers to every high school student within a span of one year. A challenge facing school leadership and instructors was how to transition the learning environment, including pedagogy and instructional strategies, to take full advantage of the new technology.

Teachers at the subject school, as in all schools (Oliver, Corn & Osborne, 2009), have varying levels of technology skills. Every teacher will bring individual strengths and weaknesses to the process of transition. Most positive impact from ubiquitous computing on instruction is dependent upon the instructor and his or her technological adeptness, grasp of learning theory, and openness to changing strategies which take advantage of the presence of the technology (Harris, 2010). A concern for the school leadership was how equitable would the effective transition to choosing appropriate technology infused instructional strategies be among the more than thirty classrooms in the building.

This capstone project is a case study of several of the school's instructors and their classrooms nearly two years after the initial rollout of the one-to-one laptop program. Changes to instructional strategies and learning environments were certain to occur with the innovation but the extent of those changes and the effect on the learning environment could not be assumed as the first devices were distributed to the students. The researcher believes the exploration and definition of the transformation catalyzed by the ubiquitous computing initiative is necessary to evaluate the program's benefit to the learners, as well as to provide insight to other educators or schools who may be considering a one-to-one laptop program.

Statement of the Problem

The current catalog of research on ubiquitous computing is expanding but still limited (Penuel, 2006). Included in the literature are studies, which explore how the transformation of instructional practices emerges in technology-rich learning

environments (Alvarez et al., 2011; Bebell & Kay, 2010; Delisio, 2010; Dunleavy, Dexter & Heinecke, 2007; Hasley, 2007; Jones, 2007; Lawless & Pellegrino, 2007; Livingston, 2007; Mouza, 2008; Newhouse, 2008; Oliver, 2010; Valiente, 2010; & Zucker & Hug, 2007). Other works describe schools, which developed systems to evaluate their programs (Lawless & Pellegrino, 2007; Ross et al., 2003; Valiente, 2010; & Zucker & Hug, 2007). This one-to-one program was launched with limited time for the school leadership and the instructors to prepare for a paradigm shift in the school's learning environments. There were very limited professional development opportunities prior to the distribution of the laptops to the students. There was no way for leaders and instructors to predict just what a transformation would look like and how instruction and learning would change and at what pace. Instructors have been forced to "make it up" as they go along and leaders have made efforts to respond to the need for professional development. The researcher sought to answer the question, "What changes in instructional strategies occur following the implementation of a one-to-one computing program in a high school?" A need exists for an in-depth analysis of the transformation that is taking place. The construction of a narrative built from the data may provide for a reflective evaluation of what has already occurred in instructional transformation. It may also reveal what has worked and what has not to increase the potential for student learning, and what instructional challenges accompany the implementation of the one-to-one laptop program.

Purpose of the Study

One-to-one computing in educational settings is no longer a farfetched

concept for some school districts. Since the introduction of the State of Maine's (Valiente, 2010) One Laptop Per Child program, the first of its kind, more and more educational systems or individual schools have undertaken similar ventures. Those who support one-to-one computing in education may assume the very availability and use of the devices will bring automatic benefits to an array of measurable factors, including student achievement and engagement in the learning process. Nevertheless, in its 2009 report, the Organization for Economic Cooperation and Development cautions making computing devices universally available in a learning environment without adequate technical framework, professional development, or adequate evaluation as to effective and appropriate application may contribute to frustration and a decline in the enthusiasm to teach and learn (as cited in Valiente, 2010, p. 8).

Leaders and instructors at the subject school expressed concern for avoiding the pitfalls experienced by other schools in the implementation of ubiquitous computing. In the initial planning stages they articulated the need to self-evaluate the program for efficacy and to seek out best practices for effective instruction in a one-to-one setting. A case study was used to develop a narrative of the transition, focusing on instruction, the teachers have undergone in the process of implementing the program. The researcher's question asked, "What changes in instructional strategies occur following the implementation of a one-to-one computing program in a high school?" To answer this question, the researcher examined the instructional practices of the school's teachers in the context of their learning environments, as to how their instructional strategies and learning environments have changed since the

establishment of the one-to-one initiative. The question isn't whether or not teachers use technology, but how they are using technology. A teacher may adapt technology to existing instructional practices, or innovate to employ strategies made possible by the technology's availability (Garthwait & Weller 2004).

The intent is to provide qualitative data to measure changes in teacher attitudes toward technology integration, the changes in the instructional planning process, the practical evidence of technology integration, the changes, if any, to pedagogy, and any transformation in the learning environment, including the impact on learners.

Definition of Terms

Several terms should be defined within the context of the study to assist the reader.

One-to-One (1:1) Computing

One-to-one computing, sometimes denoted as 1:1, is the term derived from the ratio of the number of computers to the number of students. One-to-one computing may refer to providing classrooms with computers, through mobile laptop labs, or classrooms of students with computers via stationary computer lab classrooms. For the purpose of this study, one-to-one will be defined as issuing laptop computers, for use at school and at home, to all students in a school.

Ubiquitous

The Cambridge Online Dictionary of American English (2011) defines ubiquitous as "found or existing everywhere." Relating to one-to-one computing,

ubiquitous refers to all students, in a classroom, grade level, school, or district, having access to a computing device. The term may be seen in the phrase, "ubiquitous computing," or perhaps as a noun, "ubiquity," to refer to the state of one-to-one computer to student ratio.

Learner-Centered

According to McCombs and Whisler (1997, p.9) learner-centered education is pedagogy, where the strategies of instruction are considerate of the needs of the students. The learner has an active role in the learning process, which is characterized by inquiry and constructivism.

Teacher-Centered

Mascolo (2009) characterizes teacher-centered learning as an instructional and learning process where the delivery of content is generated and regulated by the teacher. The learner's role is to receive and respond to the expectations of the teacher.

Project-Based Learning

Project-based learning is a student-centered approach to learning where projects are designed around a central question or key learning outcomes. The collaborative nature of PBL lends itself to a community effort toward defining plans of action, solving problems and investigating real-world issues that will support the learner's ability to make sense of issues while mastering key learning outcomes. Project work may span a considerable length of time and many times will include the development of artifacts or other evidence of learning. Students in a PBL will be expected to reflect upon the body of work and to present findings and new learning to

others in the learning environment (Jones, Rasmussen, & Moffitt, 1997; Thomas, Mergendoller, & Michaelson, 1999). Goals for learning will be presented at the front-end of the project and learning will be anchored in the real world. Formative and summative assessments of learning will be relevant to the student's investigation. The instructor will serve as a coach rather than the sole administrator of instruction (Moursund, 1999). Expectations for quality of work will also be disclosed at the start of every project with rubrics describing exemplary performance. In all, PBL requires a great deal of planning on the part of the instructor.

21st Century Skills

The Partnership for 21st Century Skills (2009) defines these as "essential skills for success in today's world, such as critical thinking, problem solving, communication and collaboration." The use of one-to-one technology may enhance proficiency in these skills.

Interdisciplinary

The Cambridge Online Dictionary of American English (2011) defines interdisciplinary as "involving two or more different subjects or areas of knowledge." The use of the word in this study will relate to collaborative learning projects participated in, jointly, by two or more high school classes of different subject areas.

Thinkfinity

Thinkfinity is an online learning community, sponsored by Verizon, by which students and teachers have a variety of educational resources and communication tools. Teachers, who are participants in this study, use this tool in their classrooms.

Dropbox

Dropbox is an online application and service for storage of digital content.

Cognitive Tutor

Cognitive Tutor is a computer-assisted instruction platform for supplemental instruction in mathematics. It is proprietary of Carnegie Learning.

Study Island

Study Island is a computer-assisted instruction platform for supplemental instruction in a variety of subjects.

TeacherEase

TeacherEase is an online learning information system, which includes classroom management and student records management.

Limitations of the Study

The study has several limitations, which may make generalization to other contexts difficult. First, the scope of the research is limited to selected teachers in one school. No comparisons can be drawn from subjects from another site. Second, preparation for the implementation included upgrades to the school's infrastructure and data pipeline to adequately accommodate devices for all students, teachers, and the existing computer labs. This is not the case for all ubiquitous initiatives. Third, teachers at this school have already been using classroom technology bundles, which include interactive whiteboards, document cameras, and data projectors. The teachers also, before the implementation, had access to classroom computers and labs, which created a computer to student ratio of 1:2. Schools looking toward some level of one-

to-one implementation may not have this prior availability and experience with technology. Fourth, the program, at the time of data collection, had only been implemented for two years. This may not be sufficient time for transformation of learning strategies to be realized. The study will, however, yield triangulated qualitative data, which will provide the narrative of the how the participants responded to ubiquity in assessing their instructional roles, in the decisions as to pedagogy, in evaluating their own adeptness with technology use and integration, and in the planning of instruction and assessment for a one-to-one learning environment. A fifth limitation is validity might be affected by the Hawthorne Effect (Check & Schutt, 2012), which could result from teachers, selected for participation in the study, exhibiting behaviors which are extraordinary, because they know they have been chosen for participation.

Significance of the Study

As more and more schools are increasing the availability of technology to students and teachers, it can be important to find an exemplar, including successes and challenges, which may help those considering or, perhaps, beginning a one-to-one program. The researcher attempted to construct a narrative of any changes to instruction and learning, the one-to-one initiative catalyzed at the school in this study. The findings of this case study will be of particular interest to administrators, teachers, and other instructional leaders, who seek greater technology integration in classrooms, regardless of whether a one-to-one initiative is in place in their schools. Barrios (2004) suggested implementers of new ubiquitous initiatives should build

upon what can be learned from previous ones. The experiences and practices of the participants in this study, in their pursuit of effective technology integration, can provide valuable insight as to the challenges instructors may face in developing instruction for a technology-rich, 21st century learning environment.

CHAPTER TWO

Review of Literature

The origins of one-to-one computing initiatives can be traced back almost two decades. In recent years, a growing number of schools and districts have launched such programs, while more are considering implementation. The development of a comprehensive plan, with defined expectations and goals, and encompassing budgetary, logistical, curricular and pedagogical aspects, is essential to the success and sustainability of one-to-one initiatives. Nevertheless, the success of such programs will hinge on the effective transition to technology immersion in the learning environment. Instructional strategies will most certainly be affected but the extent and value of the effect will vary with each teacher's response to the new context. This literature review will focus on current studies of one-to-one computing, as to instruction and learning, in hopes of categorizing various aspects of such programs, which should be examined by those who are considering the implementation of a ubiquitous computing plan.

Searches of online research databases were conducted using terms such as *one-to-one, 1:1, ubiquitous computing, technology planning, laptop programs, curriculum, teaching, instructional strategies* and etc., to gather the body of research used in this review. Only articles written after 1995 were considered for inclusion.

Ubiquitous programs, discussed in 25 journal articles and reports, were largely from North America, but also included schools and school systems from Latin American and European nations, as well as from Australia. The programs ranged

from small, single-classroom mobile labs, to whole grade-level or multiple grade-level programs, in a single school, to district or system-wide implementation.

The catalog of research conducted on ubiquitous computing is expanding, but still limited (Penuel, 2006). Not all of these studies give significant attention to the changes in instruction. Even so, much of this review will examine common findings in order to define and describe the changes to instruction ubiquitous computing precipitates.

Focus of Current Research

An important consideration at the outset of the review process was to determine the purposes of the various studies. Some studies of one-to-one programs were more comprehensive, exploring multiple impacts ubiquity had on learning. Others were targeted to measure a few specific items. Nevertheless, most findings did not reach beyond several shared elements. Four studies of 1:1 programs found a common focus on student performance, student engagement, and transformation of instructional practices (Bebell & Dwyer, 2010). Student achievement, and its improvement, was identified as a central goal of several programs examined in the studies (Bebell & Kay, 2010; Holcomb, 2009, & Jones, 2007). Also related to direct impact on learners was how the accessibility of students to technology would foster the development of 21st century skills (Alvarez, Alarcon & Nussbaum, 2011; Barrios, 2004; & Bebell & Kay, 2010), as well as student proficiency in computer skills relating to productivity and communication (Ross, Lowther, Wilson-Relyea, Wang &

Morrison 2003; Shapley, Sheehan, Maloney, & Carnikas-Walker, 2011; & Zucker & Hug, 2007).

Research related to instruction cited concern for adequate professional development in technology integration (Barrios, 2004; Drayton, Falk, Stroud, Hobbs & Hammerman, 2010; Jones, 2007; Lawless & Pellegrino, 2007; Livingston, 2009; Newhouse, 2008; Oliver, 2010; Ross et al., 2003; & Valiente, 2010), and investigated how the transformation of instructional practices emerges in technology-rich learning environments (Alvarez et al., 2011; Bebell & Kay, 2010; Delisio, 2010; Dunleavy, Dexter & Heinecke, 2007; Hasley, 2007; Jones, 2007; Lawless & Pellegrino, 2007; Livingston, 2007; Mouza, 2008; Newhouse, 2008; Oliver, 2010; Valiente, 2010; & Zucker & Hug, 2007).

Another common topic in the literature reviewed was the management of the ubiquitous initiatives. Leadership was agreeably a key factor to the success of one-to-one initiatives (Davies, 2010; Toy, 2008; & Zucker & Hug, 2007). Developing program expectations was considered quite important for several of the programs (Drayton et al., 2010; Hasley, 2007; Holcomb, 2009; Livingston, 2009; Newhouse, 2008; & Valiente, 2010), as well as designing an evaluative process toward analysis and improvement (Lawless & Pellegrino, 2007; Ross et al., 2003; Valiente, 2010; & Zucker & Hug, 2007). Technical support was discussed as to its effect on program efficiency or sustainability (Barrios, 2004; Dunleavy et al., 2007; & Newhouse, 2008) and several studies presented discussions on the costs of launching and maintaining one-to-one programs (Holcomb, 2009; Livingston, 2009; & McHale, 2008). Of

course, one area, contributing the ultimate viability of such initiatives, was the planning process (Barrios, 2004; Davies, 2010; Drayton et al., 2010; Hasley, 2007; Holcomb, 2009; Jones, 2007; Lemke, Coughlin & Reifsneider, 2009; Livingston, 2009; McHale, 2008; Newhouse, 2008; Shapely et al., 2011; & Valiente, 2010) in which the aforementioned elements and outcomes of one-to-one technology programs are anticipated and given value.

The Importance of Planning

Research of ubiquitous computing programs is certainly an emergent work but much can be learned from these early adopters. Livingston (2009) examined the one-to-one programs at three schools and suggested the use of the studies in the development of new initiatives. Noting the successful elements of a program and analyzing challenges can be helpful in designing a plan with greater potential for success.

Barriers to efficacy caused by technical problems with one-to-one devices and infrastructure must be examined. Pre-implementation consideration of logistical and technical challenges was believed, in one program study, to be a necessary part of the planning process and to be helpful in developing strategies for dealing with such issues to allow instructors to focus on teaching and learning (Dunleavy et al., 2007). Technology's value to the learning environment, as Dunleavy found, was diminished by technical problems. Oliver (2010) addressed this same issue by recommending a collaborative response to technical support needs, where instructors and students share the responsibility for solving technical issues. The Denver School of Science

and Technology incorporated students as part of troubleshooting teams to solve hardware, operating system, and network problems (Livingston, 2009). Some schools, however, planned for and hired on-site technicians (Newhouse, 2008).

Teachers, working in a ubiquitous learning environment, must feel adequately prepared for the task. Planning, therefore, must include a relevant professional development component (Holcomb, 2009). Barrios (2004), presented the State of Florida's commitment to this need, evidenced by the state's professional development plan for technology integration and the modification of teacher preparation programs. The efficacy of technology integration, according to Lawless & Pellegrino (2007), is determined, at least in part, by relevant teacher training. They noted, however, the inadequacy of some technology professional development plans did not prepare instructors well enough to cause significant transformation of instructional practices. There is evidence of increased instructor readiness to embrace technology integration, possibly as a result of instructor awareness of the contemporary learner's indigenousness to the technology-enabled world (Ertmer et al., 2012, p. 432).

Jones (2007) also pointed to the need for a professional development plan but focused on the importance of on-going training with an accountability component to measure levels of technology integration. One district, in this study, developed an instrument for tracking integration and a rubric by which instructors could show progression of their skills. The result was a rise in standardized test scores.

Philosophy and Expectations

Putting technology in the hands of a group of learners would seem to have the potential of impacting the learning environment. Nevertheless, it is important to determine purpose and define expectations for ubiquitous computing programs. Several schools examined in studies, included in this review, put much emphasis on the defining of expectations for their programs (Drayton et al., 2010; Hasley, 2007; Holcomb, 2009; Livingston, 2009; Newhouse, 2008; & Valiente, 2010). Florida's statewide framework for ubiquitous computing was developed for the purposes of bridging the Digital Divide and developing proficiency of 21st skills for the state's students (Barrios, 2004). The Denver School of Science and Technology designed its technology integration program to place emphasis on technology as only a tool used for discovery and learning but equally emphasized the essential roles of the learner and the instructor, as well as the roles of administrative and support personnel in seeing the outcome of learning was achieved with the aid of technology, and not because of it. (Zucker & Hug, 2007). One comparative study discussed the purpose of technology integration for three philosophically different schools. One school believed technology access and proficiency would boost student confidence toward success. Another school used laptop computers to facilitate its accountability initiative to increase student performance on high stakes testing. The third school initiated a one-to-one program to help teachers differentially teach to three tiers of students (Drayton et al., 2010).

Some organizations in these studies had expectations for what one-to-one programs should accomplish. Holcomb (2009) concluded many schools adopted these programs to bring about higher standardized test scores. A Connecticut grade school phased in its ubiquitous program to give its students access to Internet resources for research to support its goal of facilitating student-centered learning (Delisio, 2010). Michigan's Walled Lake Consolidated School implemented a one-to-one program, modeled after the established Anytime Anywhere Learning (AAL), to give students the opportunity to learn round-the-clock, from any location (Ross et al., 2003).

Systemic Change and One-to- One Computing

Systemic change and ubiquitous computing can be linked, although some may argue if the technology is a response to needed change or if the technology is the cause of change. Reigeluth (1999) cites the evolution of societal and economic conditions, from past efficiencies to those adapted to the current digital world as a catalyst for systemic change in education. The complexity of the job duties workers in this era must perform requires training for new aptitudes (pp. 16-21). A holistic approach to transformation of education will be necessary, as all components of the institution must experience the transformation simultaneously and symbiotically (p. 16). Implementers of ubiquitous computing may define purposes for their initiatives, which have system-wide implications (Penuel, 2006, p. 335.). Weston & Bain (2010) examine the role of ubiquitous computing programs on instructional changes and suggest the emphasis on change has been misplaced, with more attention given to a

treatment (one-to-one programs), than on the systemic issue of making more effective schools and transforming instruction (p. 9).

The introduction of one-to-one computing in schools is a variable, which necessitates consideration by all parts of the educational system. An examination of the instructional impact made by the introduction of computing programs in the classrooms of our schools is necessary, particularly how the transformation moves systemically (Bielefeldt, 2006).

Rogers (2003) has constructed a framework, through his Diffusion Theory, by which the spread of an innovation happens systemically. The science of this research may offer insight to those interested in how the establishment of ubiquitous computing in schools impacts changes to pedagogy and instructional strategies throughout the school organization.

The Measure of Success: Outcomes

One-to-one programs should be designed to include defined outcomes that will be analyzed to determine efficacy. The Berkshire Wireless Learning Initiative listed as its outcomes, "enhanced student achievement, improved student engagement, changes in teaching strategies, curriculum delivery, and classroom management; and enhanced capabilities among students to conduct independent research, and collaborate with peers" (Bebell & Kay, 2010, p.8-9). Planners for new one-to-one programs could look to studies of existing initiatives and find common outcomes, which could be integrated into their own goal-setting processes, provided they support the planner's philosophy and purposes.

Engagement.

One outcome, discussed in a majority of studies was an increase in student engagement (Bebell & Kay, 2010). Shapely et al. (2011), credited this to the types of connected, germane learning experiences, which were facilitated by laptops and an Internet connection. Mouza (2008) studied a group of underprivileged urban students and provided evidence of greater student confidence and the feeling they contribute to the learning process. Instructors at the Denver School of Science and Technology also indicated greater engagement (Livingston, 2009). Nevertheless, technology saturation caused students at Urban Tech High to become quite desensitized to computer access, stagnating motivation (Drayton et al., 2010).

Student achievement.

Improving student achievement, a common justification for implementing a one-to-one program, was supported by data from several existing programs, but the impact was not equal for all subject areas (Holcomb, 2009). Valiente (2010) pointed to the lack of a substantial number of scientific studies on the affect ubiquitous computing on student academic performance. Nevertheless, student performance on writing assessments did show an increase after the implementation of Maine's laptop program (Holcomb, 2009). Valiente (2010) also indicated an improvement in writing scores for some programs but also offered evidence of improvement, at a lesser degree, of mathematics achievement. Bebell & Kay (2010) found evidence of higher standardized assessment performance for one-to-one middle school students, in the area of Reading/Language Arts.

Impact on the learning environment.

Ubiquitous computing requires a change in the way teachers teach (Holcomb, 2009). Transformation of instructional practices was found to be progressive throughout the first several years of one program studied. Stages began with acquiring proficiency of basic technology skills and progressed to include adapting the new technology to strategies already in place (Oliver, 2010). Teachers at a Connecticut school moved away from day to day lesson planning to create constructivist-inspired projects spanning longer periods (Mouza, 2008). At least two studies indicated one-to-one access enabled teachers to personalize learning, giving instructors greater flexibility in designing instruction for students at multiple levels of proficiency (Drayton et al., 2010; & Oliver, 2010). Changes to instructional practice for many of these ubiquitous programs signaled a progression away from teacher-centered classrooms to more learner-centered environments (Bebell & Kay, 2010; Drayton et al., 2010; Dunleavy et al., 2007; Holcomb, 2009; Jones, 2007; Livingston, 2009; Mouza, 2008; Oliver, 2010; Penuel, 2006; Ross et al., 2003; Shapley et al., 2011; Valiente, 2010; & Zucker & Hug, 2007).

Evaluating Programs

Ubiquitous computing is undoubtedly a departure from the traditional learning environment. It creates a shift in the instructional strategies. A core principal in instructional design is the inclusion of an evaluative process to guide revision and refinement toward greater effectiveness. Penuel (2006) agreed there must be more

done to study the impact of one-to-one computing on learning, but says not enough scientifically verifiable data exists on the subject.

Some programs are building evaluation into their design. The Denver School of Science and Technology was conceived and opened as a ubiquitous learning environment and leaders of the institution took action to self-study the program's efficacy. Furthermore, the school has implemented periodic online benchmarking giving leaders another source for evaluative data (Zucker & Hug, 2007). This same school monitored teacher proficiency in technology integration and used a peer guidance system to offer training and support to those teachers who needed it (Livingston, 2009). The Berkshire program used data from teacher and student surveys to measure the impact of ubiquitous computing on student motivation and changes to the learning environment and used assessment data for reading/language arts and math to assess that program's effectiveness and potential for continuation (Bebell & Kay, 2010). Delisio (2010) described an accountability system, implemented by one school program, by which teachers tracked technology integration in classrooms, measuring the impact one-to-one computing. Jones (2007) described a similar measure and advocated for reflective practice among instructors to improve teaching strategies in the one-to-one environment.

Commitment Toward Sustainability

Launching a one-to-one computing program creates a radical shift in the learning environment and presents challenges to instructors and students. Schools and leadership considering implementing one-to-one initiatives must understand

realization of outcomes may not be immediate (Holcomb, 2009). Impatience with the process, or perhaps flawed reflective and corrective processes, could lead to an early demise of a one-to-one. Schools in New York, Virginia, and in California phased out one-to-one programs, which became cost prohibitive in light of unmet expectations and goals (Hu, 2007). Stakeholders should realize sustainability relies upon a commitment towards dealing with challenges by devising research-proven solutions in order to make one-to-one computing the expected norm for the classroom.

Conclusions

This review of literature on ubiquitous computing programs reveals common ideas and findings across the breadth of work. Most programs were launched in hopes of improving student achievement and changing the way teaching and learning takes place. While there is evidence one-to-one computing contributed somewhat to these ends, the data are not plentiful, nor does it conclusively make the case. What is clear, is the fact technology, in the hands of every student, brings freshness to the classroom and increases student engagement. Nevertheless, rigorous, relevant and technology-rich instruction must be present to sustain higher levels of engagement. Transformation of instruction will only be supported by plans for relevant professional development and accountability.

Educational leaders considering new programs must look to current research to support new initiatives. One-to-one programs should be carefully designed for the long-term and should be collaboratively built, with all stakeholders sharing ownership before the first laptop is handed out.

CHAPTER THREE

Methodology

The researcher sought to answer the question, "What changes in instructional strategies occur following the implementation of a one-to-one computing program in a high school?" The research approach was a case study, defined by Check & Schutt (2012) as "a setting or group that the analyst treats as an integrated unit that must be studied holistically and in its particularity (p. 190)." This was a qualitative design. The research presents a "thick description (p. 190)," or narrative of the implementation of the one-to-one program and the changes, which occurred in the learning environment, in regard to instructional strategies, once the computers were utilized in classrooms.

Context of the Study

Some level of technology integration is present in most P-12 schools. All classrooms in the county school district, for at least five years, have been equipped with technology bundles, which include mounted projectors and interactive whiteboards, as well as with at least one computer with productivity software and Internet access. Teachers, therefore have some experience with technology integration. The implementation of the one-to-one computing initiative at the subject school was accomplished in 4 phases, with devices distributed to students in grades 9-12 over two school terms. The ubiquitous access to personal computing devices would seem to necessitate a re-evaluation of instructional practices. In essence, the implementation of ubiquitous computing could either be a catalyst or at least a

component of systemic change for the school. Schools are in need of transformation, which will enable them to more effectively educate learners in the context of a changing society, yet the pathway to transformation is unfamiliar and untried (Jenlink, Reigeluth, Carr & Nelson, 1996. Jan., Feb., p.21). The task of teaching, in the context of ubiquity, is sure to be of concern to classroom teachers.

The acceptance of a one-to-one environment, and teacher attitudes toward modifying pedagogy was studied in this project. Of particular interest is how the innovation, namely new instructional strategies, is spread throughout the setting. Rogers (2003) describes the means by which new ideas are introduced and disseminated, which he calls "diffusion," which "is the process in which an innovation is communicated through certain channels over time among the members of a social system" (Kindle location 769). His theory, "Diffusion of Innovations," first published in 1962, offers insight as to how the proliferation of innovations is affected by various factors of transmission and human condition (Rogers, 2003, Kindle location 782-783).

Role of the Researcher

The researcher was responsible for the design and implementation of the study and was the administrator of the subject school during data collection. The researcher conducted and transcribed all interviews and focus groups and collected all archival data. The researcher also coded and analyzed all data.

Selection of the Participants

Purposeful sampling to derive "information-rich" responses (Patton, 1990, p. 169) was used to select participants for the study. Participants, who were to be selected from the academic departments, must have instructed students both before the implementation of the one-to-one program and after, in order to qualify for the study. The selected teachers were to be representative of various comfort levels, with the one-to-one innovation, ranging from high to very high; moderate; and low to very low. The original design of the research included a survey of all teachers, who were on staff pre- and post-implementation, to identify potential participants and their comfort levels. The researcher originally proposed a questionnaire via Survey Monkey to measure comfort levels of technology use and integration strategies, but opted for a tested instrument, the Stages of Concern Questionnaire, or SoCQ, which evaluates the responders' perceptions of a new strategy or innovation, in this case, the one-to-one laptop program (George, Hall, & Stiegelbauer, 2006). Prior to the selection process, several instructors retired or changed employment. There were only nine teachers of core subjects, at the time of selection, which met the criteria for participation. It was determined that all nine of these instructors would be invited to participate. All nine of the candidates consented to participate and completed the SoCQ.

Description of the Participants.

Nine classroom teachers, of core subject areas, participated in the study. These participants had been employed at the subject school pre- and post-implementation of

the one-to-one laptop program. There were seven female participants and two male participants. Four of the participating teachers held bachelor's degrees and five held master's degrees. Experience levels varied for the participants, and ranged from 4 years to 42 years of teaching. All were certified, according to the state's Department of Education, for their subject areas. Three were language arts teachers; three were science teachers; two were math teachers; and one taught social studies and history. All nine teachers had participated in numerous hours of professional development in technology and pedagogy. Prior to the collection and analysis of data, the participants understood they would be assigned pseudonyms (Check & Schutt, 2012, p. 54). Every reasonable effort was made to ensure anonymity of the participants. Table 1 displays the participants, identified by pseudonyms, and other demographic data.

Table 1

Participant Demographics

Participant	Gender	Age	Degree level	Yrs. experience	Subject
Barbara	F	29	Bachelor's	4	Science
Betty	F	47	Bachelor's	8	Lang. Arts
Dorothy	F	35	Master's	8	Math
Robert	M	65	Master's	42	Math
Joan	F	62	Bachelor's	28	Science
Mary	F	45	Master's	18	Lang. Arts
Patricia	F	29	Master's	7	Lang. Arts
James	M	63	Master's	23	Science
Shirley	F	36	Bachelor's	8	Soc. Studies

Data Collection

Data were collected through intensive interviews of individual participants, as well as a focus group of all participants. A focus group of students, each of who were instructed by the teacher-participants pre- and post-implementation of the one-to-one initiative, was conducted to produce triangulation data for verification of participant responses to interview and focus group prompts. All interviews and focus groups were conducted in late November and early December of 2013. Interviews and focus groups were transcribed by the researcher and coded using the Dedoose application for analyzing qualitative data (SocioCultural Research Consultants, LLC, 2013). Content analysis was used to analyze this data (Krippendorff, 1980).

The researcher conducted classroom observations in late January and early February 2014, using the Instrument for Classroom Observation of Technology (ICOT) (ISTE, 2011), providing further data for triangulation. Finally, an examination of the participants' lesson plans, pre- and post-implementation, was conducted to find any changes to classroom instructional strategies. Logs of professional development experiences in technology integration were also examined.

A system of codes for analyzing qualitative data.

Characteristic of content analysis and using a thematic approach (Krippendorff, 1980; Guest & McClellan, 2003) the researcher applied codes to the excerpts from interview, focus group and lesson plan data to identify specific themes to which the excerpts were related. Excerpts could have multiple codes attached depending on the scope of ideas expressed.

The researcher selected focus areas of the study to create a coding system (Richards & Richards, 1995) to identify specific ideas of themes found in the data. A preliminary set of main ideas for the coding framework was developed from themes found in the literature. The coding system was further developed from the researcher's consideration of participant statements in the interviews. The hierarchy of the code system, includes the "big ideas" of instructional strategies, technology integration, learning, planning and professional development, and a complex subset of codes for the main categories. The Dedoose application designates the subset codes as "child codes" and "grandchild codes" of the main code categories, called "parent codes" (SocioCultural Research Consultants, LLC, 2013). Some of the lesser codes have weight systems, usually Likert scales, attached, for recording frequency, levels of intensity or response options (see Appendix D for the code hierarchy).

The researcher performed code occurrence and code co-occurrence analyses of the data depending on the information needed for each category of results. Code occurrence was measured in order to find the frequency a code or theme was found in the data set. For instance, if the researcher needed to compare the frequencies to which participants discussed teacher-centered or learner-centered instruction, he would simply query the code occurrence for each. Code co-occurrence can be used to determine the occurrence of one code, which has also been identified with another. The co-occurrence of codes may reveal the emergence of a motif (LeCompte & Schensul, 1999). For example, using the researcher's coding system for this study, determining the occurrences of excerpts coded teacher-use of technology as related to

pre-implementation of a one-to-one program, the researcher would query for excerpts coded for both teacher-use and pre-implementation.

Intensive interviews.

The study included intensive interviews of the participants. "Intensive or depth interviewing is a qualitative method of finding out about people's experiences, thoughts, and feelings (Check & Schutt, 2012, p. 201)." The researcher conducted the intensive interviews to gather data as to the participants' personal and professional journeys from functioning in the pre-implementation learning environment to the transition of implementation to the on-going adjustments of instruction as they become more adept with teaching in a ubiquitous setting. Questions were open-ended and interviews were transcribed and coded for analysis, using the Dedoose application (SCRC, 2013).

Focus groups.

Conducting focus groups is an accepted practice in qualitative research. According to Wilkinson, focus groups yield "qualitative data" as a facilitator guides a conversation among the members of the group (as cited in Onwuegbuzie, Dickinson, Leech & Zoran, 2009, p. 2). In this study two types of focus groups were convened. The first consisted of the teachers selected as participants. The facilitator moderated conversations dealing with instructional strategies, both pre- and post-implementation of the one-to-one program. One participant was unavailable for the scheduled focus group. The second was populated by students of the participants, who discussed the types of instructional strategies they experienced, both before the one-to-one

implementation and after. Focus group discourse was transcribed and coded for analysis, using the Dedoose application (SCRC, 2013).

Examination of archival data.

The examination of archival data focused on lesson planning documents, both before implementation of one-to-one and those following the implementation. The researcher looked for references to technology integration and teaching strategies. The researcher also examined professional development logs, in regard to technology and pedagogy, to derive a narrative of how changes occurred in planned instruction by the participants.

Documentation of curriculum and/or departmental meetings, as well as documentation of technology team meetings was also to be analyzed, according to the proposed design of the study, for evidence of system responses to the implementation. The limited availability of these meeting notes and the irrelevancy to the research objectives prompted the researcher to disqualify them from the archival catalog.

Classroom observations.

Observations of classroom instruction occurred within the study to record actual classroom practices of instruction and the integration of technology. These observations provided triangulation data as a comparison of beliefs and practices. Ertmer et al. (2012) recognized the significance of comparing actual implementation of technology integration to the teacher's philosophy of instructional conventions. The researcher, acting in the role of an overt observer (Check & Schutt, 2012, p. 194), conducted two observations, each lasting 30 minutes, for each participant. The

researcher's presence in the classrooms was not considered as unusual or unnatural, as the researcher frequently conducted observations as a school administrator (Check & Schutt, 2012, p. 194). Observations were not announced. The observations were conducted within the framework of the Instrument for Classroom Observation of Technology (ICOT) (ISTE, 2011).

Threats to Validity

Several threats to validity had to be addressed. The potential for bias was present, due to expectancies of the experiment staff (Check & Schutt, p. 137). As the administrator of the subject school, the researcher would have expectations of success for the one-to-one program. Nevertheless, the researcher believed the "team nature" of the learning community would diminish this threat. A 2013 report of the State's Office of Educational Performance Audits (OEPA) included a commendation for leadership, in which teachers expressed trust in and felt support from the school's administrator, this study's researcher. The report also recognized the collaborative climate of the school (Office of Educational Performance Audits, 2013).

Another source for potential contamination was the John Henry Effect, where competitive attitudes may influence the actions or responses of those who are being studied (Check & Schutt, p. 137). For instance, teachers, selected for the study, who perceive themselves at a lower level of expertise and comfort with the technology integration, could have altered their natural progression of instructional growth. The researcher attempted to avoid contamination by concealing the selection process from the participants.

A third potential threat was the Hawthorne Effect, in which the participants of the study could have altered their natural behaviors, simply because they were aware of their participation (Check & Schutt, p. 137). The researcher attempted to curb this threat by explaining the purpose of the study was to take a "snapshot" of the current evolution of instruction in regard to the one-to-one implementation and the importance of the legitimacy of the data.

CHAPTER FOUR

Results

This case study focused on the instructional transformation, which occurred in a rural high school following the implementation of a one-to-one laptop initiative. The researcher's question asked, "What changes in instructional strategies occur following the implementation of a one-to-one computing program in a high school?" The researcher investigated reported changes in pedagogy, technology integration, instructional planning processes and perceived impacts on learning, as interconnected components of the instructional changes. Qualitative data were collected through intensive interviews of teacher-participants and focus groups of teachers and of students. The researcher also conducted classroom observations and examined lesson plans and professional development logs for triangulation. Nine teachers consented to participate in the study. Three participants teach English/Language Arts (ELA); three teach science; two teach mathematics; and one teaches social studies and history classes. The results of the research are organized by subject area.

English/Language Arts Participants

Betty, Mary and Patricia teach English/Language Arts at the subject school. Betty, age 47, has a bachelor's degree and has eight years of teaching experience. Mary has a master's degree and is 45 years old, with 18 years classroom experience. Patricia, 29 years old, has a master's degree and has 7 years of experience. All three teachers were employed at the school prior to the one-to-one implementation.

Changes in pedagogy and technology use: English/language arts.

A code co-occurrence analysis of interview data for the ELA teachers revealed several trends concerning pre-implementation/post-implementation change in the focus areas of instructional strategies and technology integration. The frequency of interview excerpts coded as "teacher-centered" instructional strategies decreased from 42 occurrences in excerpts coded "pre-implementation" to10 occurrences in excerpts coded as post-implementation. The frequency of excerpts coded as "learner-centered" increased from 17 occurrences for pre-implementation excerpts to 51 occurrences for post-implementation excerpts. The data also show increases in teacher-use of technology code occurrences and increases student-use of technology code occurrences from pre- to post-implementation. The data suggest a shift from a more teacher-centered pedagogy among ELA instructors prior to the one-to-one implementation to more learner-centered pedagogy after students received their devices, as well as dramatic increases in technology use for both teachers and learners.

Participant 1: Betty.

Instructional strategies, pre-implementation of the one-to-one program.

Betty described her pedagogy, prior to the implementation of the one-to-one as equally teacher-centered/learner-centered. When asked to rank her pre-implementation instructional strategies, she listed lecture as first. "Direct instruction is lecture, showing things on the whiteboard. Predominantly we used direct instruction."

Although direct instruction was a regular part of her pre-one-to-one repertoire, she described assignments, which required students to conduct research and compose multi-media presentations. Betty's students had access to computers and various applications via a mobile computer lab she received as part of a grant. The availability of laptops made it possible to assign student multimedia presentations as a "final product" after knowledge was acquired from direct instruction and assigned readings. The frequency of assigning student presentations was limited because students had to complete the projects in class, since the laptops had to remain at school.

Instructional strategies, post-implementation of the one-to-one program.

Post-implementation, Betty identified with a more-learner-centered pedagogy. She credited the greater availability of technology for the change. She listed student-centered activities, such as online discussion threads and collaborative projects, first, followed by direct instruction. Her students post and respond daily to threads she begins on the Thinkfinity Community, an online classroom platform, and regularly collaborate on multimedia presentations using Prezi, a web-based presentation application. Betty still lectures, but not as often, as she explained a transition to placing the acquisition of knowledge in the hands of students. An example would be a project for which the students were given the topic of "the American Civil War and slavery". The students' responsibility was to research the topic, develop an understanding of the content, and to present the acquired knowledge through a final product.

Textbook use.

A result of Betty's instructional transformation was a decrease in the use of the adopted textbook. "I rarely use a textbook in my class. I don't think I've used a textbook all year." Betty compiled a collection of resources and readings she found by researching, online. She created links to this content on a Thinkfinity Community page for students to access.

Technology integration.

Betty reported the level of technology integration prior to the implementation as moderate, explaining she was able to incorporate more technology in her classroom because of the availability of a mobile computer lab. The levels of use for her and her students were not, however, the same. "It was daily with my technology use but with the students it was once or twice a week."

The levels of both teacher and student uses of technology increased in the post-implementation learning environment, as indicated by interview excerpt code occurrences for each. The participant indicated greater frequency of student multimedia presentations, although the code occurrence analysis was inconclusive. The data did show significant occurrences of the codes for instructional/learning management and computer-assisted instruction/learning for both teacher and students. The use of the Thinkfinity Community as an online classroom platform, mentioned six times in her interview, as well use of the CAI application, Study Island, for tutoring, diagnostics and test preparation, contributed to the rise in student and teacher use of technology in the learning environment.

Teacher comfort level.

Betty responded to the questions about her comfort level with technology integration and how it changed, pre- to post-implementation: “High. We are getting there. You have to understand with my age and stuff it's a big deal to say that.” The teacher believes she has been challenged to build expertise and proficiency in teaching with technology in order to live up to the expectations of her students in the one-to-one environment.

Correlation between interview data and lesson plan data.

Lesson plans from both pre-implementation and post-implementation were coded for teacher-centered/learner-centered instructional strategies and teacher/student uses of technology. Code co-occurrence analysis was used to determine changes to instructional strategies and/or classroom technology use from pre- to post-implementation. The researcher compared the results from the lesson plan analysis to trends discovered in the interview data. The number of teacher-centered activities decreased by 50%, from 6 occurrences to 3, from pre-implementation to post-implementation lesson plans. Learner-centered activities increased by 50%, from 10 occurrences prior to the one-to-one program to 15 occurrences post-implementation. Thus, the patterns of change to instructional strategies, as indicated by analysis of the lesson plans is in agreement with the trends found in Betty’s interview excerpts.

Technology use by students also increased from pre- to post-implementation, as indicated in the lesson plan analysis, as well as in the interview data. Teacher use,

however, decreased, according to code co-occurrence. This was not the same pattern found in the analysis of the interview, in which both student and teacher use of technology increased from pre- to post-implementation.

Correlation between interview data and classroom observation data.

The Instrument for Classroom Observation of Technology (ICOT) (ISTE, 2011) was used to document observed instruction and technology integration. The researcher focused on the practices or role of the teacher during class, as well as the use of technology by both teacher and students. Two unannounced observations were conducted for each participant. The data reflects only the post-implementation classroom.

Two 30-minute observations of Betty's classroom were conducted. The teacher was engaged in teacher-centered instruction, such as lecturing and modeling, two times, over the two observation periods. Learner-centered instruction was observed three times. The learner centered instruction included student research of online historical documents and writing of personal responses, as well as an analysis of political cartoons students retrieved from Internet research.

"The ICOT instrument calculates the percentage of "student" or "teacher use" based on the "time periods" for "technology use" the user of the instrument identifies during the observation (ISTE, 2011). The ICOT data for the first observation of Betty's classroom showed both Betty and her students used technology for almost the entire observation period. Betty's use of technology included a Smartboard presentation of content and the use of Thinkfinity to interact with her students during

an assignment. Betty's students used their laptops to access historical documents for analysis and synthesis. During the second observation, the teacher used technology 86% of the time and student use was identified at 96% of the observation period. The same type of uses occurred in the second observation as the first.

Professional development.

The participant attributed her increased comfort level with technology to professional development sessions she experienced throughout the implementation. From 2011 to 2013, Betty attended 50 hours of training in best practices related to technology integration.

Planning process.

The participant mentioned Thinkfinity as one contributing factor to changes in her lesson planning process. Betty said, "I can link my lesson plans if I am not here where students can actually access them if there is a substitute teacher." The teacher's lesson plans have actually become a digital document students can access. The availability of the Study Island CAI has also given her the ability to conduct more formative assessment and to personalize instruction.

> If we have a project and the kids are writing an essay and I know subject-verb agreement is a problem for them I can set up an assignment or activities to help them. I had a student today in advanced placement class, who is an excellent writer. He was having problems with this. He was low on this level and it affected his ACT score. We assigned him those lessons on subject-verb agreement to help him. Students may be advanced in none thing and be weak

> in something else and we can differentiate quite easily. Every teacher here knows about Study Island and we've had training sessions so they can differentiate instruction using the one-to-one program and Study Island.

Planning and management.

Betty also believes that a challenge for teachers is establishing a management protocol and setting expectations for student use of laptops. “The biggest thing I had the problem with, when we started the one-to-one was coming up with the procedure. They had to know the procedure for the class. They needed to bring the laptop daily and know they had to use this.”

Determining appropriateness of technology integration.

The participant was asked to discuss how she determined when the use of technology was appropriate for instruction and learning both before the implementation of one-to-one and since the implementation. Prior to the laptop program, student use of technology was planned for summative activities resulting in a final product, such as a multi-media presentation as evidence of learning. In the post-implementation classroom, students use the laptops and technology resources at all phases of the learning process, including the knowledge acquisition stage. She believes access to information and the student’s ability to judge the reliability of information should be part of the acquisition process.

> There is direct instruction but direct instruction has changed. It may not be direct instruction on the complex sentence but it may be about how to evaluate the source: to be able to tell if a source is credible, to teach you about writing

> a complex sentence or to teach you about constructing a narrative correctly. Even though we go over them, the important thing for kids to do is to be able to look and say how I know this is reputable information. My kids not only get me to instruct them but they get all the sources I find to instruct them. I can find better sources than me that can teach them something differently than I could. They have that now with one-to-one instruction. The question is when would it not be appropriate for me in my classroom. It's just a different avenue that these kids can use. I think it's always appropriate.

Impact on learning.

It is important to know if changes to instructional strategies and greater availability of technology have impacted learning in terms of engagement and enhancement. Betty has seen the greatest impact among rural male students.

> We live in a rural area and some of our gentlemen students are very reluctant to use computers. I've noticed with that being a requirement, they gain skills they would not have had, had we not been in a one-to-one program. I've noticed they been able to access things they would not have been able to access without the one-to-one program. We still have areas in our community where there is not Internet access at home. When our kids are here, they have that. So, the learner, I think, has been impacted.

The ICOT (ISTE, 2011) measures the level of learner engagement during the observation period. In Betty's classroom, the instrument data indicated 100% of students remained engaged throughout both observations.

When asked if learning has been enhanced because of the laptop program, Betty recalled Prensky's (2010) description of today's students as "digital natives."

> Our students are digital natives but they did not have this technology before and they were held back at school. They have this program now and now they can move forward. Their brains are wired differently in the digital age. We were hindering their process before the one-to-one. At home they were on the computers and they were on their phones and iPods. Now we have the computers at school and they are typing… They are digital natives. We are delivering instruction in their native language.

Negative impact.

The only negative impact Betty discussed was the inclination for some students to get off task and to view websites not connected to the lesson. "I do realize there may be situations where the program may not be implemented correctly and it could have a negative impact, but if it is implemented correctly it will be positive." Betty stressed the responsibility of teachers to "monitor" the students' technology use to lessen a negative impact.

Participant 2: Mary.

Instructional strategies, pre-implementation of the one-to-one program.

Mary, also an English/Language Arts teacher, described her pre-one-to-one pedagogy as "more teacher-centered," saying, "In all honesty it's like I was doing all of the work." She stated large-group discussions were most frequent in her classroom because it helped her "ascertain" the students understood what was being taught. A

lot of assignments were textbook-based, including the answering of "questions at the bottom of the page." Her assessments were also textbook-dependent because the textbook was the predominant resource of content.

Learner-centered instruction was also a part of her repertoire of instructional strategies, as she said collaborative partner and group activities were included in her teaching before students received their laptops.

Instructional strategies, post-implementation of the one-to-one program.

Learner-centered strategies seem to have increased in Mary's classes since the arrival of the student laptops. Analysis of code co-occurrence from the interview transcript shows eight occurrences of the learner-centered code for post-implementation to only one code occurrence, pre-implementation. Significantly, collaborative activities were identified five times for post-implementation to one code occurrence identified as pre-implementation of the one-to-one program.

Access to resources, outside the textbook, has contributed to a change in Mary's instructional program. "They research every story. They do background information on the authors." The participant ranks web research as most frequent, made possible by the availability of the laptops and Internet access. There is also an increased use of collaborative learning, as students participate in online discussion threads, accessible on the Thinkfinity site, related to the reading content. Video conferencing has also been used to facilitate student discourse. Mary believes students "work better when they can bounce ideas off of someone… It's free-thinking

for them, only guided by me. I love these computers." The teacher also reported a collaborative activity between her one of her classes and a class at another school.

Textbook use.

Mary reports using the adopted textbook less frequently since the laptop program was initiated. The same stories she would use from the textbook, she says can be located on websites, along with links to supplemental content.

Technology integration.

The participant described the frequency of technology integration as "low" before the laptop program because of unavailability of computers for student use. The teacher used a Smartboard to present information, but students, she said, "really didn't get to use the Smartboard." Mary sometimes scheduled computer lab time for students to conduct research, but it was limited by availability.

The frequency of technology integration has increased since the implementation of the one-to-one program. Code co-occurrence analysis indicates two interview excerpts were coded with both "technology integration" and "pre-implementation" codes, while there were nineteen excerpts relating to technology integration, post-implementation of the one-to-one program. Using the same analysis method, an increase is evident for both teacher use of technology and student use of technology.

The daily use of the Thinkfinity Community site, for resource links and discussion threads, and the use of Dropbox attributed to the increase in Mary's integration of technology. Mary's incorporation of the cloud based-storage tool,

Dropbox has not only facilitated paperless assignment submission but has given her a way to provide feedback to her students through teacher annotation of submitted assignments.

> All of their assignments are submitted within Dropbox. I can pull them out and put comments on them and put them back and they can correct them. It's not just used for the final assignment but it's used for ongoing assignment. I can pull it up and say, "This is not right. This is not right. Make corrections." And I point out citations. Formative, but focusing on feedback.

Teacher comfort level.

The participant described her comfort level with technology integration as "moderate but growing." Her comfort level, she said, is increasing as she is using technology more.

Correlation between interview data and lesson plan data.

An examination of the participant's lesson plans, indicate slight differences in the documented instructional activities from plans prepared pre-implementation of the one-to-one program and those prepared after. Code co-occurrence analysis shows a decrease of 1 occurrence of teacher-centered activities between pre- and post-implementation lesson plans (6 occurrences to 5 occurrences) and a 1-occurrence decrease in learner-centered activities from lesson plans prepared before the laptop program to those prepared following the implementation (7 occurrences to 6 occurrences). The occurrence of activities coded for teacher use of technology and those coded for student use of technology, both increased in post-one-to-one lesson

plans. The growth of code occurrence was slight, however, with each category increasing by just one occurrence.

Mary's interview responses seemed to indicate greater changes to instructional strategies and technology integration than what was evident from her lesson plans. It is important to note, the researcher and participant did not jointly review the lesson plans and the researcher could make no assumptions of related technology use beyond what was documented.

Correlation between interview data and classroom observation data.

Two unannounced observations of Mary's classroom were conducted, each for 30- minutes. The ICOT (ISTE, 2011) data reflect only the post-implementation classroom. The teacher was not engaged in teacher-centered instruction, such as lecturing and modeling, at any time during the two observation periods. Learner-centered instruction was observed three times. Activities included personalized instruction using the Study Island CAI and a group activity in which students analyzed sonnets accessed from Thinkfinity and wrote personal responses.

Technology use was also documented during the observations. The ICOT (ISTE, 2011) data for the first observation of Mary's classroom showed both Mary and her students used laptops and the Study Island CAI for the entire observation period. During the second observation, the teacher used technology 49% of the time, while students used technology for the entire observation period.

Professional development.

From 2011 to 2013 the participant attended more than 27 hours in technology related professional development. The types of sessions Mary attended had an impact on her teaching. “The programs I use every day are the ones I've had professional development on.” The teacher spoke specifically about the professional development sessions on using Thinkfinity and Dropbox, two applications she reported as using frequently in her classroom. Nevertheless, Mary indicated she would like to receive training to help her teach students basic skills in computing, saying, “…even though I am comfortable with it, they may not be…”

Planning process.

Mary believes the one-to-one program has affected the way she plans and delivers instruction. “I cover less material, but I cover it in a more in-depth manner, by adding in components I could not have before, like the online threads and the research online, the rewriting and reworking of student essays,” she said, responding to the question on her planning process. She also reported fewer textbook-dependent activities in her lesson plans.

> You don't see the textbook as often in my lesson plan anymore. I will spend more days dealing with one story than I used to because I have more stories or resources and can use more depth. You can find online videos included in my lesson plans I would never have used before. If I'm not here I have links in my lesson plans so the substitute can use them.

Rigor.

Mary plans for a higher level of rigor in her assignments, asking questions she describes as harder, as she expects students to employ a higher level of thinking. Rigor has increased because the greater ability for students to research resources found online facilitates a greater depth to learning. “I think my level of questioning has gotten harder.”

Relevance.

The teacher also considers relevance, when planning instruction for students who have daily access to technology, linking student writing to current trends and topics. “We do a lot more of argumentative essay writing and a lot more informational text. We look at the events of the week. I keep them on track with what is going on now in the real world.”

Personalization of instruction.

Mary’s lesson plans, prepared since the one-to-one program, also reflect efforts to personalize instruction, with notes for alternative plans to accelerate or to re-teach. When asked about individualized instruction she responded, “I create different assignments at different levels and set up discussions at different levels. It is like working with IEPs for every student. Study Island and Thinkfinity help.”

Planning and management.

The practice of reviewing and critiquing student work could be considered part of instructional management. The participant attributed a greater efficiency in grading and giving feedback to student work being created and submitted in a digital

format. “I could not have got them graded then handed back to them in the amount of time it takes now.”

Determining appropriateness of technology integration.

Mary described her process of determining the appropriate times technology should be integrated, saying, “When I feel like students need more depth in their knowledge, on any particular subject or area, it is appropriate.” Prior to the laptop program, Mary experienced difficulty in implementing technology integration she believed would enhance the learning process. Students did not have daily access to computers and information systems. Ubiquity has changed this situation as the teacher is able to plan for more learning experiences, aided by technology resources.

Impact on learning.

Mary believes learner-engagement has increased among her students, since the implementation of the one-to-one program. Specific She stated,

> So many more kids are involved in the discussion now. I get so much more work than ever before. I had kids who never turned in papers to me before to now turn in things all the time. They were losing things all the time, before. They are more involved because they get to play games, they think, instead of learning. The videos pull them in. They find their own videos and bring them in to show me. They get so more engaged in what we are teaching.

She also believes the technology has enhanced the learning experiences of her students, specifically those who are at risk for not graduating. She has students who

stay in her classroom, after school, to complete assignments for the online credit recovery program. Those students, she said, have a belief "they can finally graduate."

Negative impact.

Mary's beliefs on negative impacts to learning, caused by the laptop program, were similar to those of participant, Betty. She echoed Betty's concern about students being off-task, at times, and the responsibility of teachers to monitor technology use in class.

Participant 3: Patricia.

Instructional strategies, pre-implementation of the one-to-one program.

Patricia teaches English/Language Arts at the subject school. She described her instructional strategies, before the one-to-one implementation as "teacher-centered." She stated, "It was teacher-centered. It was mainly me giving information and I would explain how to do something and show them how to do something or model it and they would do it." She ranked her pre-implementation instructional strategies as lecture being first and teacher created handouts, as resources, second.

Instructional strategies, post-implementation of the one-to-one program.

Patricia's pedagogy changed once the laptop program was implemented. She described her strategies as "more learner-centered," citing group work, peer-review strategies for writing, and collaborative project-based learning, culminating in student presentations of final products as evidence of learning. She ranked her methods with cooperative learning as first, followed by projects, peer-review, and lastly, direct

instruction. She still sees the need for lecturing, saying, "You still have to use direct instruction to a point. You can't just turn them loose on something, I think."

Textbook use.

The use of the traditional textbook, according to Patricia, has nearly ceased since students received laptops. "We don't have textbooks anymore or I should say we have them but we don't use them," she stated. The teacher explained many of the reading resources and supplemental materials can now accessed by students, using the Thinkfinity Community site. Her response was similar to those of the other teachers in her department.

Technology integration.

Patricia rated technology integration, prior to the laptop program, as low. She frequently used the Smartboard for presenting content and occasionally taking virtual tours, to enhance student learning. Students did work with audio podcasts, before the one-to-one, but those experiences were limited to the scheduling of computer lab time.

Patricia's indicated her comfort level with technology integration is high. She indicated she was more cautious when integrating technology before the one-to-one implementation, because of inexperience. She also rated the post-implementation use of technology as high, due to the greater availability, which comes with ubiquity. She stated technology is now used daily by her students. Assignments and reading materials are linked to Thinkfinity. Reading activities, she described, are all "research based" and students use their laptops to find resources to support their interpretations

of the text. She describes her classroom as paperless, having students to digitally compose assignments and submit them to a shared Dropbox folder. Her critique of student writing and feedback is accomplished through the "track changes" feature in Microsoft Word.

Patricia's students participate in project-based learning, which requires summative multimedia products. Podcasts, movies, and other multimedia presentations are the norm. She discourages students from using PowerPoint, however, because she prefers them to use Prezi, which has online collaborative features. She also assigns activities on computer-assisted instruction platform, Study Island.

Correlation between interview data and lesson plan data.

Code co-occurrence analysis of the participant's lesson plan data was used to determine changes to instructional strategies and/or classroom technology use from pre- to post-implementation. The researcher compared the results from the lesson plan analysis to trends discovered in the interview data. The number of documented teacher-centered activities, found in Patricia's lesson plans decreased from 6 occurrences in the lesson plans developed prior to the one-to-one program to no occurrences in the post-implementation lesson plans. Learner-centered activities increased by 175%, from 4 occurrences prior to the one-to-one program to 11 occurrences post-implementation. Thus, the patterns of change to instructional strategies, as indicated by analysis of the lesson plans is in agreement with the trends found in Patricia's interview excerpts.

The use of technology by students, documented in the lesson plan data also increased from pre-implementation of the one-to-one program to post-implementation. This increase agrees with the interview data. Interestingly, no occurrences of items coded as "teacher use of technology" appeared in either the pre-implementation lesson plans or those prepared for the post-implementation time period.

Correlation between interview data and classroom observation data.

Two- 30-minute unannounced observations of Patricia's classroom were conducted and data were recorded on the ICOT (ISTE, 2011). The data reflect only the post-implementation classroom. The teacher-centered strategy of modeling was observed once in Observation 1, as Patricia demonstrated the use of an online writing reviser tool. Lecturing was observed once in Observation 2. Learner-centered instruction was observed two times in each observation, with students writing an essay on topics of personal interest in the first observation, and student personalized learning on Study Island during the second observation. The classroom observation data show a greater learner-centered environment in Patricia's classroom, as indicated in the interview data, and also corroborates her interview statement, "You still have to use direct instruction to a point."

The ICOT (ISTE, 2011) data for technology use indicate teacher use of technology and student use of technology each occurred for the entire length of both observations. Although the teacher lectured and modeled for brief periods during the

observations, she incorporated her computer and presentation software. She also played a podcast for her students.

Professional development.

Patricia has participated in 22.5 documented hours of professional development in technology related topics from 2011 to 2013. She also presented training in NextGen/Common Core Standards and technology integration, to a multi-district group of language arts teachers. She admits to feeling frustrated with some of the offerings, saying, “I don't mean to say that I'm an expert, but sometimes it's stuff I already know. I wish they would come up with something or show me something we don't already know and that we can use.” She suggested planning professional development that would include tracks divided by level of expertise.

Planning process.

Patricia described her instructional planning process as “almost easier” since the laptop program began. Finding and making supplemental resources available to students is less difficult because much of what she uses is online. Making hardcopies of handouts, prior to the laptop program, was time consuming, so she would plan to use fewer resources.

Rigor.

The teacher believes the laptop program has contributed to higher levels of rigor in her assignments. She has observed her students using resources with higher levels of informational texts, as they research and participate in their projects. She

described one such project as a video newscast on “typhoons”, connected to the class study of the Odyssey.

Relevance.

Patricia said her students were asking questions about typhoons after reading a passage in the story. She capitalized on their curiosity and devised a lesson incorporating technology use and real-world relevance. She had her students research catastrophic storms and script and produce a newscast as evidence they understood the real-world connection to the Odyssey’s content.

Personalization of instruction.

Patricia described several ways the laptop program has helped her personalize instruction for her students. She uses the diagnostic assessment tools on Study Island to determine the strengths and weaknesses of each of her students. Study Island’s learning activities can be individualized to meet the students’ instructional needs. She is also able to differentiate instruction to incorporate student interests and skills.

> You might have four kids at a table and they might all be doing something different. The same thing with the project. They can use a different medium. Someone might want to do a video. Someone might want to do a presentation. Somebody might want to podcast. They are still doing the same thing but they can pick their area of expertise and use it. It makes them feel like they are more in control.

Planning and management.

The management aspect of Patricia's planning process has been impacted by the students' access to technology and the use of Thinkfinity. Several interview excerpts included statements about the availability of technology affecting the variety of resources Patricia could incorporate. After the implementation of the laptop program, she was able to use a greater variety of supplemental texts because students could access them via links she posted on Thinkfinity, rather than by having a hardcopy handout.

Determining appropriateness of technology integration.

Patricia stated before the one-to-one program she determined the appropriateness of technology integration based upon availability of the technology. She now determines that appropriateness based upon the task the students will be performing.

> We use it every day. I just usually look at what we are going to be doing. I know if we're writing a paper we're going to be using the Internet and we're going to be using Microsoft Word. If we're doing a project I just look at different mediums. Do they need a video component? And if they do, we use Movie Maker. If not we use Prezi.

Impact on learning.

Patricia has observed an increase in learner-engagement since the laptop program began. She believes students feel more involvement in the learning process because they have the laptop in-hand and the resources it connects them to. She also

believes students have been more engaged because she frequently gives them a real-world connection to the content and lets them make choices in which mediums to use when working on projects.

Analysis of the English/Language Arts Department.

An analysis of the data for the three ELA participants reveals several similarities. All speak about greater learner-engagement and describe a shift toward more learner-centered pedagogy. Betty, Mary and Patricia describe their classrooms as more learner-centered since the implementation. Learner-centered activities common among all are collaborative assignments or projects and online discussion threads facilitated by the Thinkfinity platform. All ELA teachers report frequent use of Thinkfinity for posting class content and source documents diminishing the need for or use of the traditional textbooks in their classrooms. Another common belief for the ELA teachers was the participation of their students in the knowledge acquisition stage of learning because of the assignment components where students research topics and themes for deeper understanding of the content. The three teachers also cite the use of Study Island for making personalization of learning possible in their classrooms.

The three teachers describe technology integration as high since the implementation, with Mary and Patricia recalling low levels of technology integration before the program began. Betty described her pre-implementation technology integration as moderate, however, because of her access to a mobile laptop lab. Betty's access to the mobile lab and her pre-implementation assignments of student

research and presentations may explain why she assessed her pre-implementation instructional strategies as equally teacher-centered/learner-centered, whereas her colleagues said theirs were more teacher-centered.

There is no evidence that ages of the participants or education levels affected differences in instructional transformation or technology integration but the years of experience may have, at least for their readiness to embrace the implementation. The teachers' responses to the SoCQ questionnaire show Betty and Patricia are most interested in collaborating with peers in the implementation of the one-to-one innovation, suggesting high levels of use and comfort. Both teachers have less than ten years of experience. Mary's responses to the questionnaire show she has personal concerns about her performance in integrating the technology and/or her status among peers. She is incorporating laptop use but may have a degree of anxiety she is doing it correctly or effectively. She may also be comparative of herself to other teachers she perceives as doing well with the innovation. Mary described her cautious approach to implementing the technology as waiting to see how others implemented the devices. It is conceivable Mary was more attached to her pre-implementation instructional repertoire than the other teachers because of her 18 years of experience, twice more than the experience of her junior colleagues. Nevertheless, she is now embracing the change.

It should also be noted one teacher's participation in another school innovation may be a factor in her pedagogical transformation and technology integration. Patricia co-teaches two interdisciplinary blocks with social studies

participant Shirley. The humanities blocks for ninth grade students blend English/Language Arts and World History in an interdisciplinary, project-based experience, incorporating a variety of technology-rich and collaborative student projects.

Science Participants

Three science teachers participated in the study. Barbara, 29 has a bachelor's degree and four years of teaching experience. James, who is 63 years of age, has a master's degree and has been teaching for 23 years. Joan has a bachelor's degree and has 28 years of teaching experience. She is 62 years old.

Changes in pedagogy and technology use: Science.

The researcher examined interview transcript data for the three participants who taught science at the subject school. The data were analyzed using code co-occurrence to identify the number of excerpts coded as pre-implementation of the one-to-one laptop program in the focus areas of instructional strategies, specifically teacher-centered and learner-centered instruction, and the technology integration codes for teacher use and student use. The researcher followed the same process for excerpts coded as post-implementation. A comparison was made to discern a pattern of change.

The code co-occurrence for teacher-centered instruction and pre-implementation identified 14 occurrences. There were 6 occurrences of excerpts coded as teacher-centered and post-implementation, a decrease of 57%. The same analysis was conducted for learner-centered codes, which were also coded for either

pre-implementation or post-implementation of the laptop program. The occurrences of learner-centered codes totaled 7 for pre-implementation coded excerpts and 16 for post-implementation coded excerpts, an increase of 129%. The comparison would suggest a trend toward more learner-centered instruction for the department.

The analysis also showed a trend of higher technology use for both the science teachers and their students. There were 5 occurrences of excerpts coded for teacher-use of technology and pre-implementation and 9 occurrences of excerpts coded for teacher-use of technology and post-implementation. For student-use of technology there were 6 occurrences coded for pre-implementation and 30 occurrences for excerpts coded as post-implementation.

Participant 4: Barbara.

Instructional strategies, pre-implementation of the one-to-one program.

Science teacher, Barbara, reflected on her pedagogy, as to teacher-centered or learner-centered, before the one-to-one laptop program was implemented. She stated it was more teacher-centered, but she insisted she could not attribute teacher-centered instruction to a lack of technology, rather a personal belief she was the source of the content for her students.

> I had to give them that content. It was me. I had to give it to them instead of them getting it themselves. With the lecture and the notes, that is me. That is my content and me telling them what to write. It's me giving them content instead of them getting the content and putting the pieces together themselves. That wasn't happening. I was just giving it to them hoping it would just click.

Typical daily activities would include displaying the essential question, which provides the framework for learning or the learning objective, and assigning the students a bell ringer, which is an opening activity. She listed lecturing and note taking as her most frequent instructional strategies, followed by hands-on activities. She would sometimes have students to work collaboratively using a "think-pair-share" method, in which the students would personally reflect on a question and then discuss it with a partner. Students would also use graphic organizers to guide their understanding of the lecture content. She conducted labs or occasionally assigned projects with a multimedia presentation as a product, but the limited availability of technology was a hindrance. The frequency of these activities was low because of her admitted feeling of responsibility to protect the learning process. She stated, "I had to drive it. I had to keep it going."

Instructional strategies, post-implementation of the one-to-one program.

Barbara described a change in her instructional strategies from more teacher-centered before students had laptops to more learner-centered now. She attributes the change to expanded resources and technology but also credits her increasing maturity as a teacher.

The teacher explains lecturing is still an important part of her repertoire but student note-taking has evolved with the laptops, with students using Microsoft OneNote to compile notes with rich content, inserting images and other multimedia items they find through personal research.

Her essential questions are still posted daily, but on Thinkfinity instead of on the chalkboard. Bell ringers take the form of online discussion threads, which is a more learner-centered approach. She still conducts labs and assigns projects, but the number of projects has increased because of the available technology. Barbara added, "…it's still a lot of the same instructional strategies but they are just magnified, I guess you could say. And made digital."

Textbook use.

Barbara used the textbook frequently in her pre-laptop classroom. She recounted, "Before, you would walk in the classroom and you would see textbooks out. Like I said, that was my entire resource, just the textbooks and me." Since the one-to-one program began, she says availability of online resources has caused a departure from traditional textbook use, saying, "It's opened up a whole new world beyond the textbook. I have the textbook resources online and very seldom do my kids open up an actual textbook because it's right there for them. They can take that home. They don't have to worry about carrying it it's right there on their laptop.

Technology integration.

Barbara's reported level of pre-one-to-one technology integration was "really low." She spoke of the difficulty in securing computer lab time. There were a couple of computers in her classroom, on which she would allow students to research for projects, but she described a scene in which "five students would be huddled around one computer."

She continued to describe technology integration in her pre-laptop classroom, listing teacher use of the Smartboard to display content, and use of the classroom responder set for assessment.

Post-one-to-one technology integration.

Since the one-to-one implementation, the frequency of technology integration has increased in Barbara's classroom.

> High. It used to be pencils and paper. If kids didn't bring pencils and paper to class they were in trouble. They would get behind. Now if they don't bring the laptop and bring it charged to class they're going to get behind. Within a matter of a year of implementing this program it's completely changed.

Barbara makes use of the Thinkfinity Community site for daily discussion threads and the posting of content. She also assigns student presentations using Prezi, a collaborative online presentation application. The student laptops are also used for research. However, her discovery and implementation of Microsoft OneNote is mentioned several times throughout the interview. OneNote has enhanced the lecture note-taking process, making it more learner-centered, allowing students to enrich their notes with added content. She has even used it formatively, explaining,

> On a regular basis they are researching and they are figuring it out and sometimes I can assign them… Come up with your own notes… You know, come in tomorrow with a One Note section about this. They will bring it in. Now sometimes the information they bring in is kind of sketchy, and that's where I come in as the instructor and say, "This is what you really need to

know. Now take what I've given you and compare to that." They are actually getting better at being able to pick out what information is good and what's not. What websites are good and what are not. They're getting really good at that.

Teacher comfort level.

Barbara's comfort level with technology and the integration of technology is described as "high" in the post- implementation-learning environment. While she was comfortable with the use of technology before the laptop program, she was not comfortable with integrating it because of a lack of appropriate resources.

Correlation between interview data and lesson plan data.

Lesson plans from both pre-implementation and post-implementation were coded for teacher-centered/learner-centered instructional strategies and teacher/student uses of technology. Code co-occurrence analysis was used to determine changes to instructional strategies and/or classroom technology use from the pre-implementation period to the post-implementation period. There were 14 occurrences of excerpts coded as teacher-centered and pre-implementation, decreasing 79% to 3 occurrences for the post-implementation coding. There were 2 occurrences of excerpts coded as learner-centered and post-implementation, increasing 80% for 10 occurrences for the post-implementation coding. Thus, lesson plan data reflects a decrease in teacher-centered instructional strategies and an increase in learner-centered strategies, agreeing with the trend of change indicated by the interview data.

The code co-occurrence analysis of lesson plans showed technology use by the teacher increased from no occurrences pre-implementation to 3 occurrences of excerpts coded as post-implementation. Student-use excerpts also dramatically increased from no occurrences to 12. The increase in student-use of technology documented in the lesson plans, agrees with the same trend of change indicated by interview data. Interestingly, the interview data shows an equal number of code co-occurrence of teacher-use and both pre-implementation and post-implementation.

Correlation between interview data and classroom observation data.

The Instrument for Classroom Observation of Technology (ICOT) (ISTE, 2011) was used to document observed instruction and technology integration in the post-one-to-one implementation classroom. The researcher focused on the practices or role of the teacher during class, as well as the use of technology by both teacher and students. The researcher conducted two- 30-minute observations, unannounced. In each observation, Barbara delivered a lecture as her students took notes on OneNote. These lectures were the only teacher-centered activities documented on the ICOT. Learner-centered activity was present as Barbara's students worked collaboratively to create study guides in OneNote, using graphics and online resources they found during their own research. Barbara acted in the role of a coach during this activity. There was also a student discussion time in the first observation. Weighing the three occurrences of learner-centered activities documented on the ICOT against the two teacher-centered occurrences would indicate a classroom,

which is more learner-centered than teacher-centered. The observation agrees with the trend indicated by the interview data.

Teacher use of technology was non-occurring in the first observation, but in the second observation, the teacher used technology throughout the time period starting with her Smartboard during the lecture and then her laptop for the learning management system. Students used technology for 100% of the time observed in both observations, using laptops to take notes and to create study guides with rich content.

Professional development.

The participant attended 30 hours of professional development, from 2011 to 2013, on topics related to technology integration. Eighteen of those hours were specific to her content. Nevertheless, Barbara stated she still desired more content specific training related to teaching science in the one-to-one environment.

Planning process.

Barbara describes a change in her instructional planning process as being more learner-centered; explaining the students' access to the technology and the resources available because of the access guides her development of instruction.

> I make sure the content is structured… I set goals or guidelines I want the instruction to follow and then give them the material and tell them, "This is where you need to go." They have all of these resources they can use. I take my lesson plans and make them open. They're more open to students who need to take longer to complete one of the processes but then they may fly through step two. There is a lot more flexibility in my lesson plans.

Rigor.

Barbara believes she has been able to build greater rigor into her lesson plans because the technology and resources enable her students to go deeper into the content, especially when conducting research necessary for the completion of a project or product.

Relevance.

The teacher also believes her lessons are more relevant to the real world, as she described a genome mapping project. "…mapping the genome, that's real time happening. So instead of me having to go find all of these old articles and passing them out to them they can find real-time stuff that is actually happening now."

Determining appropriateness of technology integration.

Prior to the laptop program implementation, Barbara's view on determining the appropriateness of technology integration was colored by the lack of availability of technology. While she may have believed using technology was appropriate for her instruction, it was not practical. Now she believes incorporating technology is appropriate whenever she finds a resource, which supports the purpose of her instruction. She added, "Before, technology was appropriate but not convenient. Now it's integral. It's not supplemental. It is a daily part of the content."

Impact on learning.

Learner-engagement.

The participant has observed an increase in learner-engagement since the implementation of the laptop program. She indicated the students are more connected

to the inquiry-aspect of science, saying, “They are scientists. They are taking data. It puts them in the now of science, instead of just feeling like it's work.”

Personalization of instruction.

Barbara believes the one-to-one program has made personalization of learning more possible. However, her strategies of personalization are different from those of other participants, who mentioned the use of Study Island and other formative assessment aids. Barbara suggests personalization is realized through the ability of students to self-direct their learning, as far as researching aspects of the content on their own, and the opportunity to move quickly through some tasks and to take more time on others. She is still looking for appropriate resources to help her develop formative assessment strategies.

Enhancement of learning.

The teacher echoed the concerns other participants in this study had of students occasionally getting off task because of viewing sites, which are unrelated to instruction. But Barbara sees a great enhancement of learning for her students because the technology and resources give her students greater control of their learning process. She also sees enhancement through the equity of opportunity these rural students from a high poverty district now have because of the laptop program.

> If for nothing else, it's put computers in the hands of kids who didn't have computers before. And giving them equal resources, like for kids who couldn't afford a $5000 computer. And that is amazing in itself. The kids who were limited before are no longer limited. And that in itself is worth it. If it didn't

do me a bit of good in the classroom it would be worth it. In the classroom it has unbelievably enhanced the kids' learning.

Participant 5: James.

James has the greatest amount of teaching experience among his departmental colleagues. However, he devoted several years of his career working in industry.

Instructional strategies, pre-implementation of the one-to-one program.

James described his instructional strategies, pre-implementation of the laptop program, as more teacher-centered. The teacher said his instruction was driven by curriculum pacing guides and covering content, which would be assessed. His normal pattern of teaching would include presenting information to the students through modeling and lecture, whole class discussions, lab activities, compiling data sheets and assessments, usually taken via the classroom responder set.

Instructional strategies, post-implementation of the one-to-one program.

James stated his instructional strategies since the laptop program implementation have remained much the same as before. Lecturing and class discussion, he believes, are important to students because those are the types of strategies, he says, they will encounter in the college classroom. He still conducts labs but the recording of lab data is now digital, with students preparing lab data on spreadsheets and submitting them in a shared Dropbox folder. He also conducts more formative assessment but those tests are given using the class responder set. Nevertheless, he is giving more of the assessments because of a shift to testing and retesting. He sees his instructional practices as more learner-centered, now, because

of the formative assessment, not because of students having laptops. Through testing and retesting he is giving students an opportunity to understand their learning process and performance and to improve.

Textbook use.

James did not speak about textbook use. Code occurrence analysis of the interview data for James yielded no occurrence of the textbook use frequency in the document. A keyword search showed only one occurrence of the word, "textbook," but the data gave no indication as to how the textbook was used in class or as to the frequency.

Technology integration.

Technology integration was present in James' classroom before the one-to-one laptop program. He rated the frequency of use as "high" explaining, "because the classes are chemistry and physics… there is technology present on a daily basis." James frequently used the Smartboard and the document camera when presenting content or modeling processes. He had several classroom computers he used to instruct students on building spreadsheets to conduct lab data, as well as enhancing labs with science specific applications.

Post-one-to-one technology integration.

Since the one-to-one implementation, technology integration has increased beyond what James was doing in his classroom prior to the one-to-one implementation. The increase could be attributed to ubiquity. All students have access to a computer and Microsoft Excel; therefore there is greater technology use during

the lab data collection process. Also, the spreadsheets are submitted electronically to a shared Dropbox folder. The science department purchased software and installed it on all student laptops, enabling students to do a variety of lab simulations. He added there is more frequent use of the classroom responder set because of the increase in formative assessment.

Teacher comfort level.

James' experience in industry contributed to his higher comfort level with using technology. Nevertheless he says he is "reasonable comfortable" with the technology applications he now uses in the classroom because there is always something to learn.

> I've always been comfortable with the hardware. I built computers when I was in college forty years ago. The new aspect is the software. As I've gotten older, my memory slips a little bit, being able to jump from program to program and being able to do some of these things and that's a problem. And that's improved as I've worked with students. Kids teach me. They say you can do this and show me how to do things I've never seen. I love it. I have good students.

Correlation between interview data and lesson plan data.

Code co-occurrence analysis of lesson plan data was used to determine trends in the focus areas of instructional strategies and technology integration between pre-implementation of the one-to-one program and post-implementation. There were 7 excerpts coded as teacher-centered and pre-implementation. The occurrences

increased to 11 excerpts for teacher-centered and post-implementation. Three occurrences of excerpts were coded as both learner-centered and post-implementation. The occurrences increased to 4 excerpts coded as learner-centered and post-implementation. James described using several teacher-centered strategies in his interview, both pre- laptop program and post. However, the number of occurrences of the teacher-centered code decreased in the interview data from pre-implementation to post-implementation. He also described increasing the learner-centered aspects of instruction in the post-implementation classroom. The comparison of data shows no conflict regarding the increase of learner-centered activity.

A similar analysis of lesson plan data for technology use by teachers and by students for pre- and post-implementation showed increases in technology use by teachers, pre- to post-implementation, and by students pre- and post-implementation. The data reflects corroboration with trends reflected by an analysis of the interview data.

Correlation between interview data and classroom observation data.

Two- 30-minute unannounced observations of James' classroom were conducted and data were recorded on the ICOT (ISTE, 2011). The data reflect only the post-implementation classroom. James facilitated a lab with multiple activities during the first observation, with students recording and analyzing data. In the second observation, James demonstrated a laser then had the students to research lasers on the Internet and contribute to a class discussion. Teacher-centered instruction, lecturing, was observed once in each observation as James set up the lab and

demonstrated the laser. Learner-centered strategies, namely, coaching/facilitating and moderating student discussions, were documented three times over the two observations. The ICOT data indicate a slightly more learner-centered environment, based on the role of the teacher.

The use of technology by the teacher in Observation 1 was calculated as 80% of the observation period, while student-use was 36% of the time period. In Observation 2, both the teacher and the students were using technology during the entirety of the observation period. It is important to note, technology was in use by both teacher and students in both observations, reflecting the presence of integration. Observations conducted at other times may show variance in the percentage of use, according to the scheduled activities.

Professional development.

The participant attended 36.5 hours of professional development on topics related to technology integration, between 2011 and 2013. Prior to 2011 he attended training sessions on the uses of the Smartboard, document camera, and classroom responders. These sessions equipped him for teacher-use of technology. James also attended an advanced class for Microsoft Excel, an application his students frequently use. The researcher asked the participant if there was any professional development he currently needs. James said a session on classroom management in the one-to-one environment would be beneficial to him.

Planning process.

James stated he has to purpose to document the use of technology in his lesson plans. It is not automatic for him.

> I'm not like the young kids that grow up with it. I still have to sit down and write a plan of what I'm gonna place in Thinkfinity, or assignments I make on sites I will use. That's probably my weakest point is when I am going to use Study Island and some of these other things opposed to what I do in the classroom.

It is most important for James to identify what he is teaching. Deciding on which technologies to incorporate will depend on the availability of resources and how those resources will benefit learning.

Rigor and relevance.

The participant does not see any change in the level of rigor present in his instruction, from pre-implementation to the post-implementation period. However, he believes the student laptops have made his teaching more relevant.

> I think it has allowed, when we are discussing something, you can take a work topic and ask them to pull that up, take 5 minutes... Look at that element. What industries use this? What products? How many of you have this in your home? Even if they become a housewife, they can look at chemicals and see products that have those things in them. I try to address how you deal with those things in the home.

Determining appropriateness of technology integration.

James stated technology integration was present in his classroom before students had their own laptops. The way he used it, he explained, was limited to availability. Prior to the laptop program implementation, James would assess the students' needs, as to what they needed to know about using technology based on their post-secondary aspirations.

> The relevance to their career or post-high school educational plans… If I had an honors class of college bound students, I would give them more introductions to computers. If they were looking at a RN program, then we would see the types of technology, such as laboratory equipment, they might run into, such as spectrometers that would test for blood gases, and try to introduce those in a lab. If they were going into phlebotomy, for example, I would introduce them to centrifuges, so I can show them how they can use the centrifuges for liquids, so they could see how they would separate blood plasma. These are technologies we still incorporate. If you have a class of 25 and some are going to college and some going to two-year programs, I try to see what will make the biggest impact.

James also stated he looks to the availability of technology resources and how it will impact student-learning, in determining which technologies to incorporate into his lesson plans.

Impact on learning.

Learner-engagement and enhancement of learning.

James believes learner-engagement has "changed somewhat," but not for all students. For the more motivated learners, the access to information has helped them to process the presented content for better understanding. James stated, "If a student has a question about what I am presenting, they can Google it. They seem to retain better and even come up with different questions. It gets them involved in what is going on.

James was concerned for other students and said he did not see the same level of engagement. He discussed some of the same issues brought up by other participants about students getting distracted by online activity, not related to class work. The "daydreaming" students of the pre-laptop classroom are now distracted by the unlimited world of information. Still, others are not engaged because they become frustrated by their lack of basic computing skills, like file management and saving documents in Dropbox.

James does believe learning has been enhanced for the more motivated students but feels struggling students need greater guidance.

Personalization of instruction.

Personalizing learning is something James believes is less difficult with the one-to-one laptop program.

> It makes it totally possible. Teaching the subjects that I do, I can separate upper level and middle level, maybe, but to be able to reach five or six

> different levels, you couldn't do it without having these computers, tailor-making different things and keeping track of where everybody is. I can make alternate assignments to special need students or to those who cannot keep pace. I even have with some of these technologies the ability to give different exams to the same classroom. Covering the same materials, but changing them. I can eliminate some choices for some students on test questions to help make them more competitive.

Participant 6: Joan.

Instructional strategies, pre-implementation of the one-to-one program.

Joan described what her teaching strategies were like before the implementation of the one-to-one program. She said the most frequent was direct instruction, or lecturing. This would happen, as she would introduce any new topic. It would be typical for Joan to assign questions related to her lecture and have students research them in the textbook or library, and sometimes on the Internet, if she could schedule lab time. Students would also prepare summaries of what they learned from researching topics, writing in their "own words." This was documented several times in the lesson plan data. Her students also worked collaboratively on assignments. Joan described her pre-implementation pedagogy as more learner-centered, because of the research and summary component and because the students frequently worked collaboratively.

Instructional strategies, post-implementation of the one-to-one program.

Research of the lesson topics is still part of Joan's toolbox but she said it has been enhanced by the student laptops. She encourages her students to Google the topic while she delivers the lecture and to contribute to the discussion using things they find online. She says the student laptops have almost eliminated the need to visit the school library. Joan also makes use of resources found on the web-based SAS in Schools, which has a variety of instructional activities for most disciplines.

Lecturing is still one of her instructional strategies, especially if she is "starting something new." The participant says she uses the Study Island program bi-weekly for supplemental instruction and conducts labs. She believes her pedagogy has still been more learner-centered since the one-to-one program began.

Textbook use.

Joan made no mention of using textbooks during the interview. There was no specific question addressing it. It cannot be deduced from the interview data, if the textbook is used in her classes.

Technology integration.

Joan rated the frequency of technology integration in the pre-laptop learning environment as low. She used the Smartboard to present information to students. She also scheduled the use of one of the computer labs, when available, for research and for activities using SAS in Schools.

Post-one-to-one technology integration.

The participant described the frequency of technology integration in the post-implementation classroom as moderate, but she adds, "We don't use it every day." Nevertheless, Joan has incorporated several new technologies into her teaching. As she previously explained, students are using their laptops to research topics as she is presenting them, allowing them to contribute more to the discussion. She is also using Study Island, for supplemental content. She noted a lesson on Study Island, which presents the parts of cells in greater detail than in what students could access before. SAS in Schools is still used but can be used without having to schedule lab time. She also continues to use her Smartboard.

Teacher comfort level.

Joan has grown more comfortable with using and integrating technology because she has learned more about how to use the available resources within her subject matter. She added, "When I first started teaching we weren't using the computers. I would say now I am moderately comfortable. I learned a lot from teaching the kids different research sites and different programs."

Correlation between interview data and lesson plan data.

The researcher conducted a code co-occurrence analysis of lesson plan data to deduce trends, from pre-implementation of the one-to-one program and post-implementation, in the focus areas of instructional strategies, particularly teacher-centered and learner-centered, and technology integration and use by teachers and students. A comparison was made to the interview data.

Eight lesson plan activities, coded as pre-implementation were also coded as teacher-centered. Sixteen activities were coded as post-implementation and teacher-centered, a 100% increase in occurrences. Learner-centered activities increased from 9 occurrences in pre-implementation lesson plans to 13 occurrences in post-implementation plans. The data does not show a decrease in teacher-centered instruction to coincide with an increase in learner-centered instruction. It is also clear there are a greater number of teacher-centered activities in the post-implementation classroom. This is in conflict with the teacher's assessment of her post-implementation learning environment. The researcher and participant did not jointly review lesson plans. No additional information about the documented activities was available.

There were no occurrences of lesson plan activities coded as teacher-use (of technology) for either pre-implementation or post-implementation codes. There were 3 occurrences of activities coded as student-use and pre-implementation, and 10 occurrences of activities coded as student-use and post-implementation. No trend can be determined for teacher use of technology but there was a clear increase in the number of student-uses of technology from pre-implementation lesson plans to the post-implementation documents. The trend is supportive of the interview data.

Correlation between interview data and classroom observation data.

Two unannounced observations of Joan's classroom were conducted, each for 30- minutes. The ICOT (ISTE, 2011) data reflect only the post-implementation classroom. The activities observed in each observation were similar. Students were

given a topic recently covered by Joan in a lecture. The students worked in pairs to find Internet resources they could connect to the topic and create a collaborative report summary. The teacher was not engaged in teacher-centered instruction, such as lecturing and modeling, at any time during the two observation periods. Learner-centered instruction was observed twice, as Joan served as a facilitator/coach for the research activity. The data support Joan's assessment of her learning environment as being more learner-centered.

Technology use was also documented during the observations. The ICOT (ISTE, 2011) data showed students using technology for the entire observation period, as they used their laptops for research and writing. No teacher-use of technology was recorded.

Professional development.

The participant attended 27.5 hours of professional development, from 2011 to 2013, related to technology integration. Joan said she had participated in most of the school-level PD. She stated she would benefit more from having other science teachers, from other schools, meet to discuss resources they are using in their classrooms. Joan said she already shares resources with another teacher via email.

Planning process.

The researcher asked Joan to describe her instructional planning process, as it would have been before the students received laptops and after. The teacher said she would plan to use technology with the students but securing the lab time was an issue. The only change in planning, other than including time for Internet research and use

of Study Island and SAS in Schools, is the way she writes up her plans to include websites she may use.

Rigor and relevance.

Rigor has increased, according to Joan. She believes she can go into "greater detail," and her lessons are more "in-depth," because of the research component. Relevance has also increased, as she has been able to link her lessons to current research topics students can explore online.

> I get things on there like cancer research and T-cell research and how they are improving the medical field. I go into that… Like how food affects health. I did that this morning.

Determining appropriateness of technology integration.

Joan frequently discussed the importance she places on research. Once she lectures on the content, she believes the students should be able to research the topic for greater understanding. Having the laptops, she believes, has made the ability to perform research activities less difficult than before the implementation.

> About once a week we used the computer lab for research. We had to schedule the time. Scheduling was a factor. Some people would get it a month ahead of time and knock me off of the rotation. I used the smart board daily before the implementation. Some kids need to look at what you're talking about when you're discussing it.

Impact on learning.

Learner-engagement and enhancement of learning.

Joan spoke again about the research component of her students' learning process when answering the researcher's questions about learner-engagement and enhancement of learning. She believes the research engages the students.

> They are more interested I think because they can learn more about the subject area than what they could before. If you didn't have the computer to go do more research on the subject you'd have to tell the students to go to the library. Now they can just type it in and I can research it as we go. We are studying mitosis and meiosis and they can look and see the movement on the computers. Before, there was no movement. They'd rather see it and how it occurs then just look at pictures. It's really good on cells alive.com. It shows the movement.

Similarly, she believes learning is enhanced when students are able to explore a topic online as she is lecturing.

> I might throw out two or three sentences about a subject and the students go right to the computer and look it up. They'll find something and raise their hand and tell me what they've learned. It's enhanced it.

Personalization of instruction.

Joan, like other teachers in her school is using Study Island to personalize learning for her students. Having students work through the Study Island activities, at their own pace, and at their own level has been beneficial to her students.

Analysis of the Science Department.

The implementation of the one-to-one innovation has been varied among the science participants, although all have incorporated the technology into their instructional strategies. All three teachers believe their classrooms are more learner-centered because students are able to perform more in-depth research of the scientific concepts and form a more personal understanding of the content. All three teachers believe the availability of technology has affected the way they integrate technology in their classrooms but each teacher has a distinct way of incorporating the devices. As with the ELA participants, there is some supporting evidence the years of teaching experience may have an impact on the way the teacher embraces the innovation.

The two teachers having the greatest number of years of teaching experience, James and Joan, have found uses for the one-to-one devices, which are compatible with the strategies they used prior to the implementation. James mentioned the recording an analysis of lab data as being an important strategy both before and following the implementation of the one-to-one program. With the availability of the laptops and Microsoft Excel, James has assimilated the technology to enhance data collection for labs. Joan described an activity where students would research a topic and summarize their findings. Before the one-to-one program, Joan would take her students to the library or to a computer lab if a lab were available. She now continues to use this activity but students complete their research and summaries on their laptops. James and Joan found compatibility (Rogers, 2003, Kindle location 949) between the one-to-one computing innovation and their trusted teaching strategies.

Barbara has only been teaching for four years. She described her pre-implementation pedagogy as more teacher-centered because she felt a need to control the students' acquisition of knowledge. Barbara believed she was a gatekeeper of the content and could not significantly trust the students would arrive at learning without her strict guidance. She attributed this notion to her immaturity as a teacher. Barbara's incorporation of the laptops was related to her desire to give students greater ownership of the learning process. She found compatibility (Rogers, 2003, Kindle location 949) between the one-to-one computing innovation and her emerging value of student-centered learning. As with her more experienced colleagues Barbara encourages her students to use the devices for deeper research of scientific topics but she has also discovered another learner-centered use. Barbara's students now use Microsoft OneNote to compile notes with rich content they discover in their own research. The students use their notes as a resource for related classroom assignments.

Math Participants

Dorothy and Robert teach math at the subject school. Dorothy, 35, has a master's degree and is a National Board Certified teacher. She has 8 years of teaching experience. Robert, age 65, has a master's degree and has been teaching for 42 years.

Changes in pedagogy and technology use: Math.

A code co-occurrence analysis of interview data for the Math teachers showed several trends concerning pre-implementation/post-implementation change in the focus areas of instructional strategies and technology integration. The number of interview excerpts coded as "teacher-centered" instructional strategies decreased from

7 occurrences in excerpts coded “pre-implementation” to 2 occurrences in excerpts coded as post-implementation. The frequency of excerpts coded as “learner-centered” decreased from 10 occurrences for pre-implementation excerpts to 2 occurrences for post-implementation excerpts. While teachers spoke less about teacher-centered strategies concerning the post- implementation classroom, they also spoke less about the learner-centered strategies. It is important to note the coding of the interview data measures the frequency at which categories of statements occur.

Relating to technology integration the data also show increases in teacher-use of technology code occurrences and increases student-use of technology code occurrences from pre- to post-implementation.

Participant 7: Dorothy.

Instructional strategies, pre-implementation of the one-to-one program.

Dorothy described a pre-laptop learning environment having teacher-centered strategies and learner-centered strategies used simultaneously. Direct instruction was important in her teaching of math, but the teacher’s role, much of the time, was that of a coach or facilitator. The participant also listed problem solving, as she teaches mathematics. Dorothy said she regularly used cooperative learning techniques, like peer tutoring and having the student to act in the role of the expert, teaching other students.

Dorothy explained her pedagogy differently for her various math classes. The algebra and geometry classes followed the Carnegie Learning curriculum, which prescribes many learner-centered techniques as students work through scenario-type

problems. There is also a computer-assisted instruction component, Cognitive Tutor, which is used with the curriculum. For these classes, Dorothy said her strategies were learner-centered, with lecture being used less frequently. Her higher math classes, like trigonometry and pre-calculus were equally teacher-centered/learner-centered, with a greater emphasis on lecturing, but still incorporating learner-centered strategies. AP Calculus, the teacher stated, was more teacher-centered, as the instructor tries to cover as much of the material as possible before the AP exam is given.

Instructional strategies, post-implementation of the one-to-one program.

Dorothy sees no change in her instructional strategies, or her pedagogy since the implementation of the one-to-one program. In response to the interview question on post-implementation strategies, she stated, "A lot of them are the same. The computers are now more available to the student. I don't tell them when to use it."

Textbook use.

The use of textbooks also depends on the specific class Dorothy teaches. The Carnegie Learning classes, Math I and Math II (formerly Alg. I, II and Geometry), use consumable texts, so the textbook is always in use. In the higher math courses, the textbook is used less frequently. No change in usage has occurred with the one-to-one program.

Technology integration.

The participant rated the frequency of technology use in the pre-laptop learning environment as moderate. She and her students frequently used the Smartboard and the document camera and students used the TI Inspire graphing

calculators, daily. Her algebra students also used the Cognitive Tutor CAI, but she had to schedule use of the department's computer lab.

Post-one-to-one technology integration.

Since the one-to-one implementation, a few things have changed in the way she integrates technology. The student laptops have enabled student-use of the Cognitive Tutor on any day, at school or at home. Scheduling of the computer lab is no longer necessary. Dorothy said, "If it flows with my classes I can go ahead and show a student how to do a concept, rather than waiting for or five days. I can use Cognitive Tutor as a tool for students and myself because of having the computers."

Dorothy also reported using Study Island for supplemental instruction and ACT, AP Exam, and state assessment preparation. She also uses Thinkfinity to post instructional and practice material for her Math Field Day team members. Dorothy still describes the frequency of technology integration as moderate.

Comfort level.

The participant said she is very comfortable with technology use and integration, adding, "I'm not scared of it." She indicated she felt the same way before the one-to-one implementation.

Correlation between interview data and lesson plan data.

The researcher analyzed lesson plan data using code co-occurrence to measure teacher discussion of the teacher-centered and learner-centered instructional strategies for both pre- and post-implementation of the laptop program and teacher-use and

student-use of technology for pre- and post-implementation. A comparison was made between the lesson plan data and the trends found in the interview data.

Seventeen items were coded for teacher-centered instruction and pre-implementation. Sixteen items were coded for teacher-centered instruction and post-implementation, a very nominal change. Nine items were coded for learner-centered instruction and pre-implementation and 8 items were coded for learner-centered instruction and post-implementation. These slight changes reflect Dorothy's claim that her instructional strategies have not changed since the laptops were introduced.

No occurrences of teacher-use of technology were found in the lesson plan data. The teacher did not specify any use of tools such as the Smartboard or document camera. Student-use of technology, however, was documented in the lesson plans. Twenty-four items were coded for student-use and pre-implementation and 19 items were coded for student-use and post-implementation. There is a decrease in the number of occurrences from pre- to post-implementation. It should be noted however, the analysis only measures the number of times the participant documents the use of the technology, not the actual use. The data, nevertheless, support the participant's claim her students are using technology.

Correlation between interview data and classroom observation data.

Two unannounced observations of Dorothy's classroom were conducted, each for 30- minutes. The ICOT (ISTE, 2011) data reflect only the post-implementation classroom. The teacher was not engaged in teacher-centered instruction during the first observation, however the researcher observed modeling in the second

observation, for a total of one occurrence for the two observation periods. Learner-centered instruction was observed four times over the two observations, two occurrences in each observation. Students worked in pairs to find solutions to scenario-based math problems, as Dorothy served as a coach. Some students also worked as peer tutors during the class periods. The participant stated learner-centered instruction was present in most of her classes, specifically the Algebra/Math I & II and the Pre-calculus classes, which happen to be the classes reflected in the observation data. The observation data corroborate the interview data.

Technology use was also documented during the observations. The ICOT (ISTE, 2011) data for the first observation of Dorothy's classroom showed both Dorothy and her students used technology for the entire observation period, however the devices used were graphing calculators, not the laptops. During the second observation, the teacher used technology 29% of the time as she modeled problems and solutions on her Smartboard. Her students used technology, the graphing calculators, for the entire observation period. Since the occurrences of interview excerpts coded as teacher-use and post-implementation were less frequent than student-use for the post-implementation code, there is similarity between the two data sets.

Professional development.

Dorothy indicated professional development on technology and instruction have been a benefit, saying, "I think all of our trainings are supporting technology use, whether it be computers or technology I use in my classroom." She attended 33

hours of professional development on technology related topics from 2011 to 2013. She did suggest an idea for a PD session, which she would find helpful for teaching math. “I have heard of Khan Academy and I myself have not taken the time to learn that. I think a professional development on Khan Academy would be helpful to me.”

Planning process.

The participant discussed the difficulty in planning for technology use, other than the use of graphing calculators, in the pre-laptop learning environment, for which she had to schedule computer lab time for student-use of the Cognitive Tutor program. Since the introduction of student laptops, Dorothy feels there is more flexibility in planning for technology use.

> …most of what computers have done for me is flexibility as a teacher in planning… With my Carnegie classes I can do a better job of planning. If it flows with my classes I can go ahead and show a student how to do a concept, rather than waiting for or five days. I can use Cognitive Tutor as a tool for students and myself because of having the computers.

Rigor and relevance.

Dorothy reported seeing no change in the level of rigor she builds into her lessons, as she indicated as high, even before the laptop program. She stated, “I'd say the rigor has not changed. It is still just as rigorous. There was higher rigor in my classes.”

She echoed this belief in regard to relevance as she said,

> There has not been any change, because before implementation there was always relevance to the real world situation. I still use those problems I haven't used the technology to incorporate relevance. It was already there. The activities were already there. I still use the same problems and activities.

Dorothy does not seem to perceive the laptops as having increased her ability as a teacher to provide a higher level of instruction, only to have given her greater flexibility in the way she does it.

Determining appropriateness of technology integration.

Technology is a tool for learning in Dorothy's classrooms. Even prior to the laptop program, the graphing calculators were always present yet students were able to decide when they were appropriate. The Cognitive Tutor CAI was part of the Carnegie Learning curriculum, so the teacher had prescribed times the program would be called for. Determining appropriateness of technology use is related to her belief the laptop program has given her "greater flexibility" in instruction and learning.

> Well now, not only are the calculators available always, but so are their computers. At any times during their problem-solving activities they have access to their computers, where they can look up information like formulas or a definition of a word. They had that tool there to help them in their problem solving. And then, when I'm doing my Carnegie lessons, I have more flexibility when doing my lesson plans because I know they have the computers. They can pull those up to see the relationship between what they're doing on paper and what they're doing online as well.

Impact on learning.

Learner-engagement.

Dorothy sees the level of learner-engagement as much the same since the implementation of the one-to-one program but explains having more frequent access to the Cognitive Tutor CAI has enriched engagement for her Carnegie students. She stated, "Except for the Carnegie. I hate to say that over and over but when they do see those relationships they see the connections and it's theirs forever."

Personalization of instruction.

The participant has been able to incorporate the Cognitive Tutor, Study Island and Thinkfinity to help her personalize instruction for her students.

> The cognitive tutor already does it itself based on the students' performance. The program tailors the problems to the child's need. Then I myself use data from ACT scores and the Westest and benchmarking to determine what activities or Study Island assignments can be used to help students master the concepts on the assessments. Thinkfinity helps me individualize for the students who are working toward math field day.

Enhancement of learning.

Dorothy believes learning has been greatly enhanced by Cognitive Tutor, the CAI, which was in use before the laptop program.

> For the students who use the Carnegie curriculum, I would say so. The one-to-one lets them see it in two different lights. On the paper they are given a problem and it's really open-ended. There's not much scaffolding. And when

they get on the computer it provides the scaffolding. So they see the concept and it allows them to see the problem in different ways.

As she stated elsewhere in the interview, the Cognitive Tutor program can be used at any time she feels it is needed, with all students having laptop computers in class and at home.

Participant 8: Robert.

Instructional strategies, pre-implementation of the one-to-one program.

Robert described his instructional strategies, in terms of pedagogy, as more teacher-centered before the implementation of the one-to-one program. He recalled lecturing and modeling problem solving on the chalkboard were frequent in his teaching. Robert did, however, incorporate cooperative learning, at times, following his direct instruction. The student groups would collaborate on practice problems as the teacher moved among them as a coach. Robert also used Carnegie Learning's Cognitive Tutor CAI, before the laptop program but had to schedule computer lab time to give students access to the resource.

Instructional strategies, post-implementation of the one-to-one program.

Like Dorothy, Robert believes his instructional strategies, since the laptop program was implemented, has changed very little. He still uses direct instruction and occasionally incorporates "group work." What has changed is Robert's practice of encouraging his students to use the laptops to find examples of problems and supplemental material whenever they feel they need additional resources. He occasionally uses the formative assessment tools available with Study Island. Robert

no longer teaches the courses, which use the Carnegie Learning curriculum, though he has Cognitive Tutor resources available for his Conceptual Math students.

Textbook use.

Prior to the one-to-one program, Robert used the Carnegie Learning consumable texts daily, as prescribed by the curriculum. Now that he teaches the Conceptual Math classes and the College Transitional Math classes, his use of textbooks has changed. The Conceptual Math textbook is not used daily, but is a resource for practice problems. No adopted textbook is used for the CT math, but Robert uses online resources.

Technology integration.

The participant rated technology integration as moderate before the student laptop program was initiated. He used the Cognitive Tutor program because it was prescribed by the curriculum. He stated, "Occasionally I would use the Smartboard and put examples on the Smartboard for them," but this was not part of his regular practice.

Post-one-to-one technology integration.

Since the one-to-one implementation, there have been changes in Robert's integration of technology. Cognitive Tutor is used less frequently because it is not a primary instructional resource for his classes. He has begun using Study Island, but not regularly. Robert does not use his Smartboard often and opts to model the math on the blackboard instead. The teacher does, however, incorporate student-use of the graphing calculators on a daily basis.

Robert said one of the ways the student laptops have been integrated into student learning, is using Internet searches for examples of math problems and using Study Island for supplemental instruction and test preparation.

> …if I feel like the students need examples of things… And a couple of my classes we don't have textbooks so I can tell them to get examples… Here's what I need you to do… If we're factoring trinomials, I can take them to a certain website and I can say look there are examples right there. I tell them all the time they need to make use of the laptops for their home computers to look for examples and practice problems. Study Island is a good place for practice problems. If there is a test coming up they need to be practicing on some things like that at home. It's for test preparation.

Robert still rates technology use as moderate in the post-implementation learning environment.

> When it comes to the laptops I think it's a moderate amount. You know, doing the Carnegie and Study Island it's kind of moderate now compared to the instruction and the presentation in the modeling. But when you throw in the fact we use graphic calculators all the time, I would go above if there was something in between moderate and high, I would say upper moderate. It's not high because one on doing it all the time. There are other things we're doing.

Comfort level.

Robert says he is “approaching a high level” of comfort with technology and its integration in instruction. He discussed how the change has occurred.

> I'm getting better at it. I'm getting better at it all the time. When I first started I was kind of between low and moderate. In my last school I got used to the Carnegie and when I came here I got better at it. Now I'm feeling more comfortable. I feel very comfortable with the Carnegie but it's the other types of technology like some of the other teachers can just go right in there and jump on all of these things… that's not what I'm familiar with. But as far as our technology program, what to do with Carnegie and what to do with graphing calculators, I'm fine with that.

Correlation between interview data and lesson plan data.

Code co-occurrence analysis of lesson plan data was conducted to detect trends in the focus areas of the teacher-centered and learner-centered instructional strategies from pre-implementation of the one-to-one program and post-implementation. The same analysis was conducted for teacher-use of technology and student-use of technology. A comparison was made to the interview data.

There were 5 lesson plan items coded for teacher-centered and pre-implementation and 6 items coded for teacher-centered and post-implementation. The increase was nominal and consistent with Robert's interview statements concerning the frequency of direct instruction through modeling. There were 5 items coded for learner-centered and pre-implementation, increasing 100% to 10 items coded as learner-centered and post-implementation. This could coincide with Robert's post-implementation practice of students using laptops for research and supplemental instruction.

No occurrences of the teacher-use (of technology) code was documented in the lesson plan data, which could be explained by the teacher not specifying the use of the strategy in presenting information. Student use did increase 50% from 6 items coded for pre-implementation and 9 items coded for post-implementation. The data agree with Robert's statements about adding Internet research and Study Island to the daily use of graphing calculators.

Correlation between interview data and classroom observation data.

Two unannounced observations of Robert's classroom were conducted, each for 30- minutes. The ICOT (ISTE, 2011) data reflect only the post-implementation classroom. Teacher-centered instruction was observed once in Observation 1 and twice in Observation 2. Conversely, learner-centered instruction was observed twice in Observation 1 and once in Observation 2. In both observations the teacher-centered strategy incorporated was modeling the solving of practice problems. Learner-centered instruction occurred as students used their laptops to find other exemplars and resources to enhance their understanding of synthetic division. Students were also able to use the CAI, Cognitive Tutor as a practice resource. In the interview, Robert discussed a combination of teacher-centered and learner-centered strategies, which he used in his teaching. The lesson plan data suggest equity, at least in the classes observed, among these methods, although he described his pedagogy as more teacher-centered.

No occurrences of teacher-use of technology were observed in either observation period. Robert used a chalkboard to model the math. This would be in

agreement with Robert's interview statements where he described his own use of technology as infrequent. Student-use was observed, however. Students used laptops for supplemental content and math practice on Cognitive Tutor during 29% of the first observation. In the second observation, Robert's students used their laptops and calculators for the full observation time. The data agree with interview data, which suggest regular student-use.

Professional development.

The participant attended 29 hours of technology-related professional development from 2011 to 2013. Robert mentioned the professional development for Carnegie Learning (Cognitive Tutor) and Study Island as being of benefit to his teaching. He felt his need for future training would be in some of the more routine tasks some of the other teachers are more proficient in, such as using Dropbox.

Planning process.

Robert said he considered technology when preparing his lesson plans prior to the one-to-one program, and that has not changed. He stated, "Basically, my lesson plans are the same, for the most part. There was always something in there…" Now Robert plans for student use of laptops to conduct research for supplemental material and also schedules time for Study Island.

Rigor.

The researcher asked Robert if the level of rigor had increased since the one-to-one implementation, to which he replied, "I require the students to do more research and go more in depth because they have access to the Internet. There are

sites that can help them understand the math more." Robert equates the increased rigor with the opportunity students have to learn more, because of research and added resources.

Relevance.

Robert believes having the laptops allowed him to bring relevance to math by using Internet resources to make real-world connections. He commented, "With the laptops, if I want to show how a mathematical concept is used in the real-world, I can find examples of jobs or experiences on the Internet. They can see it right there."

Determining appropriateness of technology integration.

The Carnegie Learning math curriculum was in use prior to the laptop program. The curriculum prescribed technology use via the Cognitive Tutor CAI. For Robert, the prescribed technology component decided appropriateness. In his current classes, Robert suggests the appropriateness is dictated by the need for additional instructional materials and supplemental instruction for his students, using Internet resources and Study Island.

Impact on learning.

Learner-engagement.

The participant believes the laptop program has increased learner-engagement, generally, but not for all. He commented, "I think the students take charge of their own pace now that we have computers. Some students can advance, as they need to. Some students struggle to be engaged, but for the most part I think there is more student engagement."

Personalization of instruction.

Robert reports using Study Island and another unspecified application for personalizing instruction for his students, saying, "If I know a student is having problems with a topic, I can put them on Study Island or another tutorial program to address those weaknesses."

Enhancement of learning.

Robert believes the laptops have given students greater control of their learning process, enhancing engagement. His reply to the researcher's question about learner engagement was, "I think so. Instead of having the teacher teaching, and students giving back to the teacher, students are taking charge of their learning. Students can also learn at home because they have this tool."

Analysis of the Math Department.

There are notable differences between the two participants in the Math Department as to the one-to-one implementation. These differences may be related to professional preparation and the types of courses they teach. Dorothy has a master's degree and eight years of teaching experience. She is also a National Board Certified teacher. Dorothy describes little change to the pedagogy incorporated in her classrooms since the implementation. She frequently incorporated learner-centered strategies she acquired through her participation in National Board preparation and as an early adopter (Rogers, 2003) of the Carnegie curriculum before the laptop implementation. She still uses these strategies. Technology integration has also changed very little. Before the implementation she used her Smartboard and

document camera daily. Students used graphing calculators daily. Student use of personal computers also occurred regularly before the implementation but mostly in the classes, which used the Carnegie curriculum and the Cognitive Tutor CAI. The only difference in student technology use has occurred because students may use their laptops to access the Cognitive Tutor. The laptops are seldom used in her pre-calculus, trigonometry and calculus classes, because she has not found compatibility (Rogers, 2003, Kindle location 949).

The other math participant, Robert, has a master's degree and 42 years of teaching experience. He also teaches a class, which uses the Cognitive Tutor blended with a traditional textbook, and another, which does not use prescribed technology. Robert described his pre-implementation pedagogy as more teacher-centered and frequently used direct instruction and modeling in his teaching. He also stated he seldom uses his Smartboard. Unlike Dorothy, he has found a use for the laptops in his non-Carnegie classes. Robert still relies on direct instruction and modeling, but he has added a student research component to his instructional program. Robert encourages his students to use their laptops to query for examples of problems and solutions related to the content he is delivering. He believes this supplements and enhances the learning for his students. Robert also uses Study Island to give students opportunities to practice math skills and for formative assessment. Dorothy also uses Study Island to some degree.

There is no specific evidence to link years of experience to Robert's reliance on teacher-centered lecturing and modeling, but Dorothy's use of learner-centered

pedagogy can probably be linked to her preparation for National Board Certification and to her training in the Carnegie curriculum. It is interesting to note however, the more senior teacher identified a use for the laptops, which somewhat altered his instructional methods.

Social Studies/History Participant

Shirley is 36 years old and has a bachelor's degree. She has eight years of teaching experience. Shirley was the only social studies teacher included in this study.

Changes in pedagogy and technology use: Social Studies/History.

Code co-occurrence analysis of the interview data shows 6 occurrences of excerpts coded as teacher-centered instruction and pre-implementation, and no co-occurrences of teacher-centered and post-implementation. This would suggest a decrease in the use of teacher-centered instruction since the introduction of the student laptops. Learner-centered instruction co-occurs 5 times for pre-implementation and increases 320% to 21 occurrences with the post-implementation code, suggesting an increase in learner-centered pedagogy in the post-implementation learning environment. The same analysis method was used to determine trends in teacher-use of technology and student-use of technology. The data show greater frequencies of excerpts coded for teacher-use and post-implementation and student-use and post-implementation, than excerpts for teacher-use and student-use also coded for pre-implementation.

Participant 9: Shirley.

Instructional strategies, pre-implementation of the one-to-one program.

Shirley frequently incorporated lecturing in the pre-one-to-one classroom to deliver content to her students. Resources used in her classes would include, "maps, graphs, charts, textbooks, and any online resources" she was able to secure. She reported assigning collaborative projects, but doing this was difficult because of the lack of resources students had access to. Shirley indicated a desire to incorporate more learner-centered activities in her pre-laptop classroom but described her pedagogy at that time as more teacher-centered.

> Before the one-to-one program I would say I was more teacher-centered. I still do project-based learning with my students but in order to get to a project I had to start out with lecturing to students and giving them the background information, giving them anything they just couldn't find a textbook on their own. Even their projects were more teacher-centered than they were student-centered or learner-centered because most of their information came straight from me and not something they could just go in discover on their own. A lot of the projects had to fit a certain mold where everyone had to do a poster or everyone needed to create the same thing because the options weren't available. It was more my choice than their choice. It was more teacher-centered.

Instructional strategies, post-implementation of the one-to-one program.

Shirley's instructional strategies since the introduction of the laptop program are more learner-centered because of the many resources her students have access to because of the one-to-one devices. She explained the laptop program has enhanced her ability to incorporate more collaborative activities with students creating products to show learning. Collaboration is also facilitated by the daily use of the Thinkfinity site for discussion threads where students can post about their thinking on class topics and respond to the ideas of others. Lecturing, she said, is now rarely part of her teaching repertoire. She describes her post-implementation pedagogy as more-learner centered, but stops short of identifying her teaching as solely learner-centered.

> The reason I didn't say it was just learner- centered is because I still struggle with just letting them go. I still have to go back and see if they've left out anything pertinent. I still feel I have to go back to some of my old ways and say, "Well this is great, but we still need this and this and this." I think it is more learner-centered than it was but I don't think it is solely learner-centered.

Textbook use.

The traditional paper textbooks were an important and frequently used resource for Shirley's students prior to the introduction of the laptop program. The one-to-one program allowed the school district to change the textbook adoption, moving away from the traditional format to a digital textbook with online resources, including an online classroom platform. Shirley therefore has not moved away from

using a textbook, rather she has adopted the new format, making use of the enhanced resources.

Technology integration.

The participant rated the pre-laptop level of technology use as low, but explained the rating.

> I would say student use was probably really low, but the use myself was moderate because I would try to show them as many things as I could and expose them to as many programs as I could, because I could use things like Prezi, myself, and I could use different sites which would help them. I could even review things with Quizlet. I could do that, but their usage was low.

Shirley used the Smartboard and document camera in her teaching but student use of technology was limited to the availability of a computer lab. When she was able to use a computer lab, her students sometimes worked on webquests or did independent research for projects or essays, and sometimes worked on multimedia presentations. Shirley said the limited class time, in the lab, made this difficult, however.

Post-one-to-one technology integration.

Shirley rated the post-implementation use of technology as high because the integration of technology occurs daily.

> Not just daily as in we're going to get our computers out and take notes today or just look at a computer screen, but we are actively engaged in using this

technology. It's appropriate and it has a purpose and it enhances our learning and our understanding of our materials.

Shirley reported her students post daily to discussion threads on the Thinkfinity site and respond to the ideas of other students. She also uses the online classroom feature of her digital curriculum to post class announcements or to conduct online polls. Her students are frequently using the collaborative presentation application, Prezi and other multimedia applications such as iMovie, Moviemaker, and the animation application, Voki, to create rich content presentations as final products for project-based learning. She said the laptops and the available applications "really showcase the talent the kids actually have and what they were not able to show before the one-to-one technology."

Comfort level.

Shirley's comfort level with technology and its integration in the learning environment is high, but not "at the highest level it could be," she explained, "…because technology is ever changing. If you're not willing to participate in the professional development that is coming out, you can't teach it to other students and allow them to be comfortable using it."

She also believes it is important to increase her own skills because of the needs of her students, saying, "The whole purpose of technology is that it enhances their learning and not what I'm most comfortable with. I think for me it's more trying to stay on top of the newest things that are coming out because if I don't use it my kids are exposed to it and they won't be able to use it."

As the teacher's comfort level with technology use has increased and as she is exposing her students to a greater variety of technology resources to enhance their learning, her students are also becoming more comfortable with it.

> The one-to-one technology program has made it to where our students are no longer afraid of technology anymore. They know it's okay if I don't know how to do it right now because I've got someone here who can help me learn this program and if I don't know how to do it I can get in my group with other kids as we work collaboratively and they could show me what I need to know as well.

Correlation between interview data and lesson plan data.

The researcher analyzed lesson plan data using code co-occurrence to look for any trends in the focus areas of teacher- and learner-centered instructional strategies and teacher- and student-use of technology in both pre- and post-implementation periods. There were 5 lesson plan items coded for teacher-centered and pre-implementation. Six items were coded for teacher-centered and post-implementation, an increase of 20%. Shirley's interview data actually show a more dramatic decrease in teacher-centered strategies but it should be noted the lesson plan data reflect when the code was applied to an item, not the percentage of instructional time assigned to the activity. There were 5 lesson plan items coded for learner-centered and pre-implementation and 21 items coded as learner-centered and post-implementation, a 320% increase. The data agree with Shirley's report of incorporating more learner-centered instruction.

Teacher-use of technology increased by 300% from one item coded for teacher-use and pre-implementation to 4 items coded for teacher-use and post-implementation. There was an even greater increase in documented lesson activities requiring student-use of technology, 4 coded pre-implementation and 21 activities coded for post-implementation. The lesson plan data reflect the teacher plans for frequent student-use of technology, agreeing with the interview data.

Correlation between interview data and classroom observation data.

Two unannounced observations of Shirley's classroom were conducted, each for 30- minutes. The ICOT (ISTE, 2011) data showed no occurrences of teacher-centered instruction during either of the observations. Learner-centered activity was documented for both observations, occurring for the duration of the classes. In the first observation, Shirley's students moved around stations in groups and analyzed quotes and documents related to the Black Death. They were looking for context clues by which they would construct an overview of the plague and the impact on the society. They used their laptops to take notes and to write their overviews. Shirley served as a facilitator. In the second observation, her students worked collaboratively on multimedia presentations, using Prezi, as evidence of their understanding of the plague. Again, Shirley facilitated.

The ICOT (ISTE, 2011) data indicated the teacher used technology for 60% of the time, mostly the Smartboard as she posted images and text to support the activity. Her students used laptops for 90% of the time to process the information they gathered in during the activity. In the second observation the teacher used technology

for 10% of the observation period, strictly for entering data on the TeacherEase system. The students used their laptops and the Prezi application for the entirety of the observation. Thus, the classroom observation data do not negate the statements made by the participant in the interview.

Professional development.

Shirley participated in 60.5 hours of technology related professional development from 2011 to 2013, including 18 hours of training by the Mooresville, NC educators on implementing one-to-one laptop programs. She was trained extensively in technology integration but still seeks to acquire new skills and improve existing skills to better serve her students.

> I need OneNote training. Since the students are using this more and more, I need training on that. I think it would be nice to have a refresher to try to incorporate the Smartboard as more of an interactive tool with students in the classroom. When Smartboards were first placed in the classroom, we had trainings to show us the basic things on how they operate, but I think sometimes we forget that our kids coming up have not been exposed to how that can be used interactively and with their laptops and with each other. I think that would help

Planning process.

Shirley's planning, in regard to technology integration, has changed from the pre-laptop years when computer lab availability determined when she could integrate student-use of technology. Now, the instructional standards still guide her instruction,

but she looks to the technology resources to find ways of integration, which will enrich the learning experience.

> When I put together my lessons now, I still have the focus of my content standards. The next thing I look at with the one-to-one is, “Will technology enhance the learning of my students?” If so, how can I incorporate this into my unit or into my weekly or daily lesson? Before, scheduling lab time or finding lab time caused technology not to be so much of a focus. That's been a big change for me. Now it is one of the first things I look at: how can we incorporate this.

Determining appropriateness of technology integration.

Prior to the laptop program, Shirley recalled it was not always a question of when technology integration was appropriate, but a question of when was it possible. With ubiquity, the teacher can better focus on the benefit the technology will have on learning. She does not believe in using technology just because it is available.

> Still I think the whole appropriate thing means we should think about if it is not enhancing the learning of the student we shouldn’t use it. If it is a distraction or for just using it to say we can make a Prezi or a movie, then it's taking away from the whole purpose as to why you have technology. To me that whole purpose is to enhance their learning. If it's not relevant, do not use it.

Rigor.

Shirley believes the level of rigor in her classroom has greatly increased since the implementation of the one-to-one program, attributing the change to the greater ownership students have in their learning processes. She stated, "I think it becomes very rigorous when they are having to come out and discover it for themselves… "Okay, these are the important concepts and how does it relate to me or the present day or why is it important?""

Relevance.

The researcher asked the participant to describe any changes to her curriculum in regard to relevance to real world experiences, since the implementation of the one-to-one program. She responded.

> I think this is where we've seen a big increase. Not just in my classroom but in our entire school. One of the best examples school-wide last year, we were able to have the kids do an interdisciplinary project with the kids during an election. The kids were able to do political commercials for their candidates and they were also able to watch on TV and know what was going on with their candidates. For the first time they were able to pay attention to what was going on in their world and they were coming back in creating things on their own representing the real things that are happening.

Impact on learning.

Learner-engagement.

Shirley believes engagement in learning has increased with the one-to-one laptops because of the increased relevance she is able to incorporate in her instruction, saying, “They tend to be more engaged in what they’re studying, knowing why they are studying what they are studying.” She has also observed greater levels of participation by her students in classroom discussions “because of the whole anonymity of it,” now that online threads generate the discussions She goes on to say engagement has even increased for students who are absent from school because her assignments are available to them online. Some of her students have even participated in the daily discussion threads from home.

Personalization of instruction.

The one-to-one laptops have enabled Shirley to personalization of instruction with greater ease than before students had their devices. She incorporates Study Island in that process.

> We use Study Island. I love the fact that with Study Island it's tailored to each individual student. You can assign each student the same assignment but, depending on how they interpret the assignment and how well they do and what questions are asked, it adapts to their own individual needs

She also mentions the online credit recovery program, which has enabled students to earn a credit for a previously failed course by working online instead of

having to retake the class. She mentioned the third way personalization occurs for her students is the student-choice aspect the laptops bring to project-based learning.

> I also love the advantages it gives us when we assign a project because we can assign somebody options. And the students have a choice of what they can do in order to showcase what they have learned or what they are learning or how they can apply what they've learned. It doesn't have to be everybody turns in a paper or everyone makes a poster board or everyone makes a movie or a PowerPoint or anything, but it gives them so many options for the kids to showcase their best talents.

Enhancement of learning.

Shirley made similar comments about the one negative effect on learning she has observed with the one-to-one program, students getting off task by viewing sites unrelated to class, but she feels the benefit to learning diminishes that effect. She believes the one-to one program has enhanced student learning. She described an assignment she made when the students were studying the social classes of the Industrial Revolution. She sent her students out into their own neighborhoods to document via images and video the living and working conditions of their communities' residents. Her students, she said, came back to class with their products and explained they had actually documented a third social class, the middle class. One of her students said, "We still have the other half but now the other half is really two halves." Shirley believes the access her students have to technology has actually

helped them to make a connection between the instructional content and the world they live in.

The impact on the Social Studies Department.

Shirley was the sole participant from the Social Studies Department thus there is no way to compare her experience with others who teach in the same discipline. It can be determined the one-to-one implementation has made an impact on the social studies classes in the school. The adoption of digital textbooks and online resources has ensured the laptops are used daily by the students and teachers.

Further Discussion on the Impact of the Implementation: Teacher Demographics

There is no evidence to support the demographic descriptors of age, gender, or degree level impacted the adoption of the one-to-one innovation or instructional transformation among the participants. Years of experience, however, may have been a factor in some of the participants' experiences with the implementation. Five teachers, Betty, Patricia, Barbara, Dorothy and Shirley, had fewer than 10 years of teaching experience. All but math teacher Dorothy reported shifts in pedagogy as relating to a more learner-centered environment. Dorothy does incorporate learner-centered strategies but said those strategies were in use before the laptop program. It could be proposed these teachers had fewer years of attachment to their instructional repertoires prior to the one-to-one implementation found the adoption of the innovation and change to their instructional strategies less difficult than for those who had more experience in teaching, although this cannot be concluded from the

collected data. Teachers with a greater amount of teaching experience also incorporated the laptops in their classrooms, but for the three with the most experience, James, Joan and Robert, the type of laptop use was compatible with strategies they employed prior to the laptop program. Mary, whose years of experience ranked as the median among all participants, incorporated laptop use in her classrooms but did so with an amount of caution.

The Teacher Focus Group

The researcher conducted a focus group of the participants to discuss the focus areas of instructional strategies and technology integration in regard to the one-to-one laptop program. Mary was not able to participate. A recording of the focus group was transcribed and coded using the Dedoose online application for the analysis of qualitative research data (SCRC, 2013). The same code system was applied to the focus group data as used with the interview data. A code co-occurrence analysis of the focus group transcript data was used to detect themes and to help organize the researcher's findings.

The focus group dynamic of discourse was quite different from the more structured interview, in which the participant was more likely to stay on topic. The prepared questions served to guide the process, but the participants frequently veered off topic as they commented and responded to the comments of other participants. Nevertheless, valuable data were gleaned from the session.

Instructional strategies: Teacher-centered and learner-centered instruction.

The participants discussed teacher-centered and learner-centered instruction, as it occurs in their classrooms since the one-to-one program began. The number of statements coded for learner-centered instruction occurred three times more frequently than those coded for teacher-centered.

The teachers were asked if there had been a change relative to a teacher-centered or a learner-centered classroom. Science teacher, James, was quick to affirm his belief his classroom was more learner-centered. All the participants nodded or spoke to agree with him. However, another science teacher, Barbara, qualified her agreement, by saying, " It is, but I'm not totally," and "I feel like I still have to lecture." There were also similar statements made by the other two science teachers, including James' statement, "I still do straight lecture. You know, chalk and talk. Especially when we're getting ready to start new material," echoed by Joan as she said, "When you start something new you have to." Nevertheless, even the science teachers described ways their instruction is learner-centered in the post-implementation classroom.

Student ownership of learning.

For science teachers, the students' ownership of the learning process seemed to be what made them feel the classrooms were more learner-centered, as stated by Barbara, "I feel they feel like they are more in control of their education now that they have the laptops. As a teacher, we guide our students. We are still teachers but

we are more like a guide. The students get to take the reins and have more control over the process." James echoed, "I think it's making them more involved in the learning process in some cases." Barbara recounted a moment of student ownership of learning. She was especially excited, saying, "I had a girl one day I saw doing something suspicious, and I walked over there and I saw she was looking up videos on how to solve calibration problems. That was great."

Learner-centeredness and math.

Dorothy, a math teacher, indicated learner-centeredness in her classroom is prescribed by her curriculum, Carnegie Learning, which includes the CAI Cognitive Tutor. She stated, "The curriculum is designed that way to be learner centered. The teacher is the facilitator. If something is to be taught you pick a student to be the expert. The teacher is always in the background." She also seems to believe the problem-solving aspect of math diminishes teacher-centeredness, saying, "In math class, you let the math tell you if you are correct or not. The teacher doesn't tell you, the math does."

Collaboration.

The theme of learner-centeredness for English/language arts participants and the social studies teacher seemed to connect to the aspect of collaboration. Social Studies teacher, Shirley commented, "I just feel I'm in more collaboration with my students. We collaborate in our whole learning process together. I'm sitting with them and doing things more one-on-one. I'm seeing what their individual needs are as I am working together with them. I am a collaborator now that we have the one-to-one

technology.” English teacher, Patricia spoke about the collaboration made possible by technology in project-based learning, saying, “I agree with her. It's constant collaboration. They work together in groups. If one of their group members is absent they post their stuff on Thinkfinity and they can still work together, even if they are not there. With Prezi they can work together. They’re sitting at a table and all of them are working on the same project, together at the same time.” Betty also spoke about using the collaborative Prezi application but made another comment about how discussion threads on Thinkfinity have facilitated collaboration, thus, learner-centeredness. Shirley stated she used the Thinkfinity discussion boards daily in her classroom. She commented the Thinkfinity corporate site moderators have taken notice of her students’ participation, saying, “I just got on Thinkfinity during today's lunch, and there was a message from the Thinkfinity people commending our students for their thought processes, because they monitor the discussions.”

Project-based learning.

The participants reported frequent use of project-based learning as another learner-centered instructional strategy, which is facilitated by the one-to-one laptops. Science teacher, Barbara commented, “I feel more compelled to do bigger projects. I didn't feel comfortable with it before because I didn't feel all kids have equal opportunities. But now I've incorporated these more and I am doing more PBLs.” Betty, an English teacher, indicated the access to the laptops have enabled project-based learning, saying, “We can do more project-based learning because we don't have to worry about getting the computer lab, so we can do more project-based

learning." Shirley said, "I also stress the collaborative nature of our students doing projects together using the laptops." Shirley, along with Patricia, co-teach English/Language Arts and World History as an interdisciplinary block, which is entirely project-based. The laptops have contributed to this change in instruction. Shirley commented, "Now I connect historical documents with my literature just about every time we do a project."

Impacts on Learning.

One impact on learning discussed was the ability for students to keep up with their progress, even after being absent from school. Betty and Barbara both described instances when absent students were able to continue learning from home. Patricia replied to their comments saying, "So do I. I've had kids to contact me when they are absent and tell me they already have their work complete."

Personalization of learning through Study Island.

Participants made several comments about personalization of learning. Joan said, "With the one-to-one program I feel we can work more with the individual instead of a group. I feel it is more one on one, helping students at their level." Other teachers spoke about personalization of instruction and learning, mentioning the CAI Study Island, which the school adopted shortly after the one-to-one implementation. Joan spoke about the benefit to her students saying, "I think we can better address advanced students. I have an advanced placement class and they are fantastic writers, but they have a problem with subject verb agreement. We can go to Study Island now and assign particular students remedial work they can do, instead of taking class time

to do that. I'm having another student do advanced placement work in a regular section because she is an advanced student and she is not taking the advanced placement class."

An exchange took place between a few teachers who said the students expressed hate for Study Island, to which Shirley replied, "They may say they hate it, but when you talk to them about it, they talk about how it has helped them." Patricia agreed, "Yes. Some of the students who took the ACT commented the English section of the test was much like Study Island. We had a student who recently got the highest score on the state police exam because of his English score and he credited Study Island."

Textbook use.

The use of textbooks varies among the participants. Shirley no longer uses a traditional paper text because of her digital textbook, available to her students via their laptops. Math teachers reported daily use of their consumable texts in the Carnegie curriculum classes. Other teachers mentioned not using the textbook at all, or the use of the textbook as an occasional resource.

Technology integration: Teacher-use and student-use.

The participants made several statements concerning technology integration in the pre-laptop learning environment. Several participants mentioned the use of the classroom technology tools such as the document cameras and Smartboards. Patricia stated, "I used the Smartboard before and it made me feel like I was a teacher who used technology." Other uses included calculators, classroom responder sets and

scheduling computer lab time for various activities. Although students used calculators and responder sets, most participants described teacher-uses of devices. Only the math department mentioned more frequent uses by students because of the Carnegie Learning's Cognitive Tutor CAI.

Teacher-use.

According to the participants, teacher-uses of technology have changed since the implementation of the one-to-one program. TeacherEase, mentioned several times by the participants, is used as an online grade book and communication tool. The teachers discussed how using Dropbox online storage and shared folders has enabled them to become more paperless and better organized when receiving student work. Another paperless aspect discussed was the use of the Thinkfinity site to post digital copies of what used to be paper copies of handouts and other materials. Patricia stated, "With Thinkfinity we can post any document we want them to have on there for them to download on the computers… and I don't have to make 1 million copies of something. If they lose the copy or they're not at school they can contact me and I will say, "Check Thinkfinity," and they can have it." As previously stated, teachers also use Thinkfinity for online discussion threads. Applications, such as Study Island, WV Writes, Cognitive Tutor and others are also mentioned throughout the focus group.

Student-use.

Students frequently use the laptops to check their grades and email their teachers on TeacherEase and to access materials and discussion threads on

Thinkfinity, as mentioned by most participants. They are also using the CAIs Cognitive Tutor and Study Island for supplemental instruction. The teachers also indicated Dropbox use was common among their students. Science and English/language arts teachers, as well as the social studies teacher, discussed student multimedia projects using tools like PowerPoint and Prezi.

The teachers indicated students are taking advantage of the vast catalog of information they can find online, many times, during class. James stated, "They have instant access. I might be talking about hydrogen and I mentioned the Hindenburg, and someone asked, "What is that?" I said, "Google it." And they were amazed at that. I told them no American airships burned. They asked why and I told them to look it up and they discovered they used helium." Patricia also commented, "We Google everything. They will ask you something and sometimes you don't know and you don't need to pretend you do. I just say Google it."

Frequency of laptop use.

The laptops are used more frequently in some classrooms than others. The researcher asked the participants to indicate if there were more activities using the laptops or more without. Math teachers Dorothy and Robert, as well as science teacher, James, all said there were more activities, for which students did not use laptops in their classrooms. The remaining two science teachers, all English/language arts teachers, and social studies teacher, Shirley, reported more frequent use of the devices. Shirley indicated her situation was unique because the adopted social studies textbook and all resources are now digital. She stated, "In social studies it is more

with. Before the computers we did not even have maps in our classrooms... The online textbook facilitates daily use."

Planning Processes.

Planning is another aspect of instruction teachers believe has been impacted by the one-to-one program. Dorothy commented, "For me as a teacher, it makes my planning more flexible. I don't have to wait for the computer lab. I can plan my lessons knowing they'll have their laptops with them." Betty also spoke about the diminished limitation of availability, saying, "Before we had the laptops I was afraid to assign things, which required Internet research or doing Power Points because a lot of them didn't have the computers at home. The one-to-one computers leveled the playing field." Betty also commented, "We can open up new activities we couldn't before. I think all of our lesson plans now reflect technology. Couldn't do that before."

Professional Development.

All participants reiterated the thoughts on professional development they expressed in their interviews. Barbara wants more content-specific training in technology. Joan wants training in how to teach basic computing skills to her students. Dorothy wants to know if there are other resources for math, since she feels little has been offered specifically for math teachers. Patricia, also sustaining the belief espoused in her interview, feels many times professional development is "redundant." She commented, "It's like we already know this. Show was something else."

Other comments.

Much of the other teacher focus group data included teacher comments about concerns with classroom management issues and maintenance issues. These concerns agreed with those expressed by all teachers in the interview data.

The Student Focus Group

The researcher conducted a focus group of the students to discuss the focus areas of instructional strategies and technology integration in regard to the one-to-one laptop program. Purposeful sampling was used to select a group of learners who were students of the teacher-participants, both prior to the one-to-one laptop implementation and post-implementation. All of the learners were 12th grade students. A recording of the focus group was transcribed and coded using the Dedoose online application for the analysis of qualitative research data (SCRC, 2013). The same code system was applied to the focus group data as used with the interview data. A code co-occurrence analysis of the focus group transcript data was used to detect themes and to help organize the researcher's findings.

The data are compiled from statements made by students, from the viewpoint of a learner. Pseudonyms were assigned to the participants to protect anonymity. Pseudonyms assigned to the female participants were Amanda, Ashley, Brittany, Emily, Jessica, Samantha and Taylor. Pseudonyms assigned to the males were Christopher, Joshua, Matthew, and Michael. The following discussion is drawn from students' responses to questions about their learning activities and technology use.

Learning before the laptops.

The participants have been learners in a one-to-one computing environment for two years. They made few comments, specifically about their experiences before the laptops, but Matthew described what his learning was like, saying, “It was reading chapter after chapter and answering questions at the end of the chapter.” Ashley made a similar comment when she said, “It's like more busy work, I would say. I mean you got something out of it but it was more busy work before we got the computers. You couldn't really make a project before because you couldn't get all of the information you needed. We had to come to the library a lot. There were only seven computers.”

Learning since the laptops.

The participants in the student focus group spoke most frequently about the changes. Ashley spoke about change when she commented, “The laptops have changed everything. We've gone from using a notebook and a textbook to being able to have the computer and the Internet and all of these power points and presentations. It gives you a bigger variety of things you can do to learn. You are not limited.”

There were 20 excerpts coded as learner-centered, as compared to 2 excerpts coded as teacher-centered. One student, Ashley, commented how the roles of her teachers have changed in her classes, saying, “I think our teachers act more as guides now that we have the laptops.” There were 6 mentions of projects in the transcript and several student comments referred to student presentations. Matthew commented, “A lot of our classes have become more project-based. It's all about doing your own

research and building your project." Ashley said, "Each week we have presentations we have to make."

Access to information.

Projects and presentations require students to conduct research on their topics. How they find information has changed, according to Ashley. She said, "We don't answer questions from our textbook anymore. We actually get online and do research. Instead of reading a lesson in the textbook and doing six questions at the end, we're doing more elaborate work." Joshua commented, "The laptops give you more resources to find another way to look at the situation," and Samantha added, "You can find just about anything on the Internet that you need to know." Matthew referred to the way the greater access to information enhances his work and learning, saying, "It helps make your projects better and you can better understand what you're talking about." Ashley believes having access to Internet resources gives her another way of understanding what is taught. She gave an example, saying, "Before you didn't really have the extra resources to be able to look up something. For instance if you were studying rhetorical strategies in English and the teacher gave you an example. Well you may not have understood the example. But now you can get on the Internet and look at different ways rhetorical strategies come together, but then we only have what the teacher said… what was in the book. It was harder to get the outside information."

Using laptops to connect to the content.

The researcher asked students to describe how the laptops connect them to the classroom content and materials. Joshua answered, "Everything is online, no matter

where you are. Whether you are at home or here in another class you can get online and see what the teacher has planned for the day and work on. It's always available to you." Several times students mentioned assignments and activities being posted to Thinkfinity. Ashley stated, "We use Thinkfinity. Your teachers can post your assignments in there and you can reply with answer to your assignments. We do a lot of bell ringers on Thinkfinity. The essential question would be on there and we could answer it." Students said teachers post links to assignments, notes and multimedia presentations on the site as well. Having access to the materials online, according to the students, has given them access to content outside of the classroom. Taylor commented, "Most of the time the assignments already on and we can look at that at home and know what we need to do." Ashley explained further, saying, "I remember when we first picked up on Thinkfinity we had a big assignment one day and my friend missed school. The assignment was right there online. She wasn't in school but she was right there with us answering the discussion thread and participating with those of us who were here. She did that from her house."

Textbooks.

Students discussed how textbook use has changed since the laptop program began. Christopher said, "Some of the textbooks are online," adding, "We use the computer as a book." Matthew commented, "We can use our laptops to find more library information and expand on what our book normally gives us. We've moved on to the e-book technology and don't have the drag around certain books. We just use our laptops." Several times students described access to online textbooks or e-books,

but as they conversed, they reconsidered the idea most of their texts were online. Christopher stated, “Come to think of it there are just two of my classes, which have a complete online text.” Nevertheless, the students did not change their reports of using the paper textbooks less frequently. Ashley said, “Teachers may have a book but they are finding things you can use with it instead of just using straight textbook.” Several students identified classes where their traditional texts are seldom or never used. Joshua called the textbook, “just another resource.”

Collaboration.

The collaborative nature of the learner-centered classroom and the project-based learning, which Matthew said has caused he and his classmates to be “closer together,” seems to have inspired students to find other ways to collaborate. Brittany stated, “Sometimes students share things they worked on with other students that they might be able to use. Like, if were taking notes or something not everyone will take notes. So one student might take the notes and share with everyone else.” Ashley suggested sharing the digital notes helps students who may have to be absent from class.

Learning outside the classroom.

Several comments were made about accessing assignments outside the regular classroom. The researcher asked a specific question about how the laptops affected learning outside of school. Emily answered, “We learn at home.” Students stated online access to class content and Internet resources has changed when and where they learn. Ashley said, “I’m probably learning as much outside as I am inside.”

Electronic communication has also contributed to this idea. Amanda stated, “I feel like I don't even have to be at school sometimes. I can get my laptop and get on there and if I don't understand something I can email my teacher and they can email me back. They can tell me what I need to do.”

Student laptop use.

Students reported frequent use of their laptops. Joshua stated, “They are everything. They are your textbook, your notebook, your note cards, anything you need in the classroom you have on the computer…” The students repeatedly mentioned using their devices and resources like Thinkfinity and Dropbox, as well as their online textbooks. They also discussed using Internet resources to help them in their learning process. Multimedia applications such as PowerPoint, Prezi, Movie Maker and iMovie were used frequently for presentations. They use Microsoft Word to create documents and essays, and mentioned the annotation features their teachers use to critique their work and provide feedback. Excel is used mostly in science classes to record lab data.

One application mentioned more than any other was TeacherEase, the school’s chosen platform for information and communication. Emily said, “I check TeacherEase everyday.” Jessica explains, “TeacherEase is where we check our grades. Our teachers put our assignments on there and we know what we missed when we miss school… We know our grade all the time.” Taylor believes accessing TeacherEase on her laptop has helped her improve as a student. She said, “Before the

laptops I got a lot of bad grades. Now I know more about what I'm supposed to be doing. I see TeacherEase all of the time. And things are better."

Computer-assisted instruction.

Cognitive Tutor and Study Island are computed-assisted-instruction platforms students reported using. Most students in the focus group are seniors, currently taking higher math classes and have not used Cognitive Tutor since taking algebra and geometry. They reported Study Island, a multi-subject tutoring program, is used frequently in many of their classes for supplemental assignments and test preparation for AP exams and the ACT. Ashley stated, "In English class, we have a lot of Study Island to do." Christopher described using Study Island, saying, "Teachers will give lessons based on what were doing at that time. Normally they give 10 to 15 questions that we have to pass… We do all subjects."

Math and laptops.

Students agreed one subject for which the laptops were used least was math. Christopher said, "I go through seven periods where I don't need anything but my laptop. I don't need pencil or paper until I get to eighth. It's math class. Calculus. I don't use my computer much at all in math." Several students made similar comments, suggesting laptop use has not found its way into the math curriculum, except for the Cognitive Tutor program.

Comfort level with technology/ teacher training (professional development).

A student said the longer the laptops are in use, "the teachers get more comfortable with them." Surprisingly, they mentioned "trainings" or professional development. Joshua commented, "It makes a difference when the teacher is trained how to use the different programs." Ashley added, "The teachers talk to us about the trainings they go to," and Ashley said, "They talk to us when they come back. A lot of the demonstrations my teacher is using in her psychology class came from trainings she went to."

Concerns.

Many of the students echoed the concerns of their teachers when they mentioned frustration with maintenance of the computers and repair time. The laptop computers have become an important part of their learning. Ashley commented, "There are very few classes where you don't do assignments on the computer. The laptops are such a big part of our school now. If you forget to take your laptop to school and there isn't another computer for you to use, you might as well stay home."

Stages of Concern Questionnaire (SoCQ) Data

The Stages of Concern Questionnaire (SoCQ) is a survey instrument, which quantifies a respondent's feelings or attitudes toward a new education-related measure he or she may be called upon to implement or participate. (George, Hall & Stiegelbauer, 2006, p. 11). The SoCQ was developed by those who subscribed to the tenants of the Concerns-Based Adoption Model (CBAM), a "framework" to guide

those who may have charge of implementing a new measure, recognize the unique requisites of those who will work to put the measure into practice (p. 1). The SoCQ measures the degree of concern the respondent has in the "stages" categorized as "unconcerned" (Stage 0), relating to the person's interest in the new measure; "informational" (Stage 1), relating to the person's need to know more about the measure; "personal" (Stage 2), relating to the person's sense of self in relation to the measure; "management" (Stage 3), relating to the person's concerns of what he or she must do to implement the measure; "consequence" (Stage 4), relating to the person's concerns of how the measure will affect learners; "collaboration" (Stage 5), relating to working with colleagues in the implementation; and "refocusing" (Stage 6), relating to the respondent's ideas of transforming the measure to increase effectiveness (p. 8).

The researcher administered the SoCQ to the participants to measure their perceptions of the one-to-one innovation. Three types of analysis were conducted on the data: analysis of Stage 0 scores, to determine the participant's "interest" or "involvement" (George, Hall & Stiegelbauer, 2006, p. 8) with the one-to-one innovation; a "frequency of highest concern stage" for the participants interpretation (p. 31) of the group data to determine a trend toward specific concerns; and a "first and second highest stage score interpretation" (p. 34) to identify the individual participants' greatest concerns of the laptop program. The researcher believed SoCQ data would give helpful insight in drawing conclusions about the participants'

implementation of the one-to-one laptop program and the changes, which may have occurred in their instructional strategies and technology integration.

Stage 0 interpretation.

An analysis of the Stage 0 scores was conducted to examine the participants' "degree of interest in or engagement with the innovation" (George, Hall & Stiegelbauer, 2006, p. 33) as it correlates with other measures the participants are engaged with (see Figure 1). The higher the score, the higher the concern is measured for the individual. A high score would show the respondent places a lower importance on the one-to-one innovation. A low score would show the one-to-one program has preeminence in the respondent's teaching (p. 33). The low scores recorded for Shirley and Patricia indicate their intense engagement with the laptop program as it relates to instruction and learning. Mid-level scores recorded for Betty, Mary, Joan and Robert may indicate the teachers are moderately engaged with instruction incorporating the technology. Mid-to-high range scores for Barbara and James may indicate the innovation is integrated to some extent, but is not of highest priority. Dorothy's very high score seems to show she places a very low priority on the laptops in her instruction and may indicate rare usage of the devices in her classroom.

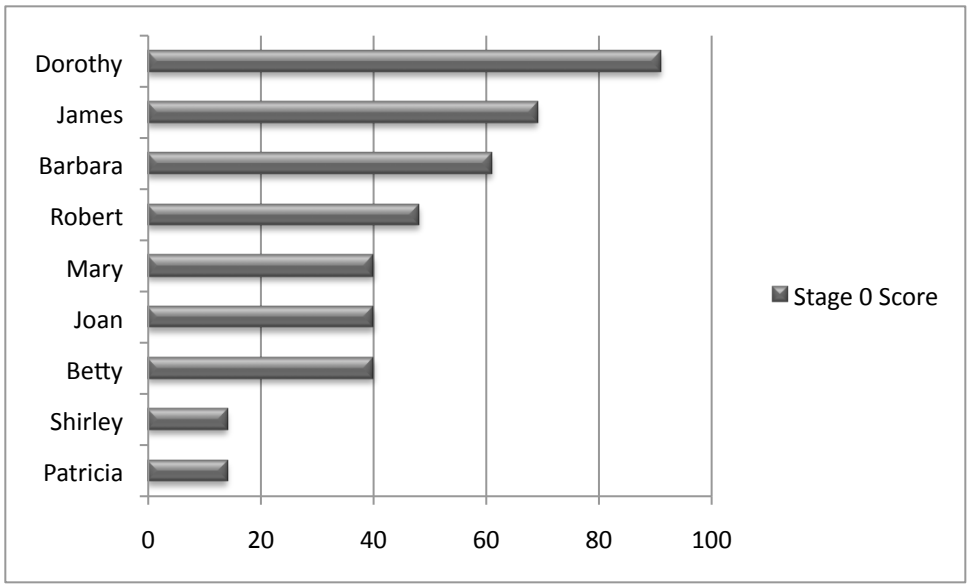

Figure 1. Stage 0 Scores for the Participants.

Frequency of highest stage.

The researcher analyzed the group data to determine if one stage was scored highest, more frequently. Stage 2 (Personal) was the highest scored concern for 45% of the participants (see Figure 2). The data would indicate more participants have stronger feelings pertaining to personal concerns about their performance in integrating the one-to-one laptops into their instruction, and/or their status among peers. These participants may be implementing the innovation but may have a degree of anxiety they are doing it correctly or effectively. They may also be comparative of themselves to colleagues they perceive as using the innovation well.

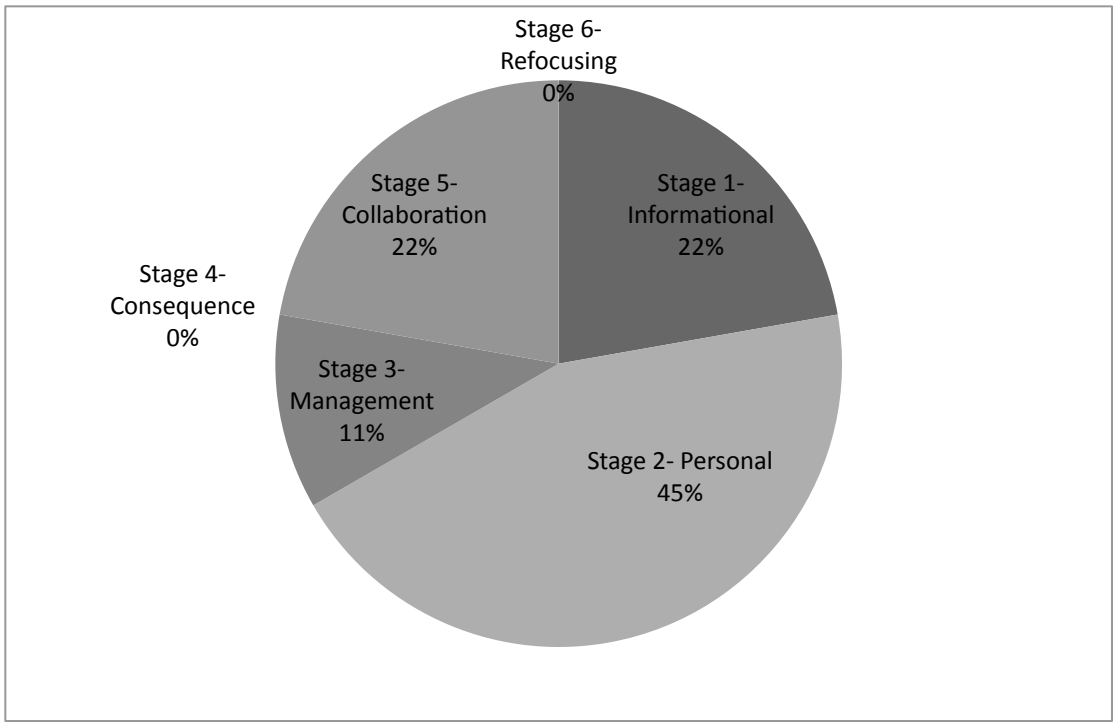

Figure 2. Frequency of Highest Concerns Stage for the Participants

First and second highest stage score interpretation.

The researcher identified the highest and second highest stage scores for each participant to further examine how each felt about the one-to-one program and their role in implementing it (see Table 2). Barbara's highest stage score was 2 (Personal) and her second highest stage score was 5 (Collaborative). It would seem Barbara has concern about her ability to effectively use the student laptops in instruction and also believes she could benefit from working with her colleagues. Betty, who scored highest for stage 5 then stage 2 would seem to place a priority on collaborating with her peers in using the laptops in instruction, and the personal score may indicate her standing among her peers, relative to implementing the program, is important to her.

Dorothy and Robert's highest stage was Informational and their second highest score was Personal. They may need to know more information about using the laptops in their classrooms before feeling comfortable using them more frequently. James had a first-highest score for Management and a second-highest score for Personal. This could be interpreted as having significant concerns about how he can coordinate the use of the laptops within the structure of his classroom. Joan, Mary, and Shirley each had stage 2, or Personal, as the first-highest stage score and stage 1, or Informational as the second-highest stage score. They may be integrating the laptops into their teaching, but knowing more about how to integrate the technology would increase their effectiveness in doing so. Finally, Patricia scored highest for Collaborative and second highest for Consequence. Patricia believes it most important to work with her colleagues in the implementation of the laptop program, but is concerned how the innovation will affect the learners in her classroom.

Table 2

First and Second Highest Stage Score

Participant	First Highest Stage	Second Highest Stage
Barbara	2-Personal	5-Collaborative
Betty	5-Collaborative	2-Personal
Dorothy	1-Informational	2-Personal
James	3-Management	2-Personal
Joan	2-Personal	1-Informational
Mary	2-Personal	1-Informational
Patricia	5-Collaborative	4-Consequence
Robert	1-Informational	2-Personal
Shirley	2-Personal	1-Informational

Summary of Findings

The implementation of a one-to-one laptop program has created an instructional transformation at the rural high school examined in this capstone study. The participant's beliefs and attitudes expressed in the interviews, the examination of archival documentation, the classroom observation data and the statements recorded from the teacher and student focus groups indicate changes have occurred in instructional strategies and pedagogy, technology integration, instructional planning and the learning processes of students.

Instructional transformation: Moving toward more learner-centered strategies.

The laptop program has enabled participants to plan and facilitate instruction for more learner-centered classrooms. Participants described frequent pre-implementation strategies as focusing on direct instruction and textbook dependent assignments, believing the depth of instruction and learner engagement to be less than in the post-implementation classrooms. The participants' perceived need to control the delivery of the content and to protect the content led them to employ more teacher-centered strategies, but this has changed for most.

Teachers in three of the four subject areas, English/language arts, science and social studies, reported they and their students are now engaging in more learner-centered activities because of increased availability of technology to students. The one-to-one program made it possible for teachers to increase the integration of project-based learning and student multimedia presentations as well as to incorporate greater collaboration among students through the project work and online discussion threads. Access to Internet resources enables students to have ownership of their learning processes, starting in the knowledge acquisition stage of instruction, through frequent use of research to support deeper learning of the content. A transformation to the extent described for these departments, however, has not occurred in all subject areas.

Prior to the one-to-one laptop program, math instruction at the school followed a curriculum, for most classes, which prescribed the use of a CAI, Cognitive

Tutor, which students engaged in a computer lab. Learner-centered strategies of collaboration and student presentations were an important part of the curriculum, but direct instruction was also used frequently. The laptop program, the teachers explained, has impacted their classrooms very little, except for greater access of the students to the CAI. They believe learner-centered instruction, paired with direct instruction was the norm for their classes before and after the laptop program began. Triangulation of the interview data, archival documents and focus group data support this belief.

Technology integration.

The level of technology integration in the school has shifted from mostly low, to moderate to high levels, with most participants reporting high levels of use for both students and teachers. Prior to the implementation, teachers used Smartboards and document cameras. Student use of technology was limited to time scheduled in computer labs. Since the implementation, frequent use of the Thinkfinity Online Community for posting resources and activities, as well as an increase in student multimedia products as evidence of learning have contributed to the growth of technology utilization. The introduction of online texts and the CAI Study Island, used for tutoring, supplemental assignments and test preparation, have also led to the increase. Several participants described their classrooms as paperless, as there is a school-wide focus on using the cloud based Dropbox service for storage and submission of student work. Students also frequently access Internet resources on their devices to perform research or to find supplemental information to support their

learning. Teachers continue to use their pre-implementation technology, such as Smartboards and document cameras to facilitate their instruction.

Textbook use.

Traditional paper textbooks are used less frequently, with some participants rating the frequency as rare to not at all. Students participating in the focus group support this claim. Textbooks, whenever used, are now regarded as just another resource for learning. The use of online textbooks for some departments and the posting of class content to Thinkfinity have contributed to the change. The only exception would be for math, which has consumable textbooks prescribed by the curriculum.

Instructional planning.

Changes to instructional planning processes are different among the participants. Most all teachers say there is greater flexibility in planning instruction to include technology integration but not all have changed the types of activities because of the laptops. Math and science teachers, with the exception of one, have not altered their instructional activities significantly from the pre-implementation period. However, other teachers now plan for elaborate projects and student presentations. They also plan for more collaborative learning activities. In some cases, online collaboration tools have enabled students to cooperate in interdisciplinary instruction, working with multiple teachers and multiple classes. All teachers continue to plan instruction based on their standards for learning and determine the appropriateness of

technology integration based on how it will enhance the instruction and learning and its relevance to the assignments.

Professional development.

Numerous hours of professional development related to technology integration have contribute to the successful implementation of the one-to-one laptop program and to the students' immersion into a technology rich learning environment. Teachers feel the professional development opportunities have been beneficial to their instruction, affecting the learning of their students. They also believe there is more to learn. Some teachers would benefit from refresher sessions in basic computing skills and some would like to know how to teach those skills to their students. Other teachers would like to be trained in specific advanced technology skills and applications. The most desired type of professional development among the teachers was more content specific training related to the one-to-one program. This would be most helpful for science and math teachers, who frequently attend trainings appropriate mostly for language arts and social studies.

Rigor and relevance.

The one-to-one program has also impacted levels of rigor and relevance in instruction and learning. The incorporation of student research has enabled students to dig deeper into the content. The frequent use of project-based learning and student products, as well as collaborative activities, require students to defend their ideas and give evidence of learning. Relevance has also increased, as teachers and students use Internet resources to connect the class content to applications in the real world.

Personalization of learning.

The laptop initiative and available resources have allowed teachers to better personalize instruction for their students. For some students, personalization can occur because of their choices of media through which to create products as evidence of learning. The use of Study Island has also allowed for individualization. Teachers are using the tool to give diagnostic tests and to prescribe personal learning programs based on student strengths and weaknesses.

Learner-engagement and enhancement of learning.

Students have been more engaged in learning since receiving their laptop computers. Teacher-participants in the study and the student-participants in the focus group both credit access to Internet resources and the research component present in many of their classes as an important factor in increased learner-engagement. Students also participate more in project-based activities, which give them an opportunity to use their creativity in producing multimedia products. Students also engage frequently in online discussion threads where they express their own ideas and respond to the ideas of others.

The computers and the various resources such as Thinkfinity, Study Island and Cognitive Tutor have also created opportunities for learning outside of school. Absent students regularly use their home Internet connections and their laptops to access class assignments and content, working from home. It is not unusual for these students to actually participate in their classes in real time through email and discussion threads.

The anytime, anywhere learning aspect of the one-to-one program has been an enhancement of student learning. The participants also believe enhancement occurs because of the learner-centered pedagogy that has taken prominence among instructional strategies. The students have greater control of their learning and can make connections between the classroom content and the world around them.

Finally, the implementation of the laptop program has enhanced student learning because of equity. Rural students from a high-poverty community now have access to all information and resources found the World-Wide-Web. As one teacher said, “It levels the playing field,” for our rural students.

CHAPTER FIVE

Conclusion

A one-to-one laptop initiative was implemented at a rural West Virginia high school two years before the completion of this capstone project. The program was initiated, top-down, because the school district believed the ubiquitous computing program would give students greater opportunities to succeed in a 21st Century world, where technology is the tool of choice and information is currency. The school leadership had limited time to prepare for the implementation in terms of professional development and identifying and planning the type of instruction, which would take full advantage of a one-to-one computing environment. It was difficult to predict how the learning environment would transform or if it would. An equally difficult prediction was how instruction and learning would change. Transformation was a desired outcome but the pathway to transformation was unfamiliar and untried (Jenlink, Reigeluth, Carr & Nelson, 1996. Jan., Feb., p.21). The school's leadership began pouring over the expanding body of work on ubiquitous computing initiatives, but found it limited (Penuel, 2006). The school's teachers had to innovate "on the fly" and the school's leadership had to anticipate professional development needs. The initial uncertainty of what would happen as far as instruction and learning was diminished as participants in the process had a front row seat to the resulting transformation. This capstone project was an observation and analysis of an innovation in motion as the researcher sought to answer the question, "What changes

in instructional strategies occur following the implementation of a one-to-one computing program in a high school?"

Diffusion of the Innovation: The Spread of Adoption and Transformation

New ideas and technology are introduced to the marketplace and to the public in hopes of finding acceptance and successful integration. Rogers (2003) describes the means by which new ideas are introduced and disseminated as "diffusion," which "is the process in which an innovation is communicated through certain channels over time among the members of a social system" (Kindle location 769). The introduction of the one-to-one initiative was an innovation, which was embraced by the adopters, the teachers, who saw a relative advantage (Rogers, 2003, Kindle location 949) to employing new instructional strategies. They saw a value in departing from traditional teacher-centered instructional strategies and found compatibility (Kindle location 949) between the one-to-one computing innovation and the school's emerging value of student-centered learning. The innovation and transformation of instruction was encouraged by previous teacher experiences with technology since every classroom in the school had been equipped with Smartboards and document cameras for five years prior to the arrival of the student laptops. The "diffusion of the innovation" (Kindle location 769) and the resulting learner-centered and learner-engaging instructional practices began first, with innovative teachers, who led the transformation by becoming examples to others throughout the school's learning community (Kindle location 1085-1098). The transformation reached the school's classrooms at different rates of change and has not yet fully diffused. Nevertheless,

the final areas are ripe for transformation as teachers have reflected on their own concerns and needs for relevant professional development.

Actions

The transformation identified in this study has prompted various actions. First, the more learner-centered pedagogy employed in the school's classrooms has fostered a sense of ownership by students in their educational processes. The school had already created a one-hour instructional block, known as Mods, in the daily program to provide academic support for students based on instructors' and administrators' weekly reviews of student progress. Since students have become more aware of their own needs, there has been a significant shift to include self-placement in the support classes. Second, student presentations, which include multimedia products, occur with such frequency, the faculty secured grant money to install a presentation package in the school's auditorium to include permanent audio, and high-lumen data projection, well as on-stage interfaces to connect the student laptops to the system. A media production lab has also been installed to facilitate more elaborate projects. Third, the school's leadership team has become more responsive to the requisites of the staff, and is scheduling professional development to include tracks based on levels of expertise, instruction for teachers in managing the one-to-one classroom and teaching students basic computing skills. Fourth, the school is exploring a software solution to aid teachers in the monitoring of student devices in class.

Implications

Several themes emerged from the study, which would suggest the need for future research and/or action. First, a study of technology integration as it relates to mathematics instruction could lead to a better understanding of how the one-to-one innovation could used most effectively in teaching math. Participants of the study, who taught math, discussed the limited awareness of available math resources, which could be used along with the devices.

The frequent discussion by the participants of the study about compiling online resources and the diminished use of the traditional textbook would suggest the school district should conduct an examination of Open Education Resources (OER) to learn how custom online curricula could be designed to bring added value to the one-to-one program and to provide an alternative to the high cost of textbook adoption.

Third, both the teacher-participants and the student focus group discussed the benefit of the one-to-one program and the teachers' practice of creating online access to classroom content and activities to students who were absent from the classroom. A topic for future research could be the use of innovative school scheduling and curriculum structures, which abandon the traditional format of the institution and take into consideration learner-centered pedagogy and the optimization of technology resources.

Fourth, daily student use of the laptops for learning may have resulted in the development of new processes for students. A study could be conducted to identify

specific cognitive, technical and social skills students are acquiring because of the one-to-one study.

Fifth, the data and findings of this study may provide insight to other schools considering the implementation of a ubiquitous computing initiative or having already embarked on the one-to-one computing pathway, toward how instructional transformation can occur and the beliefs and concerns of instructors who teach in the one-to-one environment.

Summary: The Transformation

In conclusion, the purpose of this capstone project was to provide qualitative data to identify changes in instruction and learning and in the processes related to instruction when a one-to-one computing initiative is implemented. The study's research question asked, "What changes in instructional strategies occur following the implementation of a one-to-one computing program in a high school?" The following description of the observed transformation answers the research question.

The adoption of the one-to-one laptop program catalyzed a transformation of pedagogy and instructional strategies from teacher-centered to learner centered. The integration of technology dramatically increased in instruction and learning, but the use of technology in the school's classrooms, once limited mostly to teacher-use, transformed to daily use by learners. The catalog of classroom content grew beyond the traditional textbook to include the wealth of information available in cyberspace. Learning was no longer confined to forty-five minutes, eight class periods a day, five days per week, but became an anytime, anywhere possibility. Students were no longer

the receptacles for knowledge, which flowed only from the teachers' lectures and handouts, but were active in the acquisition and interpretation of the knowledge. Straight rows of desks facing the teacher's podium and blackboard gave way to collaborative hives of learning and simple, single-faceted assignments made way for complex, rigorous, and technology-infused projects with multimedia products as evidence of student learning. Teachers planned for rigorous instruction and looked for ways to connect their content to the world their students lived in and understood. The transformation resulted in active and engaged students whose learning was enhanced by every student having a computer of his own, bringing equity of opportunity and potential for the learners in a rural, high-poverty community.

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Appendix A

Intensive Interview Questions

Introduction

This school has implemented a one-to-one laptop program for all students. This study is a qualitative approach to determine how instructional strategies may have changed since the implementation. You will be asked a series of questions pertinent to your instructional practices, both pre implementation and post-implementation.

Questions

- Describe the instructional strategies commonly used in your classroom prior to the implementation of the one-to-one laptop program.
    - Rank the strategies you described as to frequency of implementation.
    - Are any of these strategies no longer part of your repertoire?
- Describe technology integration, as it would occur in your classroom prior to the one-to-one implementation, citing specific practices, tools, devices and resources.
    - Would you rate the frequency of technology integration as high, moderate, or low?
- Describe your process of determining when integration of technology was appropriate in your learning environment prior to the implementation of the one-to-one laptop program.
- Describe the instructional strategies commonly used in your classroom since the implementation of the one-to-one laptop program.

  - Rank the strategies you described as to frequency of implementation.
- Describe technology integration, as it occurs in your classroom, now that the one-to-one program has been implemented. Please cite specific practices, tools, devices and resources.
  - Would you rate the frequency of technology integration as high, moderate, or low?
- Describe your process of determining when integration of technology is appropriate in your learning environment, now that the one-to-one program has been implemented.
- Describe your current comfort level with technology integration.
  - How has your comfort level changed, if at all, since the implementation of the one-to-one program?
- What professional development have you participated in, which supports your delivery of instruction, in the one-to-one computing learning environment?
- What types of professional development experiences do you still desire, in order to become a more effective teacher in the one-to-one laptop classroom?
- How do you become aware of new instructional strategies, particularly those incorporating the one-to-one devices?
- Please give some examples of how you discovered and integrated new instructional strategies, which were workable because of the one-to-one program.

Appendix B

Teacher Focus Group Questions

- What ways do the one-to-one laptops make instruction & learning better?
- What problems do having the laptops cause?
- What should be changed about the laptop program?
- What are your professional-development needs, relative to teaching in the one-to-one laptop environment?
- How was technology used in your teaching before every student had a laptop?
- What types of learning activities, using the laptops, happen in your classrooms?
- What other types of learning activities, not using laptops, happen in your classrooms?
- Are there more activities using the computers than not?
- Has there been a change relative to a teacher-centered or learner-centered classroom? Explain.
- In what ways do the laptops give your students access to classroom content and materials?
- Are textbooks used more or less, now that students have laptops?
- How has the laptop program affected how paper textbooks are used?
- How do the laptops help you communicate student performance or give feedback?

- How do you believe the laptop program affects student learning outside of school?
- How do you think your students feel about the laptops?
- What else do you want to say about the one-to-one laptop program?

Appendix C

Student Focus Group Questions

- What ways do the one-to-one laptops make learning better?
- What problems do having the laptops cause?
- What should be changed about the laptop program?
- What was learning like before having the laptops?
- How was technology used in your learning before every student had a laptop?
- What types of learning activities, using the laptops, happen in your classrooms?
- What other types of learning activities, not using laptops, happen in your classrooms?
- Are there more activities using the computers than not?
- Do you have more control over how you learn, now that you have the laptops? Explain.
- How is this different from before having laptops?
- In what ways do the laptops give you access to classroom content and materials?
- Are textbooks used more or less, now that students have laptops?
- How has the laptop program affected how paper textbooks are used?
- How do the laptops help you to know how you are performing in your classes?
- How has the laptop program affected your learning outside the school?

- Are there differences in how the laptops are used in all your classes? Describe the differences.
- How do you think your teachers feel about the laptops?
- What else do you want to say about the one-to-one laptop program?

Appendix D

Coding System for Content Analysis of Intensive Interview, Focus Group and Lesson Plan Data

Code	**Child codes**	**Grandchild code**	**Great-grandchild code**
Pre-Implementation			
Post Implementation			
Instructional strategies	Teacher-centered	Bellringers (TC)	
		Direct instruction	
		Textbook assignments	
		Traditional Assessment	
		Worksheets	
	Learner-centered	Bellringers (LC)	
		Collaborative	
		Student Presenting	
		Inquiry	
		Product as evidence	
		Project-based learning	
		Student choice	
	Textbook use frequency 1-none 2-rare 3-occaisional 4-regular		
	Pedagogy perception Teacher-centered (TC) v. Learner-centered (LC) 1-LC 2-More LC 3-Equally LC/TC 4-More TC 5-TC		
Technology integration	Frequency of laptop use (Used for focus groups only) 1-infrequent 2-occaisional 3-frequent		
	Teacher Use	Learning information systems (Teacher)	
		Instructional/learning management (Student)	

		Computer-based instruction/learning (Teacher)
		Research (Teacher)
		Note compilation (Teacher)
		Multimedia presentation (Teacher)
		Assessment (Teacher)
	Student use	Learning information systems (Student)
		Instructional/learning management (Student)
		Computer-based instruction/learning (Student)
		Research (Student)
		Note compilation (Student)
		Multimedia presentation (student)
		Simulations
		Assessment (Student)
		Writing/literacy activities (Student)
		Problem-solving
	Comfort level reported by teacher 5 very high 4 high 3 moderate 2 low 1 very low	
	Frequency of technology integration reported by teacher 5 very high 4 high 3 moderate 2 low 1 very low	
	Applications used	Win
		Blabberize
		Spark Notes
		Miscellaneous Science Applications
		Photostory
		McGraw-Hill Online Classroom
		Google
		Audacity
		Aventa/On Target Credit Recovery
		Carnegie Cognitive Tutor
		Dropbox

		Keynote	
		Khan Academy	
		MS Excel	
		MS Moviemaker	
		MS One Note	
		MS PowerPoint	
		MS Word	
		Acuity	
		Online textbooks	
		Prezi	
		Quizlet	
		Read-Write-Think	
		SAS in Schools	
		Skydrive	
		Study Island	
		TeacherEase	
		Thinkfinity	
		Voki	
		WV Writes	
		iMovie	
Learning	Learner-engagement	Perceived change in engagement 1-decrease 2-no change 3-increase	
	Enhanced learning 1-decrease 2-no change 3-increase		
	Negative impact on learning 1- no negative impact 2- indifferent 3- negative impact		
Planning	Instruction	Standards (Common Core/NextGen/CSOs)	
		Rigor	Perceived change in rigor 1-decrease 2-no change 3-increase
		Relevance	Perceived change in relevance

			1-decrease 2-no change 3-increase
		Personalization of instruction	
	Management		
	Appropriateness of integrating technology		
Professional Development	Pedagogy PD		
	Technology PD		
	Desired PD		
Diffusion of Innovation			
Concerns			
Additional Comments			

Appendix E

Barbara Intensive Interview Transcript

Researcher: **This school has implemented a one-to-one laptop program for all students. This study is a qualitative approach to determine how instructional strategies may have changed since the implementation. You will be asked a series of questions pertinent to your instructional practices, both pre implementation and post-implementation.**

Researcher: **Describe the instructional strategies commonly used in your classroom prior to the implementation of the one-to-one laptop program.**

Barbara: As far as instructional strategies, I always tried to let kids do. I mean like think pair share, where they try to come together and bring their minds and share the information they each had. Prior to the one-to-one program though, it was hard to let that be any kind of real depth of knowledge, because it was only what I'd given them in class. It was them coming together one-on-one and sharing the information. Another one was to possibly have the different types of projects, like webquests, to be able to implement different types of media into those things. It was really hard, though, because not every student had the ability to be able to use technology and have it at home. They could only use the computer labs we had here. So it was hard to be able to do

creative things for some kids. For some kids they can go home and had computers and good Internet access and it was fine and dandy. Think pair share. My kids would take notes for my lectures and they would have to handwrite the notes. Their only resource in class was a book and so anytime they had to look up anything or anytime they had a question outside of what I had for them or outside my class was either my knowledge or textbook. I didn't care for that so much. Testing. With our tests it was all hand written and be able to go back and evaluate where they went wrong and what they did and to be able to look up they could only, as far as your reassessment, to look back to see what they had done wrong on the tests, once again it was very limited in the resources they had to do that as far as reassessment of tests.

Researcher: Rank the strategies you described as to frequency of implementation.

Barbara: What happened most was lecturing and the kids taking notes. I would implement labs in the classroom. Labs and activities. Especially my physical science class, was a lot of activities, a lot of hands on, not technically what the kids would consider labs. Lectures and then labs and the think pair share, using bell ringers. That's a daily thing. My essential question was always on the board and I always try to refer back to that on a daily basis, and have the students look back and

reflect on that. The frequency I would say would be the lectures, bellringer, think pair share, typically on a daily basis. Then it came down to labs and projects, using graphic organizers, and that was on a daily basis. With the projects, I would also do webquests.

Researcher: Are any of these strategies no longer part of your repertoire?

Barbara: No, I wouldn't say any of these are no longer part of my repertoire. They are enhanced now. The strategy, itself, are still used but how I use it is completely different now that we have one-to-one.

Researcher: Describe technology integration, as it would occur in your classroom prior to the one-to-one implementation, citing specific practices, tools, devices and resources.

Barbara: It was really hard to integrate technology, once again, because we didn't have access to computers in the class. Technology, as far as using the technology, like the Smart Board, and my computers and stuff, any time I was lucky enough to have a couple computers in my classroom, I could integrate that if kids needed to research, but it was typically like, you know, five kids to one computer. That's stretching it. And it was really difficult for them to do in-depth research, and me being able to monitor that research as they were doing it, instead of just going home and randomly turning in what ever. I would use my classroom computers, my Intelliboard, the projectors, just the basics. And my responders. I had responders prior to one-to-one.

Researcher: **Would you rate the frequency of technology integration as high, moderate, or low?**

Barbara: The frequency of technology integration… I would say that has to be really low. Because to be able to go, when we would go to the computer labs, we would have to schedule the lab, and once we got up there, a lot of times, there would be difficulties in the computers, actually getting those to work, and even with the mobile labs, getting those booked, a lot of times we would get the computers and they would be dead and they would not be updated so it was really difficult to be able to bring into the classroom on a regular basis. I specifically tried to use it for the projects. I would have kids to do their own presentations, if I wanted them to do a more investigative style type of lab, you know where they took the lab and went with it their own way and design their own experiment. They needed to be able to do some really good research to be able to do that. Like, it was really difficult to have them come up with their own individual kind of investigation style for that lab if they were all huddled around one computer. So I was able to implement it in a certain way but not as individualized as I would've liked to have done in the science classroom. Compared to what I do now, low.

Researcher: **Describe your process of determining when integration of technology was appropriate in your learning environment prior to the implementation of the one-to-one laptop program.**

Barbara: Determining when it was appropriate… it was always appropriate to be able to use that in the classroom. I always wanted to find a way to integrate it when it was most convenient. That was when it was more than being appropriate but being convenient. It wasn't always convenient to book the lab. It wasn't always convenient to get a mobile lab. When it would be more appropriate is when it was… I would try to build up to be able to use technology. I'll try to get all the information into my kids and then turn them loose. That why they had a really good background so they could see what information, like as far as to be able to do projects… Mostly when it got to, in a unit we get to a project stage, was the only time when I got to let them integrate technology because otherwise it just ate up too much of my classroom time. You know, trying to get the technology to be beneficial.

Researcher: **Describe the instructional strategies commonly used in your classroom since the implementation of the one-to-one laptop program.**

Barbara: I use a lot of the same type. I still lecture but they use One Note now instead of trying to write by hand. It gives them a huge range of being

able to use pictures and graphics and everything they get to do now with one note… I just love it. It's amazing. I still do the same ones. I still do think- pair- share. They do a lot of projects, but the projects, they are not such grandiose projects, you know what I mean. They can do small things like web quests and they can go on and create their own web quests. They can take an article and find it and they get to do a lot more reading in the classroom, as far science articles, because they're readily available. Thinkfinity… I use Thinkfinity on a regular basis as far as discussions and posting discussions and kids commenting on discussions and replying to other kids. Having them to do that… I'm starting out with my Advanced Placement. I'm getting my Advanced Placement students really involved in speaking that advanced placement language and being able to do the test. We still do bell ringers and we still do the essential questions. That's where my discussions and comments are going to come from… on Thinkfinity…mostly my essential questions. Being able to realize they can answer those. And it's all on their computers now. Thinkfinity is huge. It's one of my main resources now, and if kids are missing, they know to go to Thinkfinity and it's automatically right there. So it's still a lot of the same instructional strategies but they are just magnified, I guess you could say. And made digital.

Researcher: **Rank the strategies you described as to frequency of implementation.**

Barbara: Once again, the class lecturing and kids being able to take notes. And doing their own notes. I've noticed my kids, now that we have this, and I've introduced them to One Note. They're taking their own and making their own notes. Really, they get excited about going on Google and searching images and finding graphics that can visualize some of these things. They are really taking it on their own to do this outside of the classroom too. So lecturing and taking their notes and outlining and taking their own notes in their own hands, and taking their content in their own hands. Once again, bell ringers are on a regular basis. My essential questions and think pair share they are on a regular basis. It's not necessarily so much of a think-pair-share, not as organized, but it is that whole concept. I feel like it's more on a mature level for these kids. Projects happen. And even my labs. My labs have gotten more into the digital age. My Hardy Weinberg lab, we did the other day with kids doing the Excel spreadsheets. That couldn't happen before one-to-one. That's an AP standard lab. That could not have happened. We are getting ready to do another one where we will map out the DNA of different species and find their similarities. That is completely done and what is called a blast lab. It's online. Even my labs and projects and stuff, they've gotten amplified. But I would say

it's in that order. My daily activities my lectures, my bell ringers and all that, and in my labs, and in my projects are all there together now.

Researcher: Describe technology integration, as it occurs in your classroom, now that the one-to-one program has been implemented. Please cite specific practices, tools, devices and resources.

Barbara: Daily Thinkfinity. TeacherEase… in our classroom and even using TeacherEase, kids get to check their grades and all of the work they got. I very rarely run anything off on the copier anymore because I go straight to Thinkfinity. It's posted as a document. Kids call me when it's finished. They put it in the Dropbox. I don't have to take home handfuls of papers anymore because it's all right there for me. Doing the discussions on Thinkfinity. Any time a kid is absent, that's been the biggest thing, anytime the kid is absent… Now it's not going back and keeping files of… we did this on Monday, we did this on Tuesday, and keeping paper copies… it's right there on Thinkfinity. They can log on and they can see it at home and go ahead and get caught up before they ever get back to school and have to get their makeup work. That's been pretty huge for me. Being able to research, even in class. If they have a problem and they can't figure it out… sometimes I can say the same thing to them in 50 different ways and it's not clicking. They can, themselves, go on in research and find it and it just clicks for them. That's a whole other tool. It's a world of information in their hands. On

a regular basis they are researching and they are figuring it out and sometimes I can assign them… Come up with your own notes… You know, come in tomorrow with a One Note section about this. They will bring it in. Now sometimes the information they bring in is kind of sketchy, and that's where I come in as the instructor and say, "This is what you really need to know. Now take what I've given you and compare to that." They are actually getting better at being able to pick out what information is good and what's not. What websites are good and what are not. They're getting really good at that. Especially the freshman. Prezis. Getting my kids to do Prezis. This is the first year I've done them. We actually just had a unit, or we covered a content standard in a biology class where the kids each took a body system and they developed it and they taught the whole class. They taught the content standard to each other. That was great because it was in their own words and they were just talking to each other. It did really good. Of course I was there and summed it all up at the end, on the things they didn't get. But once again it was almost supplemental, what I did because they had that whole depth of knowledge right there in front of them. Devices… They have their laptops and they still get to use my Intelliboard, and I actually have the Apple TV in my classroom now. The kids can pull that up and we can look at different apps we can find on the Apple Store. Especially in my Anatomy class. It's really huge.

There are all kinds of apps where you can get specifics on bone structures and muscles. Resources, like Thinkfinity… that's an amazing resource. The Acuity website. Being able to test Acuity and not having to book a lab to do it the kids can just sit down and do their Acuity. All of that is right within our reach now.

Researcher: Would you rate the frequency of technology integration as high, moderate, or low?

Barbara: High. It used to be pencils and paper. If kids didn't bring pencils and paper to class they were in trouble. They would get behind. Now if they don't bring the laptop and bring it charged to class they're going to get behind. Within a matter of a year of implementing this program it's completely changed.

Researcher: Describe your process of determining when integration of technology is appropriate in your learning environment, now that the one-to-one program has been implemented.

Barbara: It's appropriate whenever I can find something that will apply to my content. I constantly stay on the Internet researching web quests and researching projects. Researching things they can actually use this technology with. So anytime I can find something that is content appropriate, then that is appropriate for me. Before, technology was appropriate but not convenient. Now it's integral. It's not supplemental. It is a daily part of the content.

Researcher: Describe your current comfort level with technology integration.

Barbara: I'm completely comfortable as far as the technology itself… the mechanics of all of that. I am completely comfortable with that as far as implementing it. I do wish there was a little bit more of… I wish we had content specific training as far as technology integration. My comfort level… I am completely comfortable with it as far as me integrating it myself. High comfort level.

Researcher: How has your comfort level changed, if at all, since the implementation of the one-to-one program?

Barbara: Before it was moderate because I was comfortable with it, but I didn't have the resources. So I never felt like I was getting to the point where I wanted to with the technology.

Researcher: What professional development have you participated in, which supports your delivery of instruction, in the one-to-one computing learning environment?

Barbara: We've done a lot of in school professional development on our instructional support days. We've done these with each other, like Prezi and Rubistar. They were informal trainings. That's all I've had as far as technology is concerned. No. Except for my advanced placement.

Researcher: What types of professional development experiences do you still desire, in order to become a more effective teacher in the one-to-one laptop classroom?

Barbara: I would like to have content specific training in the one-to-one classroom. I think that would be amazing. You know, just science specific.

Researcher: How do you become aware of new instructional strategies, particularly those incorporating the one-to-one devices?

Barbara: Through word-of-mouth. From other teachers. If I find something online… We will even go online and compare. It's when my self and other teachers, we have all of the freshman. If one of us is using it then all of us are going to use it. Through word-of-mouth. We're going to go online and find things we can use.

Researcher: Please give some examples of how you discovered and integrated new instructional strategies, which were workable because of the one-to-one program.

Barbara: For example, Prezi is an online presentation tool. It's kind of like a really cool PowerPoint, you know. I've heard kids talking about doing Prezis for other teachers and I thought we should try it and see what it is. I really like it. Again, that is through word-of-mouth and me getting online and looking at the website and saying this is easy enough and

my kids can do this. And my Advanced Placement lab. I found the Hardy Weinberg lab. There is blast. There is a whole depth of resources. There are a lot of labs especially the blast labs. It's being able to go online and map out the DNA of different species. The kids can compare them and see our DNA and other DNA. They say we had this many differences in our sequences. There are so many species that have been mapped out and they can see it. If we didn't have these computers and the availability they wouldn't be able to have this depth. That's a whole new level of depth and discovery for them they were not able to have before.

Researcher: **Describe changes to your lesson planning process, if any, since the implementation of one-to-one.**

Barbara: Being a relatively new teacher, my lesson plans are almost brand-new from year-to-year. When I first started working here we did not have one-to- one. I had just about as much time with one-to-one as I have not. It was finding lesson plans and activities that can be ran off and handed to them. It was about as far as I can go with it unless I booked a lab and go through that whole thing. It took more time preparing for then it took to do in class. The content was just content in class. It led up to some kind of project that led up to using technology in some kind of way. My lesson planning process is more centered around students. It's more student- centered than… They drive the instruction

now because they have such availability to the resources. Hopefully they can catch onto it and use that instruction instead of me just having to present all the content… They kind of move at their own paces now. I make sure the content is structured and they know they have this by this and that by then… I set goals or guidelines I want the instruction to follow and then give them the material and tell them, "This is where you need to go." They have all of these resources they can use. I take my lesson plans and make them open. They're more open to students who need to take longer to complete one of the processes but then they may fly through step two. There is a lot more flexibility in my lesson plans. When I sit down to do them I look more for lessons that are going to be able to provide it for me… For me to be able to provide, or not to completely be stuck on lecturing. I leave it open to me presenting content and then leaving it open for inquiry. For them to be able to take it and run with it and develop their own kind of thoughts about it. I feel like it sticks with them better that way. If they can get to the overall answers to the essential questions… If they can get there on their own instead of me saying this is the answer, it's going to stick with them. It's going to go with them next year.

Researcher: **How would you describe your pedagogy prior to the implementation of the one-to-one program, in terms of teacher-centered, more teacher-centered, equally teacher-**

centered/learner-centered, more learner-centered, learner-centered? Please provide anecdotal support.

Barbara: Prior to the implementation, I hate to say it, but I was more… I was more teacher-centered probably. I hate to say that. It's not where I wanted to be. It's just where I was. I don't want to blame it on the lack of technology because there are ways to develop it. At times I was more learner-centered, but overall just teacher-centered, because I felt I had a responsibility, that their only link to the content was made. I had to drive it. I had to keep it going. With that thought process… I've moved more toward learner-centered now because I've had a few more years teaching. But before I had to give them that content. It was me. I had to give it to them instead of them getting it themselves. With the lecture and the notes, that is me. That is my content and me telling them what to write. It's me giving them content instead of them getting the content and putting the pieces together themselves. That wasn't happening. I was just giving it to them hoping it would just click.

Researcher: How would you describe your pedagogy since the implementation of the one-to-one program, in terms of teacher-centered, more teacher-centered, equally teacher-centered/learner-centered, more learner-centered, learner-centered? Please provide anecdotal support.

Barbara: More learner-centered for sure. I'm not 100% learner centered. I'm still getting there. Hopefully, that is my goal to be 100% learner centered. But I think even with the kids… They're not ready for complete learner centered yet. I still need to be able to get in there and kind of directed and give them my… I don't feel free to just let them go. With some of my classes, like my advanced placement I feel I can just turn them loose. But overall I am more learner-centered. Like today, we did a roller coaster lab with physics. I was falling more into that teacher-centered, you know. I was just giving them the content. I said, “Forget it. I'm not doing that anymore.” I stood up and said, “This is what I want you to do. This is how you do it. Figure it out. You've got all these resources. I’ve given you all I can.” I told them, “I want it in a table like this and go for it.” They sat down and I gave them the reins and it worked. It was a sigh of relief. I let them say… Make the connections between velocity. If my velocity is ending here… If I'm trying to do acceleration. Two different hills that are back to back. My second velocity for the first one is going to be my starting one because that's where it picked up. I saw those things clicking for them because I said, “Here you go,” and I gave it to them. They had their computers out they were doing charts and graphs in One Note and they were pulling that stuff over into Excel and it would calculate for them. It

was beautiful. I loved it. I wanted to bubble over but wanted to be completely calm at the same time.

Researcher: Describe any changes to the level of rigor in your curriculum since implementing the one-to-one program.

Barbara: My kids don't have enough of the scientific mind. Coming up, they didn't have a good science background. Increasing the rigor has been difficult but not quite as difficult as I thought it would be. The children are technologically minded. If you can increase… By increasing my rigor I have been to go more in depth. Everything they do I've taken it to a whole new level. Before, they would just create a poster. Now, for elements, for example, we would do an elements advertisement. They had to advertise for this element, and it was a plain poster, and they would turn in a sheet that would have the facts on it for the poster. That was as good as I can get it. Now I can incorporate so many different things. We use Microsoft Publisher. They go on Microsoft Publisher and they create it. They can do a PowerPoint on industry related to that… And how it affects scientific technology. They can get so much deeper with all of the content because they have it right there at their hands. Not just that, but there is more. I get to go deeper into the content. The projects and the assignments, they are just more than they were before. Whereas, before they were just standards… almost

old-school. That's what I want to call it. Whereas, now, they get to engulf themselves in that whole content.

Researcher: Describe any changes to your curriculum in regard to relevance to real world experiences, since the implementation to the one-to-one program.

Barbara: I get to incorporate so much more of the technologies, like bio genetics and everything that's happening. It's just cutting edge. Kids get to research that and find it for themselves, but I have to monitor it very carefully because they can find some just insane stories, especially for my AP kids. Having them relate what they're doing to the real world. That's going to be big on the AP exam. Being able to really talk about it and having a real common language about it when they go to do the essays on the AP exam. Letting them take what we are talking about now and researching advancements, like, we are getting ready to start on genetics, mapping the genome, that's real time happening. So instead of me having to go find all of these old articles and passing them out to them they can find real-time stuff that is actually happening now, I let them do that because that's completely beneficial to them. And even too with my physics kids, they can get on and see where it actually applies. They may say how is it going to apply to me. I can bring it up, like with their physics lab on roller coasters, there's this flash player game and they can go on and see how the exact

physics plays out with the roller coasters and watch it. They can look up videos about it. It's completely different. I get to incorporate them into my lectures and PowerPoints, incorporate videos, it's changed drastically.

Researcher: How has the one-to-one program impacted the state/district-adopted curriculum?

Barbara: It's opened it up. It's opened up a whole new world beyond the textbook. I have the textbook resources online and very seldom do my kids open up an actual textbook because it's right there for them. They can take that home. They don't have to worry about carrying it it's right there on their laptop. Like with vocabulary, instead of that old-school looking up the word and writing it down, our resources have e-flashcards on the website, and that's how my kids study for their exams. I put it on Thinkfinity, a list of the vocab. I put the link on that chapter's e-flashcards, and kids can study that way instead of using pen and paper to write it down and looking at it over and over. They can sit there and quiz themselves and learn it at the same time. So, I've moved away more from the textbooks. I use them as a resource. They are supplemental resources instead of essential, I guess you can put it that way.

Researcher: **How has the state/district-adopted curriculum impacted the instructional strategies, which make use of the one-to-one technology?**

Barbara: I am still using our old content standards. I am not yet in the Next-Generation standards. The state standards are kind of lacking a little bit. I think when I can go to the Next Generation standards the one to one… The new standards are more geared toward technology. The old standards are just factual standards. Whereas the NexGen move more. So the standards, as they are now, they are not where they need to be with one-to-one technology. It's not as easy with the older standards because they are more factual. They don't leave a lot of room for inquiry and that's where it's at in science. If kids can get to the inquiry level it's clicked for them. They are there. They are completely there. Those standards, as I have said, are more factual. You know, "How do you quantitatively define this?" Whereas, the NextGen are going to get toward a broader way of thinking. These are still in the box kind of standards. They don't coincide with the whole idea of one-to-one.

Researcher: **Compare and contrast learner engagement of the pre-implementation to the post-implementation learning environments.**

Barbara: It's completely different. I've had just as much time without one-to-one as I have had with one-to-one. My classroom is immensely different. Before you would walk in the classroom and you would see textbooks out. Like I said, that was my entire resource, just the textbooks and me. I had my laptop open and if I wanted to show them something or have them to look at something, I would have to pull it up on the screen and project it. That was technology but it was still very limited. It wasn't learner centered. It was centered around the teacher and what the teacher could present. Today was a perfect example of them being engaged. I said listen, I don't know how to get this across to you just take it and do it on your own. I can just see… Even some of them… I had some special education students and they were just picking it up. It was one of those days you just go home and say, "Hey! Today I was a teacher." If I could have every day like that, it would be amazing. Before, it was so hard for that to happen. You did have those days and it didn't click for them, but to have them get to that level and have it click… They are just so technologically minded, that having a computer in front of them, and having them to put it into digital data instead of writing it down… But even having to look at it in charts and graphs and having them on Excel, it just seemed to work for them. They are scientists. They are taking data. It puts them in the now of science, instead of just feeling like it's work.

Researcher: **Do you believe the one-to-one program has enhanced the learning experiences for your students? Please provide anecdotal support.**

Barbara: Absolutely. If for nothing else, it's put computers in the hands of kids who didn't have computers before. And giving them equal resources, like for kids who couldn't afford a $5000 computer. And that is amazing in itself. The kids who were limited before are no longer limited. And that in itself is worth it. If it didn't do me a bit of good in the classroom it would be worth it. In the classroom it has unbelievably enhanced the kids' learning. As I said, it's put them in the now of science. It's turned them into little scientists. They have their data and everything they get to do is kept on their laptop. That's their science journal. They get to be in control of it and they get to drive their content. I guide them and they drive it. It's enhanced it greatly.

Researcher: **Do you believe there are ways the one-to-one program has negatively affected student learning? Please explain.**

Barbara: I don't know if it's negatively impacting student learning, but in the classroom sometimes, kids use proxies to get on other websites and it's created a disturbance. That's the only thing. If they didn't have laptops in front of them they would find another way to do those things. That would be the only negative thing I would say. Every so often it can create a class disruption just because a kid will be found on something he shouldn't be on. I do wish there was some kind of monitoring

software that went with it. That way you can keep a better eye on it. The kids would say, “She has eyes in the back of her head.”

Researcher: Describe any skills your students are developing because of the one-to-one laptop environment.

Barbara: Some kids were just lacking in basic computer skills. Like I said, kids who didn't have access to a computer before, they were lacking. Shockingly so. It's 2013 and I didn't think I would have to show kids things I've had to show them on the computer, like Word and One Note. All of these programs are available to them at their fingertips. It would be like the different functions of Word or Excel, putting words and numbers in boxes. How you can use it to organize and calculate itself and to be ever-changing, an ever-evolving kind of document. With Word and Publisher, how you can incorporate all of those things together and pull them in. Sometimes with Thinkfinity, kids will have problems with downloading and the same thing with Dropbox. I tell them always be careful where you save it to make a note of where you saved it to. They struggle with basic computer skills, being able to easily and fluently work a computer instead of just saving documents and working with Word. How to actually use the functions of all of these different programs like Microsoft Office, instead of just going in and typing something out, but how to develop the document… How to use all of these things and cohesion with one another.

Researcher: **Describe benefits and challenges to instruction and learning in the one-to-one computing learning environment.**

Barbara: Mostly just making sure kids are doing what they're supposed to be doing and not just getting the bluff on you and using Facebook… their proxies. I wish we had some kind of monitoring software so we can see their computer screens and see what they're doing. Other than that that can be remedied by being active in your classroom. I know the second I turn my back they can get on something they shouldn't be. Also keeping the computers charged. I don't have any outlets in my classroom the students would have access to. The outlets I do have are on opposite inns of the room. There are only two tables, which can reach the outlets. If they didn't charge them at night they wouldn't be charged for class. As far as benefits, having them on a level playing field. That outweighs the challenges. It is a level playing field as to the resources they have.

Researcher: **How does the one-to-one laptop program impact your ability to individualize instruction?**

Barbara: It makes it so possible to individualize. It makes it to where kids get to go on their own pace. I can say this is where I want to debate and whatever you need to do to get there. Here are your assignments. I am here and I will present the content and I will give them what they will need to get to the end, but however they need to get to the end they do

that. They open that laptop and that is the world for them. They have every resource they can think of available to them and for some people they like to watch videos. I saw a student on teacher tube and I thought she was on YouTube. I asked her what she was doing and she said, "I am watching a video on acceleration. I am watching a video on how to do acceleration problems." It was one of those great teacher moments. It was because I had given them that time. If you don't know how to do it you can ask me that you can also go online. She chose to go online and look up how to do acceleration problems. And she was just sitting there doing them right along with the video. I wanted to impact formative assessment in my classroom. I saw on TeacherEase how there is a new feature to work with formative assessment. If I can find something like that… I've been looking into it but I haven't found anything yet. But as far as doing retests they can take their test and I can tell them where they're wrong, but as far as formative assessment, we are using our responders.

Researcher: **In regard to the implementation of the one-to-one program, do you believe the benefits outweigh the challenges? Support your answer.**

Barbara: The fact that it puts people on a level playing field is great. But as far as the challenges, keeping the laptops charged and the technical support and the maintenance of the computers, but that's going to

come. The benefits far outweigh the challenges. If it didn't help me in my classroom as much, the fact they have their computers and resources even at home… When I first came here and realize so many kids didn't have computers and access to the Internet I gave them an assignment like I would do in high school as a student, and figured they would be able to do it at home. But my kids tell me they didn't have computers at home or access to the Internet I was amazed. I started checking and found out that was accurate. They didn't have computers at home. So now that's blown out of the water. They have a computer and they can do Word and Excel even if they don't have Internet at home. They can do it at school and that has created everyone as equal. They can copy and paste or do screenshots of the research at school. They can do a screenshot of what they find and put it in a Word document or One Note and use it at home.

Researcher: **What changes to the current one-to-one program should be made to improve instruction and learning?**

Barbara: I would have charging stations in each room and have better access to outlets in my classroom so it wouldn't be a hassle. Monitoring software, that would be huge. That would change everything. Just having the monitoring software and the charging. Because those are really the only challenges I have.

Researcher: Please make any additional comments.

Barbara: I love the program. Sometimes it can be a pain when you catch kids doing something they shouldn't be doing in class, but the thing is, as long as they are doing and getting the content, it's amazing. There are certain things they shouldn't be doing in the classroom I understand that. They might get finished with my work and they will have another teacher's work pulled up or documents for another teacher pulled up and they will ask me if they can do this or that. They may be doing the web quest for someone else. They don't have to go get a book from the other teacher. They can be doing that. It's right there at their fingertips. Like with their social studies, our textbook is online and they have it. It's amazing to me.

Appendix F

Betty Intensive Interview Transcript

Researcher: **This school has implemented a one-to-one laptop program for all students. This study is a qualitative approach to determine how instructional strategies may have changed since the implementation. You will be asked a series of questions pertinent to your instructional practices, both pre implementation and post-implementation.**

Researcher: **Describe the instructional strategies commonly used in your classroom prior to the implementation of the one-to-one laptop program.**

Betty: Well, some of the strategies that were used, they didn't have a computer but we did. And we would still use a lot of PowerPoint and direct instruction in the classroom. Some of the strategies I would use would be … I'd have to make sure that they had the document, but with the one-to-one program now, I don't have to give them the document. We just have to have it link to a place where they can access it. But we would have to provide all the materials to the student upfront. And we would use PowerPoint and direct instruction mainly. Handouts, study guides, mapping activities, we would have to provide all of those documents to the students. I would deliver instruction using the PowerPoint so students would have a visual aid. We've done

some hands-on activities prior to the computer, the kids having the one-to-one computers, but they would be hands-on. For example, we reduced sentence structure. I would cut up different kinds of sentences and the kids would have to put them together to make the best paragraph and they would have to make sure they were using compound, complex compound-complex sentences and so we would do some handouts on activities and we still do using the one-to-one program, but that's predominately what we had prior to that… things we came up with. Either direct instruction or hands-on activity.

Researcher: **Rank the strategies you described as to frequency of implementation.**

Betty: Direct instruction is lecture, showing things on the whiteboard. Predominantly we used direct instruction. Direct instruction can still be using PowerPoint to deliver instruction. Bell ringers projected on the board, daily. The bell ringer would be projected on the board and the kids would answer the bell ringer. Sometimes it would be focused on the reading assignment during the day. Prior to one the one they would have to have pencil and paper. The bell ringer would be placed prior to direct instruction. It's to focus my lesson.

Researcher: **Are any of these strategies no longer part of your repertoire?**

Betty: Well, the direct instruction is still there. However, there is not a need for so much direct instruction. I mean it's a big push now for students

to read for themselves, I mean, before the one-to-one program you had to copy this material for them to read. Now I can link it to Thinkfinity on the one-to-one program and they can read for themselves this information. The hands-on activities have changed. Kids now can do hands-on activity every day with the computers. The frequency of them was much less before the one-to-one program. Because you had to have a lot of time to construct those things and put them together.

Researcher: Describe technology integration, as it would occur in your classroom prior to the one-to-one implementation, citing specific practices, tools, devices and resources.

Betty: Prior to one-to-one I was fortunate because I had access to a computer lab that was purchased through the Gear Up program, so I would have access. The only difference was students could not take those laptops home. But we could use them during my class so the instruction during my class and what we did with the activities probably are somewhat different, but I did have more access than most people would to Internet access and computer usage. So it was typical for me to have kids do Movie Maker presentations and typical for them to do Voki's and typical for them to do a lot of Internet activity like Blabberize. They had access to that but they had to be done during the class time. So class time had to be usurped by completing a final product. Whereas, with one-to-one they could work on them at home as well.

Researcher: **Would you rate the frequency of technology integration as high, moderate, or low?**

Betty: I would say moderate because, as I said before, it was pretty frequent. We would be able to use those laptops but of course other teachers could sign those out. So I would have to say moderate even though I did a lot of it, I was still restricted by the access. I would say moderate, too, because at least once or twice a week my students had technology integration in the classroom. It was daily with my technology use but with the students it was once or twice a week.

Researcher: **Describe your process of determining when integration of technology was appropriate in your learning environment prior to the implementation of the one-to-one laptop program.**

Betty: Mostly what we did before the implementation of the one-to-one program was after the kids acquire the knowledge. They would use technology to make a product. Typically that's what I would use it for. But they would use it for research from time to time. We'd be doing research projects but predominantly it was for final products after the teaching. They acquired the content knowledge from direct instruction mostly, and reading.

Researcher: **Describe the instructional strategies commonly used in your classroom since the implementation of the one-to-one laptop program.**

Betty: For example, today, some of the instructional strategies, we were getting ready to study the American Civil War and slavery in my English class, so students were able to research this subject and presented me, themselves. The direct instruction was not necessary. They were taught to find reliable sources and how to find those reliable sources and then they could read and gain the information for themselves. We I would call this student- centered learning, because they were engaged in learning the information. We still need to monitor that information. Like today they are researching Harriet Jacobs. They are going to explain the important parts of their life that I'm going to qualify tomorrow, when they present that information, to see if it is correct and expound on things maybe they had missed. More students are going to remember by looking that up themselves. The same adage, "give a man a fish and you will feed him for a day. Teach a man to fish and it will feed him for a lifetime." The biggest thing for the teacher with the one to one program is the planning. You have to plan these lessons and plan the sites and have been directed where to go to do these lessons. Once you get your planning done you will facilitate. They still do products to show learning, what they've mastered. They would do Movie Makers. They still do Movie Makers. They do blogs. I do webpages. That's changed dramatically I think. They are methods we can use for students to be able to show what

they've learned. We've also worked on Thinkfinity where they can actually converse with one another during class periods. I post my bell ringers quite often on Thinkfinity and there is a discussion thread where they can respond to each other and my questioning there.

Researcher: **Rank the strategies you described as to frequency of implementation.**

Betty: Student-centered learning would come first. Direct instruction. Bell ringers. Discussion threads. Products that are summative. They do products continually, which are formative. The bell ringers have summative assignments and exit slips are summative and formative. Today I assigned each kid a word and they had to present that word to the class. They had to have a picture of that word that represented that word. It's different than just putting together a list of words and say research. The front load part for the teacher is the most important part of the one- to- one program. It is the lesson planning.

Researcher: **Describe technology integration, as it occurs in your classroom, now that the one-to-one program has been implemented. Please cite specific practices, tools, devices and resources.**

Betty: It is daily. I do online discussion threads. Also the kids do the Prezis. Kids may live all over the county or all over our area we serve as a school and they can work together on a Prezi online. They collaborate. Almost every resource I have is linked to my Thinkfinity on the

Internet. I rarely use a textbook in my class. I don't think I've used a textbook all year. The things I find they're all linked to Thinkfinity. They are all linked to some site where the kids can have access. Even the reading assignments are accessed from the Internet. They use Study Island. I use Study Island a lot. In some of my classes like my AP class we do it for preparation for the AP exams. I use it, once my students find information, on a particular topic, we do that particular lesson on Study Island to make sure they can pass on that particular level. I also use Study Island for enhancement, to enhance a lesson we've done. I have students go back and make sure all kids have mastered that area before we go on.

Researcher: **Would you rate the frequency of technology integration as high, moderate, or low?**

Betty: Oh, high, definitely. When the Internet is down we go into panic mode.

Researcher: **Describe your process of determining when integration of technology is appropriate in your learning environment, now that the one-to-one program has been implemented.**

Betty: Look, that to me, is absolutely impossible: to work in a classroom in the 21st century without kids having this access. They are able to do articles, they are able to see other kids responses to articles from across the nation when they read these articles and see their response

to them. It's imperative in our classroom that we have this access. The kids, you have to understand they are the digital natives. We are the immigrants. They know what they are doing technology-wise and we need to lead them to the appropriate technologies and sites. We were talking about direct instruction a moment ago. There is direct instruction but direct instruction has changed. It may not be direct instruction on the complex sentence but it may be about how to evaluate the source: to be able to tell if a source is credible, to teach you about writing a complex sentence or to teach you about constructing a narrative correctly. Even though we go over them, the important thing for kids to do is to be able to look and say how I know this is reputable information. My kids not only get me to instruct them but they get all the sources I find to instruct them. I can find better sources than me that can teach them something differently than I could. They have that now with one-to-one instruction. The question is when would it not be appropriate for me in my classroom. It's just a different avenue that these kids can use. I think it's always appropriate.

Researcher: **Describe your current comfort level with technology integration.**

Betty: High. We are getting there. You have to understand with my age and stuff it's a big deal to say that.

Researcher: **How has your comfort level changed, if at all, since the implementation of the one-to-one program?**

Betty: Oh it's changed. I've increase year after year but with one-to-one I've had to spend a lot of time increasing myself so I could get myself for the kids needed me to be. I've also been fortunate enough to participate in a lot of professional developments that would help me.

Researcher: What professional development have you participated in, which supports your delivery of instruction, in the one-to-one computing learning environment?

Betty: I could go on for a while on this one because I have participated in the TIS program (technology integration specialist). I've been to all of those classes. I've been to professional developments through Gear Up on available technologies for our classroom. _____, for example, he did the lesson on Thinkfinity. This is a big one for our one-to-one program. You can use Thinkfinity for your bell ringers and to post assignments. For kids that are absent you can use Thinkfinity so kids can access the lessons right from where they are. Study Island is another. We had a training on Study Island. It's another program that without the use of one-to-one it would be useless for this school. The kids have access to these assignments and the instruction that goes along with them. We had to be trained on that first. We've had trainings on Blabberize. Our county professional development told us about this. We get emails on these things frequently and we can check them out ourselves. Another big thing is the lesson planning. It was

very beneficial to me to be a part of learning the understanding by design concept. I needed to understand what I wanted my kids to do and how to get them there. I needed to know the end result and how to get them there. That's helped me more than anything. I want my kids to be able to read and comprehend. But to read and comprehend what? To read and comprehend out what level? I have to make those decisions and then I have to go back are and modify my instruction to get my kids ready. You have to think about it in reverse. That's been one of the most beneficial things I've been exposed to.

Researcher: **What types of professional development experiences do you still desire, in order to become a more effective teacher in the one-to-one laptop classroom?**

Betty: I would like to have a training on building webpages with students. I want to know a safe way to build webpages with students.

Researcher: **How do you become aware of new instructional strategies, particularly those incorporating the one-to-one devices?**

Betty: They are provided at our school. We naturally are asked what we need when we are in faculty meetings and professional developments are designed to be delivered on days we are here when our students are not. The administration tries to bring in things that will help us in developing lessons and using one-to-one activities. We have common planning among other departments and we have common planning

with the history department this year, the history and English. We share and we are all open.

Researcher: Please give some examples of how you discovered and integrated new instructional strategies, which were workable because of the one-to-one program.

Betty: Just like the one I was talking about before, Thinkfinity. We had a special training on that and almost everyone in the school has implemented Thinkfinity in their classrooms. You can use Thinkfinity for wealth of things. You can find sources and link them, you can write responses, students can collaborate with one another. Another would be Prezis. Kids could collaborate with one another from home. I learned it through collaboration with teachers in my own department.

Researcher: Describe changes to your lesson planning process, if any, since the implementation of one-to-one.

Betty: I've been doing the Understanding by Design lessons before one-to-one. So I knew about those prior to this. The difference in me is what I can ask the kids to do, what activities in my lesson plans I can include in the one-to-one program that I could not do before. Also, another thing is that I can link my lesson plans if I am not here where students can actually act ask them if there is a substitute teacher. There's going to be someone in the classroom that she can access from my lesson plans as well. I will link things to my reading assignments.

PowerPoint's and documents… They would have to reply to Thinkfinity. When I was not in school I could see what my students were doing when I was gone. Also Study Island is good for this. Study Island is an enhancement but it is an activity kits can do. It can be a final product kids do because you can go in and create tests based on things that you taught. For example, if I taught my kids understand inferences I could create a test online that my kids could take and it would be a product to be sure they have mastered the concept. You can make those up individually. You don't have to go by their program. I have more options for formative assessment.

Researcher: **How would you describe your pedagogy prior to the implementation of the one-to-one program, in terms of teacher-centered, more teacher-centered, equally teacher-centered/learner-centered, more learner-centered, learner-centered? Please provide anecdotal support.**

Betty: Prior to the implementation I think mine was teacher centered/learner centered. 50-50. I did have access to technology before. I can access computers and my students get access computers quite frequently. If it had not been for that it would have been more teacher-centered.

Researcher: **How would you describe your pedagogy since the implementation of the one-to-one program, in terms of teacher-centered, more teacher-centered, equally teacher-centered/learner-centered, more**

learner-centered, learner-centered? Please provide anecdotal support.

Betty: I would say now I am more learner-centered. It's almost completely learner centered now Because of the access.

Researcher: Describe any changes to the level of rigor in your curriculum since implementing the one-to-one program.

Betty: Where our focus with rigor was the reading text. We make sure students are on an advanced lexile level. We also look at rigor in their products. Where they do have the one-to-one they have the ability to do this at a different level than they did in the past. We also use the one-to-one program to our advantage to learn more on a particular topic and defined the essence that require this rigor. We are limited here on the number of hardcopy texts that we would have. Therefore, I can go online and find the sites. You know with these NextGen standards it's a requirement that they meet a particular lexile level when they are in the 11th grade. It's part of the standards. To add that in there I have to go online and find the texts that I can link to Thinkfinity. My students can use them even though I don't have a hard copy in the room. I can get one or two copies for my students who may not have Internet access at home. But to have a classroom set I would have had to have the textbooks. But now I don't need as many.

Researcher: **Describe any changes to your curriculum in regard to relevance to real world experiences, since the implementation to the one-to-one program.**

Betty: I try to focus that on all of the lessons I have because kids are always asking me why do I have to know this. Why is this pertinent? I try to connect all my lessons and it is much easier when you can link a situation with a scenario or a video where I can show them it's useful. For example, if I am teaching rhetorical strategies, I can find videos on Teacher Tube where kids are doing raps with music about advertising, perhaps fast food. The advertisers are selling these fast foods to students and the students are not aware how they are being manipulated. I try to connect everything but that is just one of the thoughts that come to mind. Reading, naturally is connected to the real world because you have to read in everyday life. We try to provide examples to kids and make them aware how important it is to be on level with anything they're doing.

Researcher: **How has the one-to-one program impacted the state/district-adopted curriculum?**

Betty: The curriculum for my class… Well you know the NextGen standards is the curriculum we have to follow. There are content standards we have to cover where these kids have interaction on computers: projects that require Internet access. That's a requirement in our state standards.

This year in our history curriculum all of our textbooks are online. Without one-to-one I don't know if we would be able to do it at the level we have. We have added online textbook resources since having the one-to-one.

Researcher: **How has the state/district-adopted curriculum impacted the instructional strategies, which make use of the one-to-one technology?**

Betty: We have to use different avenues when teaching. We have diverse learners in our classroom so we have to implement videos and audio. Some kids are visual learners, some are kinesthetic learners and some are audio learners. It's easier with this one-to-one program to meet the needs of our diverse students. That's impacted how I delivered that instruction. Again, if I am teaching rhetorical strategies, and I'm using direct instruction I may find a video and present it to the kids or I may post it to Thinkfinity and it impacts their ability to gain knowledge.

Researcher: **Compare and contrast learner engagement of the pre-implementation to the post-implementation learning environments.**

Betty: There are students who will learn regardless of what we do because they are here to learn and be successful. Where I think we've seen the biggest impact… We live in a rural area and some of our gentlemen students are very reluctant to use computers. I've noticed with that

being a requirement, they gain skills they would not of had, had we not been in a one-to-one program. I've noticed they been able to access things they would not have been able to access without the one-to-one program. We still have areas in our community where there is not Internet access at home. When our kids are here, they have that. So, the learner, I think, has been impacted. This is the digital age. This is an age where there is instant gratification through content. And you can use that in teaching and learning. In the pre-implementation you didn't have that visual content as readily available to the students, so was harder to meet the needs of the students prior to the one-to-one program. When I say diverse students I'm not talking just struggling students, I'm talking advanced students as well. With advanced students you can find different avenues for them to explore. For example, today, with students in my advanced placement class, we are studying satire. My students, tonight are researching historical documents explaining the relationships between England and Ireland in the 1700s. So they can go online and they are not limited. They have to validate the sources they are using, but they are able to find different sources. Prior to one-to-one I would probably have only been able to provide one document to the students for class. Now students can research what makes sense to them.

Researcher: **Do you believe the one-to-one program has enhanced the learning experiences for your students? Please provide anecdotal support.**

Betty: I absolutely believe that and I will explain my answer. We've been to a lot of professional development explaining to us about the 21st century learner in the Digital Age. We were on board with that. We were ready to go with that but we were limited about being able to implement it at _____ before our kids had the computers. We can fully implement the idea now, what has been discussed for years. Our students are digital natives but they did not have this technology before and they were held back at school. They have this program now and now they can move forward. Their brains are wired differently in the digital age. We were hindering their process before the one-to-one. At home they were on the computers and they were on their phones and iPods. Now we have the computers at school and they are typing. Cursive writing is almost a thing of the past for kids. If you are asking them to write an essay in class you would get a printed page. They are digital natives. We are delivering instruction in their native language. At home, when they have a question they go to Google and they type in that question area. If they are using it in the classroom we can direct them to valid sources. When they are doing it at home, and they are using Wikipedia, they don't necessarily know the source, if it is a

sanctioned source. We need to help them and kids can find the answers themselves.

Researcher: **Do you believe there are ways the one-to-one program has negatively affected student learning? Please explain.**

Betty: If it is implemented and used correctly I don't see how it would make a negative impact. I do realize there may be situations where the program may not be implemented correctly and it could have a negative impact, but if it is implemented correctly it will be positive. Teachers have to monitor. One of the negative things I've heard is that kids get in sites they should not be on. Well, they were passing notes prior to having these computers. Monitoring the students is the same now. You have to be on your feet. It's no different than what we needed to do in the past.

Researcher: **Describe any skills your students are developing because of the one-to-one laptop environment.**

Betty: Students who live in rural areas who attend _____ High School and been developing skills they did not have in the past. Some of them had not been on computers, as hard as that is to believe in this day and time, and I have found this mostly with the boys here at school, they are forced to use Dropbox. They are forced to use multimedia presentations. If you get a job at McDonald's it's computerized so we're preparing them for the workforce. I think that's been one of the

biggest things. Students teach me things that are out there. Several times I've had kids, when we do multimedia presentations, I've had them to find things they can put in there that I didn't know about. I would learn from them because they are the digital natives. New programs like Blabberize. I believe Blabberize was taught to me by students. They are finding new things all the time. I had a student who had a MacBook computer last year who showed me a lot of the new video applications. I've learned from them as well and I'm forcing my students to learn as I learn and they teach me. We had a lot of kids I think, who would've had a hard time functioning in the world had they not have the one-to-one computers.

Researcher: **Describe benefits and challenges to instruction and learning in the one-to-one computing learning environment.**

Betty: The biggest thing I had the problem with, when we started the one to one, was coming up with the procedure. They had to know the procedure for the class. They needed to bring the laptop daily and know they had to use this. They would go to Thinkfinity and respond to their bell ringer. We had kids who had technical issues with their computers. The classroom has to be organized. You're going to waste time with the kids don't know the kids should have their computers in the classroom and charged and have it open and ready to go. The first thing they have to know is to go to Thinkfinity and do the bell ringer.

Then their computer is up and ready to go for the research project. If you've linked a research assignment to Thinkfinity or an adaptation checklist that you are going to go over with your students in Thinkfinity, they can open it and then we can all look at it together and they are ready to go. That is the challenge. Once you get past the organization problems… The biggest challenge I had was getting them accustomed to using their computers in class.

Researcher: **How does the one-to-one laptop program impact your ability to individualize instruction?**

Betty: I have a student who is advanced and who should be in my advanced placement class. She's in the regular classroom and we are already nine weeks into the curriculum. I asked her if she wanted or if she was willing to do the AP curriculum in the classroom because she needs to go on. She said absolutely yes. So I created a Thinkfinity page with her name and gave her the assignments of the documents I have in my AP class. She's going to be doing something completely different in my fifth period English class than what my students who are regular students are doing. It's easier to do this with a one-to-one program because I couldn't do that in my fifth period English class and teach this group and then go over there and teach her something different in the same class.. But now I can do this. On the other side, it's easy to do because we have the Study Island program. If we have a project and

the kids are writing an essay and I know subject-verb agreement is a problem for them I can set up an assignment or activities to help them. I had a student today in advanced placement class, who is an excellent writer. He was having problems with this. He was low on this level and it affected his ACT score. We assigned him those lessons on subject-verb agreement to help him. Students may be advanced in none thing and be weak in something else and we can differentiate quite easily. I become aware of these weaknesses because I'm a teacher. For example, I know I students writing once I've had an opportunity to read it over and over.

Researcher: **In regard to the implementation of the one-to-one program, do you believe the benefits outweigh the challenges? Support your answer.**

Betty: Absolutely the benefits outweigh the challenges. We face some challenges here sometimes. The Internet may go out. We know we have to deal with those but it is far better to have this availability and deal with the minor issues we have. The times we've had trouble are outweighed by the benefits of having the one-to-one computers.

Researcher: **What changes to the current one-to-one program should be made to improve instruction and learning?**

Betty: I will be honest. I think we need a monitoring system in our school. So we can see if the computers in our one-to-one program are being used

and the computers are being used to the advantage of the students in the classroom. Regardless of what the classroom is we must be taking full advantage of the program for our students. Maybe we need more professional development in this at our school, to make sure our teachers are aware of the things they can use. We've done some of that with Study Island. Every teacher here knows about Study Island and we've had training sessions so they can differentiate instruction using the one-to-one program and Study Island. But I do think this is something we need to concentrate on more. Need to meet the expectations and monitor the expectations.

Researcher: Please make any additional comments.

Betty: I was privileged to be a part of a teacher leadership group, where we met with the individuals who work telling us about the digital natives. We knew about all of these things but it was so hard to find the material and define computers where we could implement things in our classrooms. We knew… I knew we needed to. I was fortunate enough to have the portable lab at my disposal some days, but this has just been fantastic for us. We are not held back as teachers and the kids are not held back as students. We live in a rural area but the world is open to them because they have these computers. Regardless of what texts I would use in my classroom I can find a free link to novels and

short stories, and historical documents. Were not limited by funding to have access to these texts and I'm thankful for it.

Appendix G

Dorothy Intensive Interview Transcript

Researcher: **This school has implemented a one-to-one laptop program for all students. This study is a qualitative approach to determine how instructional strategies may have changed since the implementation. You will be asked a series of questions pertinent to your instructional practices, both pre implementation and post-implementation.**

Researcher: **Describe the instructional strategies commonly used in your classroom prior to the implementation of the one-to-one laptop program.**

Dorothy: The strategies in use before were lecture-based. Collaborative learning was going on. Students were working in groups with the teacher as facilitator. Problem-solving. Students tackling a problem. Using prior knowledge to tackle the problem and to solve the problem. Peer tutoring where students were working together, again the students working together and the teacher is up as the facilitator. Also a strategy where the student acts as the expert so they are teaching other students.

Researcher: **Rank the strategies you described as to frequency of implementation.**

Dorothy: It would definitely depend on the class. I would say lecture would be the highest -ranked then the problem-solving. The student acting as expert would be the lowest in that class. In algebra one, the student acting as the expert, would be what I would use most. Problem solving would be second. Next would come problem-solving and students working together to solve a problem. Lecture would be last.

Researcher: Are any of these strategies no longer part of your repertoire?

Dorothy: No. I still do them all.

Researcher: Describe technology integration, as it would occur in your classroom prior to the one-to-one implementation, citing specific practices, tools, devices and resources.

Dorothy: Before the kids had the laptops, Cognitive Tutor was part of the instruction. Teachers had to come up with a schedule so kids could work in the computer lab to make sure they had opportunities to work out assignments. I always incorporated calculators like the T-I inspires. Calculators are used daily in my classes. I also use the Elmo document camera daily.

Researcher: Would you rate the frequency of technology integration as high, moderate, or low?

Dorothy: I would rank it moderate. Compared to other teachers and technology that is used, there was still a lot of pencil and paper work in my class.

Researcher: **Describe your process of determining when integration of technology was appropriate in your learning environment prior to the implementation of the one-to-one laptop program.**

Dorothy: Calculators are part of my students' educational process at any time. I don't tell them when to use it. It is a choice they make. The Cognitive Tutor, of course, had to be planned on a certain day, so it could not be flexible the way it was integrated in my classroom. The Elmo had to be used daily for demonstrations and problem-solving. You don't necessarily tell the students what tools they have to have. Some students may want to use the calculators and others may not.

Researcher: **Describe the instructional strategies commonly used in your classroom since the implementation of the one-to-one laptop program.**

Dorothy: A lot of them are the same. The computers are now more available to the student. I don't tell them when to use it. But if they need to use a computer to find information it's at their fingertips. I don't have to give them the information myself.

Researcher: **Rank the strategies you described as to frequency of implementation.**

Dorothy: The rankings have not changed. The only things the computers have brought to my classrooms overall is they have given the students more tools. With my Carnegie classes I can do a better job of planning. If it

flows with my classes I can go ahead and show a student how to do a concept, rather than waiting for or five days. I can use Cognitive Tutor as a tool for students and myself because of having the computers. I don't know [inaudible], but for my higher math classes, I've been able to use Thinkfinity and I am currently using Study Island as supplemental material. This helps to teach the CSO's. It helps kids with ACTs and Westest. Students have taken pretests and that gives me an idea of what students understand about the CSO's and then I can assign them something from Study Island. I use Thinkfinity more for math field day. I was asking a higher-level math class questions and giving students opportunities to answer those. Students couldn't see whether or not they answered something right or wrong but they could give feedback to one another. I try not to work out a problem on Thinkfinity. I let students do that.

Researcher: **Describe technology integration, as it occurs in your classroom, now that the one-to-one program has been implemented. Please cite specific practices, tools, devices and resources.**

Dorothy: They had easier access to the cognitive tutor. They can relate what they're doing in the text with what they are looking at online. I use Thinkfinity and Study Island as supplemental materials in order to better teach the CSO's. It helps in the understanding of these concepts.

I use both these programs. I use Study Island for a ACT practice and for AP practice.

Researcher: Would you rate the frequency of technology integration as high, moderate, or low?

Dorothy: I still say moderate.

Researcher: Describe your process of determining when integration of technology is appropriate in your learning environment, now that the one-to-one program has been implemented.

Dorothy: Well now, not only are the calculators available always, but so are their computers. At any times during their problem-solving activities they have access to their computers, where they can look up information like formulas or a definition of a word. They had that tool there to help them in their problem solving. And then, when I'm doing my Carnegie lessons, I have more flexibility when doing my lesson plans because I know they have the computers. They can pull those up to see the relationship between what they're doing on paper and what they're doing online as well. And then, for my higher-level math classes, I do assigned Study Island for a ACT prep and Westest prep, depending on the CSO's they have proven to be weak on. If it's looking at their ACT data or their Westest data from last year, those are two things I look at to determine what things I need to teach.

Researcher: Describe your current comfort level with technology integration.

Dorothy: I would say I'm very comfortable with it. I'm not scared of it.

Researcher: How has your comfort level changed, if at all, since the implementation of the one-to-one program?

Dorothy: I don't really see anything that it has changed. Again, most of what computers have done for me is flexibility as a teacher in planning. And for kids it's given them another tool.

Researcher: What professional development have you participated in, which supports your delivery of instruction, in the one-to-one computing learning environment?

Dorothy: I think all of our trainings are supporting technology use, whether it be computers or technology I use in my classroom. I don't want to confuse either one of them. As of right now the only thing that I can think of would be the Study Island training we had and the Thinkfinity training with _____.

Researcher: What types of professional development experiences do you still desire, in order to become a more effective teacher in the one-to-one laptop classroom?

Dorothy: I think of professional development as giving us an opportunity to look at something and navigate through it and then for the instructor to show us how to implement it in our classroom. So I have heard of Khan Academy and I myself have not taken the time to learn that. I

think a professional development on Khan Academy would be helpful to me.

Researcher: How do you become aware of new instructional strategies, particularly those incorporating the one-to-one devices?

Dorothy: Mostly through professional development. You get the opportunity to be with other math teachers and you hear from them. That's how I heard about Khan Academy. It's basically through other teachers. That's what I would say.

Researcher: Please give some examples of how you discovered and integrated new instructional strategies, which were workable because of the one-to-one program.

Dorothy: I wouldn't say that they're new, but when I use Thinkfinity, I use it as a tool. Students can use it for problem-solving. As far as new instructional strategies, I wouldn't say there are any I am using. I use Thinkfinity mostly for the math field day people. It's for problem-solving for the more highly motivated students, working through these problems together to try to find the answer. It's like for the extension activity, which we really don't get to do in our classrooms many times.

Researcher: Describe changes to your lesson planning process, if any, since the implementation of one-to-one.

Dorothy: Again, it just provides me more flexibility in doing my lesson plans because I know I have the tools and students will have the tools.

Researcher: **How would you describe your pedagogy prior to the implementation of the one-to-one program, in terms of teacher-centered, more teacher-centered, equally teacher-centered/learner-centered, more learner-centered, learner-centered? Please provide anecdotal support.**

Dorothy: I would describe mine as, depending on the classes, in the Carnegie classes more learner-centered and in the higher classes more teacher-centered. In the Carnegie classes I would say more learner-centered. My calculus class is definitely more teacher-centered and the trig and pre-cal are equally teacher-centered and learner-centered. With the Carnegie curriculum, the curriculum itself leads us to be more learner-centered. The collaborative learning and the problem-solving… And I incorporate some of the strategies such as the student being the expert and so forth. Calculus is more lecture-based for the most part. There were times when students would present and a lot of times they are working independently and together with my assistance. But when we go to trig and pre-cal it's a little different. AP Calculus, you are trying to get all of your content covered before the AP exam. It doesn't really get student-centered until the last month when the students are taking on the exam problems themselves, you know working through it, that's when I stand back and become more of a facilitator instead of the instructor. In Trig and pre-calc, you know, mostly honors, higher

math students. A lot of the information that started there is done through lecture. There are times when we do the collaborative learning and kids are working in groups and they are getting those good problems with a problem solved but not often as it is in Carnegie. It's more traditional in a sense. I cover a topic and then they are given a problem.

Researcher: **How would you describe your pedagogy since the implementation of the one-to-one program, in terms of teacher-centered, more teacher-centered, equally teacher-centered/learner-centered, more learner-centered, learner-centered? Please provide anecdotal support.**

Dorothy: Carnegie has not changed. Calculus has not changed. Pre-calc and trig have not changed.

Researcher: **Describe any changes to the level of rigor in your curriculum since implementing the one-to-one program.**

Dorothy: I'd say the rigor has not changed. It is still just as rigorous. There was higher rigor in my classes.

Researcher: **Describe any changes to your curriculum in regard to relevance to real world experiences, since the implementation to the one-to-one program.**

Dorothy: There has not been any change, because before implementation there was always relevance to the real world situation. I still use those

problems I haven't used the technology to incorporate relevance. It was already there. The activities were already there. I still use the same problems and activities.

Researcher: How has the one-to-one program impacted the state/district-adopted curriculum?

Dorothy: I do say there is an impact. For Carnegie there is an easier access to the laptops. They get to take them home. We can increase our expectations of what they do online. It is designed for them to work on by themselves. It isn't designed for the teacher to be there with them. We know they can do it without a teacher standing there behind them. And of course when I'm planning, I can take that into consideration making sure they can see the relationship with what they're doing online to what were doing in the classroom. That's a big deal with what we are doing and are one-to-one, overall. A lot of time students weren't making that connection because of how it was seen or worded online versus paper and pencil. Even my higher classes, it's given me more tools to use and the students as well.

Researcher: How has the state/district-adopted curriculum impacted the instructional strategies, which make use of the one-to-one technology?

Dorothy: With the Carnegie, it goes hand-in-hand. It's designed to go right with the curriculum. And vice a versa. The kids can see the relationship

between the two and ideally the Cognitive Tutor could be a curriculum by itself. Now with the others I can't say the curriculum has impacted the one the one technology.

Researcher: Compare and contrast learner engagement of the pre-implementation to the post-implementation learning environments.

Dorothy: I'd say still the same. Except for the Carnegie. I hate to say that over and over but when they do see those relationships they see the connections and it's theirs forever. If that makes sense. But in the other classes, where it is just used as a supplement, no.

Researcher: Do you believe the one-to-one program has enhanced the learning experiences for your students? Please provide anecdotal support.

Dorothy: For the students who use the Carnegie curriculum, I would say so. The one-to-one lets them see it in two different lights. On the paper they are given a problem and it's really open-ended. There's not much scaffolding. And when they get on the computer it provides the scaffolding. So they see the concept and it allows them to see the problem in different ways.

Researcher: Do you believe there are ways the one-to-one program has negatively affected student learning? Please explain.

Dorothy: The only thing I've seen that has been negative would be the students who do not come in prepared the class. I've heard, “This is the first

time I picked up a pencil today." It may be because it is the math class. I still require paper and pencil. That's the only negative thing I've seen. At first when we implemented I had to set an environment where you have this computer and you can use it for a tool in my class, but you can't abuse it and be on games. I had to work up to when they knew it was okay and not okay to use the computer.

Researcher: Describe any skills your students are developing because of the one-to-one laptop environment.

Dorothy: With the Carnegie curriculum I think they are getting a deeper understanding of the skills that are being taught because of the connections we are seeing. Other than that I think the others have the computer skills necessary to do what they are doing. I've not had to show them anything. If anything they show me. I do use Dropbox to collect information too. They are the ones who taught me Dropbox.

Researcher: Describe benefits and challenges to instruction and learning in the one-to-one computing learning environment.

Dorothy: We will go with challenges first and I've kind of already said. First, it was creating the environment where students knew what computers were used for, you know making sure students stayed on task and didn't deviate from what they were supposed to be doing. That took some time for classroom management. On the other hand, it gives

them another tool where they can access information easier than before implementation.

Researcher: How does the one-to-one laptop program impact your ability to individualize instruction?

Dorothy: The cognitive tutor already does it itself based on the students' performance. The program tailors the poblems to the child's need. Then I myself use data from ACT scores and the Westest and benchmarking to determine what activities or Study Island assignments can be used to help students master the concepts on the assessments. Thinkfinity helps me individualize for the students who are working toward math field day.

Researcher: In regard to the implementation of the one-to-one program, do you believe the benefits outweigh the challenges? Support your answer.

Dorothy: Yes I do. With the technology, you know, this is what students have grown up with. And being able to incorporate this even in my classrooms kind of makes them, I guess you could say, feel like at home, but the technology is theirs. Speaking for my daughter, she's known how to draw on the computer since she was a baby. I think that knowing how to do that makes them feel more comfortable. I don't know how else to say it. When we were growing up, that's when we first saw computers in high school. Now it's vice versa. That's what

they are. If we don't incorporate the technology we are doing them a disservice.

Researcher: What changes to the current one-to-one program should be made to improve instruction and learning?

Dorothy: As a teacher I feel we need to have more computers available, extra computers for those students who have computers, which are broken down, to help out with that. As of right now that's all I can think of.

Researcher: Please make any additional comments.

Dorothy: The only thing I would like to add is, you know, because this is math, I don't know everything that is out there that will help bring math across with the integration of computers and technology. More PD in that area would probably help. We've had professional development on Study Island and Thinkfinity. But I've heard of Khan Academy. You know, I think with math teachers, the reason it's not integrated as much as the other subjects, is because we don't know what's out there to help bring those CSO's and stuff across.

Appendix H

James Intensive Interview Transcript

Researcher: **This school has implemented a one-to-one laptop program for all students. This study is a qualitative approach to determine how instructional strategies may have changed since the implementation. You will be asked a series of questions pertinent to your instructional practices, both pre implementation and post-implementation.**

Researcher: **Describe the instructional strategies commonly used in your classroom prior to the implementation of the one-to-one laptop program.**

James: Normally, I introduce topics through hands-on activities such as labs, and I now have started to substitute some of those more routine activities through Internet searches, assignments by Thinkfinity and other things since they have laptops available. Normally, after they did a lab I would do a presentation on the topic and a discussion on the topic. They would submit data collected in the labs on data sheets and then I would build formulas if in physics, and lifetime activities if we were in Chemistry, so they would have a relevance to activities in the home. I still use lectures and labs.

Researcher: **Rank the strategies you described as to frequency of implementation.**

James: Presentations and discussions. At the college level they still rely on discussions and presentations. Data sheets and labs.

Researcher: Are any of these strategies no longer part of your repertoire?

James: No.

Researcher: Describe technology integration, as it would occur in your classroom prior to the one-to-one implementation, citing specific practices, tools, devices and resources.

James: Prior to them having laptops, I had a group of three computers in the classroom and I was working to teach students how to build their own spreadsheets, to do tables, to graphing, things they would use in the college classroom for physics and chemistry. I still do those. We use responders. We use the computers to collect data. They can do some chemistry experiments and collect data using specific software like Photogates. Before we had the laptops I had the Smart Board and the camera system and I continue to use those frequently. After a presentation I would present them with a set of problems to practice and I would take the sheet and use the Elmo and project them to the Smart Board and make it easier for the kids to follow. They could make corrections to their data sheets before they submitted their work. I go over every answer before I take them up.

Researcher: Would you rate the frequency of technology integration as high, moderate, or low?

James: High, because the classes are chemistry and physics, so there is technology present on a daily basis.

Researcher: Describe your process of determining when integration of technology was appropriate in your learning environment prior to the implementation of the one-to-one laptop program.

James: Availability was a big factor because we had limited access to computer labs. The relevance to their career or post-high school educational plans… If I had an honors class of college bound students, I would give them more introduction to computers. If they were looking at a RN program, then we would see the types of technology. such as laboratory equipment, they might run into, such as spectrometers that would test for blood gases, and try to introduce those in a lab. If they were going into phlebotomy, for example, I would introduce them to centrifuges, so I can show them how they can use the centrifuges for liquids, so they could see how they would separate blood plasma. These are technologies we still incorporate. If you have a class of 25 and some are going to college and some going to two-year programs, I try to see what will make the biggest impact.

Researcher: Describe the instructional strategies commonly used in your classroom since the implementation of the one-to-one laptop program.

James: The big thing is how they submit data from the labs. Most of this is now done electronically since they have their own laptop. They can do their spreadsheets and submit them by Dropbox. I grade it in Dropbox and put it back. I make suggestions and they make corrections. I don't have to go around the room trying to individualize and see who is not putting in the formula using the computer. Some juniors and seniors are doing an Excel spreadsheet using the computer as a typewriter. They don't know they can press a button and the formula will calculate. I still use Smart Board, Elmos, the practice problems, and, if you would, worksheets, are now sent to them electronically many times on Thinkfinity. And they can actually do those on the laptops instead of filling out a sheet and handing in a sheet. They do them in Dropbox. I still am doing the hands on presentation and introductions. The presentations… For me the biggest change has been how the information is returned to me from the students. Instead of paper we are trying to do them electronically, and supplementing what I present with things they can do on their laptop: If a student has a question about what I am presenting, they can Google it. They seem to retain better and even come up with different questions. It gets them involved in what is going on.

Researcher: **Rank the strategies you described as to frequency of implementation.**

James: Presentations; labs; data collection still happens, but different format.

Researcher: **Describe technology integration, as it occurs in your classroom, now that the one-to-one program has been implemented. Please cite specific practices, tools, devices and resources.**

James: We also are using responders as a testing platform. This gives us the ability to easily retest without a lot of extra work. It gives us the ability to benchmark any quiz or exam to find out where the problem areas are. We are doing spreadsheets for data collection. We are doing Dropbox submission and digital feedback. We still use the Elmo and Smart Board. We have digital versions of worksheets and practice sheets. One of the big things I've noticed about the tech integration, is most of my students are college bound. Students did have problems knowing where they stood in the class, what there grade was; they didn't have a clue. Now, with the availability of the laptops they are continually checking TeacherEase for mising assignments. They are becoming more a part of the educational process instead of me having to track them down. This still happens, but some of our better students are more actively engaged in the process instead of me mandating it. This is one of the biggest positives I've seen. With students having laptops, one of the big things would be, we have bought and installed

software on the laptops to do simulations, and we have gone through at least 3 simulations with them. For example we can simulate reading a graduated cylinder. They click on an icon. It gives them a cylinder on the screen and they read the volume. Where before I had to go around and see if each student was reading it correctly. The software will give them a quiz or test to determine the volume. They will have to score a certain score before I will let them go into the lab doing it with real chemicals and real volumes. There are hundreds of real lab simulations. I am gradually getting those. Before I didn't want to invest a lot of money because of limited computer availability, but now we can. College level students have given me feedback. Before the only high school lab experience students had were simulations. It was unsatisfactory to them because there were students who couldn't actually use a burner. You can't just use simulations.

Researcher: Would you rate the frequency of technology integration as high, moderate, or low?

James: High.

Researcher: Describe your process of determining when integration of technology is appropriate in your learning environment, now that the one-to-one program has been implemented.

James: This has enabled us to address deficiencies, particularly in science, such as measurements. We purchased a software package called

Fundamentals of Science. They can go in and learn how to read a ruler. Kids don't know how to read a ruler. It will test them. Give them examples. It will teach them how to use an analytical balance. It will teach them how to use graduates, micrometers. If they are in shops, it explains graphing and other technologies. We use this quite a bit, even at the 9th grade level. Our teachers are using this so kids can get good measurements. I would present the technology to them and they have the option of reading the introduction, going through the examples and practicing as long as they want to, and once they are comfortable, the software gives them a 5 question test. They have to score a 100%. Those students can go on to the lab doing an actual lab.

Researcher: Describe your current comfort level with technology integration.

James: I am reasonably comfortable. Some of the software is a pain to me, but I am reasonably comfortable. Moderate to High.

Researcher: How has your comfort level changed, if at all, since the implementation of the one-to-one program?

James: I think it has increased. I've always been comfortable with the hardware. I built computers when I was in college forty years ago. The new aspect is the software. As I've gotten older, my memory slips a little bit, being able to jump from program to program and being able to do some of these things and that's a problem. And that's improved as I've worked with students. Kids teach me. They say you can do this

and show me how to do things I've never seen. I love it. I have good students.

Researcher: **What professional development have you participated in, which supports your delivery of instruction, in the one-to-one computing learning environment?**

James: All of the presentations on Smart Board technology, responder technology, document cameras, all those things, have been really helpful. Some of the computing technology has been pretty good, I had a good background in computer hardware, some of the moving through the software has been beneficial. Sometimes we move to fast through the sessions. You might know what to do but until you start using it on a regular basis or students have availability to it. It's just a lesson until you get it back in the classroom. I've taken advanced courses on spreadsheets so I can learn how to better use spreadsheets.

Researcher: **What types of professional development experiences do you still desire, in order to become a more effective teacher in the one-to-one laptop classroom?**

James: I think when I look at some of the classrooms, classroom management is still essential. How to manage the devices. The options these students have and being aware of what they can do is essential. Such as, they don't know their computers are running subroutines. They say their computers are running slow. I say let's shut down some of these

subroutines. You don't need Skype going. You don't need this running. Let's just do Excel. See how fast it runs now? That's the difference. They will try to run several programs and it will slow them down. You are helping them manage a device. That's the big difference I see. I've got students that cannot input a formula in a spreadsheet. Other students may already have it done. It frees me up to help the other students. You can diversify your teaching. I've got one student working on the first assignment, twenty working on the second. Others may be looking at what we will do next week. It frees you up to make a differentiation in instruction.

Researcher: **How do you become aware of new instructional strategies, particularly those incorporating the one-to-one devices?**

James: Usually those are through staff development. I get some information from feedback from some of my college students. I saw a program on 60 Minutes. The reporters were amazed they were in a college lecture room and they saw the responders we use. The professor said, grab your responders and answer question 1. He had immediate feedback and it affected his presentation. Previous students come back and tell me what they are doing and how it's working. A student said, “Instead of Dropbox, can we use some other storage device?” He explained how it worked and we implemented it.

Researcher: **Please give some examples of how you discovered and integrated new instructional strategies, which were workable because of the one-to-one program.**

James: Working with students to manage their device such as printers. How to add a network printer so they could print out a document. That's been one of the things I've had to take a class period and show them how to add the device. That's a problem solving. I think it's increased or raised the overall awareness of how these devices can operate in an educational setting. We see more students being able to add printers, instead of just being able to use social media. We see more able to use Word or Excel. There are still some students you see didn't even know Excel was on their device. Now they know how to use it. Now there is no excuse for them not having a worksheet if we give them something. It's on Thinkfinity. Those things are on the computer now.

Researcher: **Describe changes to your lesson planning process, if any, since the implementation of one-to-one.**

James: I don't know if I write it down in my lesson plans. I'm not like the young kids that grow up with it. I still have to sit down and write a plan of what I'm gonna place in Thinkfinity, or assignments I make on sites I will use. That's probably my weakest point is when I am going to use Study Island and some of these other things opposed to what I do in the classroom.

[Researcher: Are you telling me you plan your lesson around your objective then determine what tools you may use?]

James: What we have available and how it is applicable to that group of students.

Researcher: How would you describe your pedagogy prior to the implementation of the one-to-one program, in terms of teacher-centered, more teacher-centered, equally teacher-centered/learner-centered, more learner-centered, learner-centered? Please provide anecdotal support.

James: Prior, I was more teacher-centered. We looked at pacing guides and what we had to do to maintain pacing. When exams would be given and what they should cover.

Researcher: How would you describe your pedagogy since the implementation of the one-to-one program, in terms of teacher-centered, more teacher-centered, equally teacher-centered/learner-centered, more learner-centered, learner-centered? Please provide anecdotal support.

James: We see it necessary now to reteach and get students to a certain point before we test instead of just looking at the timetable. We are more learner-centered as opposed to what we did before. I came in and made a presentation and gave them short assignments and gave them a test.

Maybe a lab and then the test. There is more formative assessment now.

Researcher: Describe any changes to the level of rigor in your curriculum since implementing the one-to-one program.

James: I don't think I've been able to increase the rigor. I still have a huge cross range of students in these classes. Everything from pre-med people to special education in a classroom. It's allowing me to increase rigor somewhat. I can make alternate assignments to special need students or to those who cannot keep pace. I even have with some of these technologies the ability to give different exams to the same classroom. Covering the same materials but changing them. I can eliminate some choices for some students on test questions to help make them more competitive.

Researcher: Describe any changes to your curriculum in regard to relevance to real world experiences, since the implementation to the one-to-one program.

James: I think it has allowed, when we are discussing something, you can take a work topic and ask them to pull that up, take 5 minutes... Look at that element. What industries use this? What products? How many of you have this in your home? Even if they become a housewife, they can look at chemicals and see products that have those things in them. I try to address how you deal with those things in the home.

Researcher: **How has the one-to-one program impacted the state/district-adopted curriculum?**

James: The adopted curriculum has shifted away from a college focus to a focus on environment, home, work, and those kinds of things. With chemistry and physics we were focused on the college curriculum. Now we can address social and environmental aspects of chemistry and physics. We were doing bottle rockets last year. I asked a young man, "Did you know they launched a plane last week that can travel 23,000 mph?" They all went and pulled it up and looked at it. The plane had traveled so fast it ripped the wings off. They were amazed these things were out there. This encourages them to use their devices for more than just social media.

Researcher: **How has the state/district-adopted curriculum impacted the instructional strategies, which make use of the one-to-one technology?**

James: I think it's facilitated the use of technology it's easier to address the differences you have to do with the new standards in terms with how you address different students and like how we've discussed how you make or bring in relevance. With the availability of computers it's easier to do all that. I think the adopted curriculum forces you away from some of the patterns that we were in where we give a worksheet grade a worksheet given a worksheet grade a worksheet give a test,

grade a test. I'm trying to get past that how I use the technology more relevant to what they are doing.

Researcher: **Compare and contrast learner engagement of the pre-implementation to the post-implementation learning environments.**

James: I think it's changed somewhat. I'm a little concerned with the lower end of our students. Before you could engage them a little bit more. They are daydreaming and trying to do different things. Now you have to watch because they want to run subroutines. Anything could occupy them and take them away from the classroom discussion. Whereas, the upper students know they are going to be in a college classroom next year. They tend to follow along, but I think it's made it somewhat more difficult for some of the poor students to stay abreast. They've got to take responsibility. This is a way where they can kind of escape without doing that. If you don't stay on top of them. I gave an assignment last week where we drove an electric car, down the hallway. They did the times and then they did spreadsheets. I said put those in Dropbox. I showed them how to do spreadsheets. I have four or five students who never had opened their Dropbox folder. I called them up individually. Their computer skills were ridiculous. They could not take a mouse and you tell them F of X would be a function. You can click on the button and activate the formula. I had to work

with our students. But we got it done. When you give an assignment, and everyone is working on it, and I walk around and they minimize and maximize, and play it off not realizing next week I would ask them to do the same thing in another assignment. They are used to playing the game where they minimize and they have it up there. They're clicking, clicking, clicking, but they're not doing physics. I have to call them up one at a time and make sure.

Researcher: Do you believe the one-to-one program has enhanced the learning experiences for your students? Please provide anecdotal support.

James: Other then my concerns about that lower end, I think it's been really good for the upper end. Some of the middle-of-the-road students and some of the ones that are at the bottom end, I have so many kids who have no clue about being a student and I work with them for weeks. The teacher gives you an assignment. Do the assignment. Turning the assignment. Get the grade. It's a choice many are making and a lot of them, you run into, most of them are failing or not getting satisfactory grades, not because of inability, but because they are not doing the work. They refuse to do the work and a teacher may give them a zero. Enhancement is there for the students who are participating in their education. We have to work with the students who are on the verge of dropping out. Whether they graduate, they are still dropouts from our program. They are not actively pursuing learning. Those kids who are

actively engaged in learning, for them it's great. Were still struggling with some of the middle-of-the-road kids and lower in kids to make them… This facilitates… I think if we can see them and get to them… I had a kid whose worksheets were terrible. I looked at his lab and said you have this number what if it was another number? I helped him and showed him the difference. He said it changed everything. I told them next time you do it, if you do it this way and turn it in you will get the right answer. I show them how to put in the formula and calculate. At the college level, they go in and do a lab, the right answer is important, but it's more important you know how to get the right answer. The professors not looking over your shoulder to see how you're getting what you're writing. Knowing how to get the answer… They think it gives him a leg up, and it does. It is giving them an understanding that they didn't have before about the science. The math has always been a crutch to some of our students. How they can just use their calculators. I think it has enhanced for our kids who are actively engaged and it gives us a way to engage the kids who are on the lower end. But you have to seek them out and really force them to go the extra step.

Researcher: Do you believe there are ways the one-to-one program has negatively affected student learning? Please explain.

James: Other than, if a teacher is not really, if all you want them to do is to come in there and be quiet and turn in an assignment, I can see big

negatives, the cause they were sit there and play a game on a computer or Skype with a friend, and then one really good kid will get the assignment done and send them a copy or email them a copy and they will put their name on it and you will get all of these copies. I had a class and I said kids do you see that data sheet? It has that X I I on it. It means you used someone's copy and not your own. They at least figured out they had to change the name of the spreadsheet. But yes. In that respect I think it's been a hindrance, where before they had to write something and they knew they had to come to you with it. But the real advantage is before all you had to do was come up with the answer. But now they have to put the formula in and you can see how they got it. Teachers have to stay on top of it. Kids could just float along instead of being part of the process.

Researcher: Describe any skills your students are developing because of the one-to-one laptop environment.

James: Building of spreadsheets; access to extraneous data.

Researcher: Describe benefits and challenges to instruction and learning in the one-to-one computing learning environment.

James: The big benefit is making them active learners. The task is making them stay a part instead of letting them opt out to do whatever they want to do. Some days if you are tired and you've done a lab and to get

done early, and they want to do something else, I'm not going to chase them down. That is a problem.

Researcher: How does the one-to-one laptop program impact your ability to individualize instruction?

James: It makes it totally possible. Teaching the subjects that I do, I can separate upper lever and middle level, maybe, but to be able to reach five or six different levels, you couldn't do it without having these computers, tailor- making different things and keeping track of where everybody is. Such as retesting, assignments on the computer even if it's a worksheet, they can send it to you and you can make corrections and put it back in the Dropbox. Whereas before, you were passing that paper back and forth. You could loose papers. This cuts that out. You can send it back and forth… In one of my physics classes I just went through and look at the things they were doing. I highlighted them in yellow and said I want this redone and this redone. Other students, you can correct different things. You can facilitate it. They don't have to start all over. They can make changes without having to totally do a new document. I think that has facilitated a lot of the advancements in regard to the implementation.

Researcher: In regard to the implementation of the one-to-one program, do you believe the benefits outweigh the challenges? Support your answer.

James: Yes. Some of the challenges this year has been the turn around on repairs; try to work around. Some students are more neglectful. Some of the challenges this year have been the turn around on repairs. You've got kids who are doing without computers for two or three weeks. As we put more and more emphasis on it, they get backed up. I do have a couple of computers in my room they can use or someone who finishes early can loan them their laptop. In some classes it can be a real problem when students are doing without their computers. Just like if you were doing without a textbook for a month. Like doing without pencil and paper. I think this is a problem the county must address. Of course, some of the students are neglectful. They took better care of their computers last year, I thought. I haven't seen any deliberate vandalism of them.

Researcher: What changes to the current one-to-one program should be made to improve instruction and learning?

James: I think we need a larger bank of computers and availability of loaners. A way of getting those repaired in a timely manner. That would keep our students with a good laptop.

Researcher: Please make any additional comments.

James: I would like to see if we could get different types of computers and say to kids, "You're going to use a different type of system this month." They would have to learn a different system and learn to do something

else. It would be good for our students to recognize how all of these other systems function. They learn more. When you see a difference between a MacBook and they Dell. When you're learning to do the Mac you have a better understanding of the Dell. Maybe we could limit it to our upper-level students or something. I have a young lady in one of my classes and she has a really good Dell computer. She doesn't have Microsoft office on it. She has some other program on it. When I was helping her with a spreadsheet it would do everything but it would ask her are you sure you want to do this? [Referring to a dialogue box in OpenOffice]. I got a squared away on that. It's not as slick as Microsoft Excel but I think it would be good for all of our students to run into some of these different programs and stuff.

Appendix I

Joan Intensive Interview Transcript

Researcher: **This school has implemented a one-to-one laptop program for all students. This study is a qualitative approach to determine how instructional strategies may have changed since the implementation. You will be asked a series of questions pertinent to your instructional practices, both pre implementation and post-implementation.**

Researcher: **Describe the instructional strategies commonly used in your classroom prior to the implementation of the one-to-one laptop program.**

Joan: I would discuss the subject at hand when I was starting something new. Then I would give questions about what I was talking about. We would talk about in more detail. We would sometimes use the library to research. I would give questions to a group, possibly for in a group, and they would discuss the findings in that group.

Researcher: **Rank the strategies you described as to frequency of implementation.**

Joan: When you're starting something new you have to lecture. Then the kids have to research secondly. There find out more about the subject on their own time. Summarizing and analysis of what they've done.

Researcher: Are any of these strategies no longer part of your repertoire?

Joan: I don't use the library is much now. We have computers for research.

Researcher: Describe technology integration, as it would occur in your classroom prior to the one-to-one implementation, citing specific practices, tools, devices and resources.

Joan: Before the one-to-one we used the TOC lab for research and SAS in schools. We use drawings about what we are studying. This was done before the implementation. I would use the smart board. I would use the smart board because you could see everything and kids could see parts of the cell and what they look like. I would use the microscope too. I would use prepared slides with the microscopes. That's when they did the research about the function of each part of the sale that we introduced on the smart board.

Researcher: Would you rate the frequency of technology integration as high, moderate, or low?

Joan: Low.

Researcher: Describe your process of determining when integration of technology was appropriate in your learning environment prior to the implementation of the one-to-one laptop program.

Joan: About once a week we used the computer lab for research. We had to schedule the time. Scheduling was a factor. Some people would get it a month ahead of time and knock me off of the rotation. I used the smart

board daily before the implementation. Some kids need to look at what you're talking about when you're discussing it.

Researcher: Describe the instructional strategies commonly used in your classroom since the implementation of the one-to-one laptop program.

Joan: When you're starting something new you can get on the computer while you're talking about it and the kids can research it and find out more about it as you're talking about something new. I think it's a great improvement to the learning environment. The kids comprehend. They learn more. They can see it. I use Study Island about once every two weeks. I use it to let kids see more about what were studying area like cell structure and organisms and the microscope and how it's used in research. It talks about lab safety in Study Island and explains in more detail what I go over. It has the 11 body systems in detail. It's really good. I still use the Smart Board. I use SAS in school. It's a good program. I still use the peer groups. We summarize what were talking about. If they learn anything new we write it down. I still have to use lecturing when I start something new. There is too much involved in biology if you don't area. We're doing genetics now. We do student research using the computers. I make them summarize it in a page or half a page. Sometimes that is the exit slip. We use SAS in School and Study Island.

Researcher: **Rank the strategies you described as to frequency of implementation.**

Joan: Research. Discussion. SAS in School. Lecturing. Study Island. Summarizing. Labs.

Researcher: **Describe technology integration, as it occurs in your classroom, now that the one-to-one program has been implemented. Please cite specific practices, tools, devices and resources.**

Joan: When you're starting something new you can get on the computer while you're talking about and the kids can research it and find out more about it as you're talking about something new. I think it's a great improvement to the learning environment. The kids comprehend the love more. They can see it. I use Study Island about once every two weeks. I use it to let kids see more about what were studying area like cell structure and organisms and the microscope and how it's used in research. It talks about lab safety in Study Island and explains in more detail what I go over. It has the 11 body systems in detail. It's really good. I still use the Smart Board. I use SAS in school. It's a good program. I still use the peer groups. We summarize what were talking about. If they learn anything new we write it down. I still have to use lecturing when I start something new. There is too much involved in biology if you don't. We're doing genetics now. We do student research using the computers. I make them summarize it in a page or

half a page. Sometimes that is the exit slip. We use SAS in School and Study Island.

Researcher: Would you rate the frequency of technology integration as high, moderate, or low?

Joan: Moderate. We don't use it every day.

Researcher: Describe your process of determining when integration of technology is appropriate in your learning environment, now that the one-to-one program has been implemented.

Joan: After I discuss the subject I believe technology comes in after that. We would use it to do more research. These kids don't know much when they come in here. We have to start at the bottom. I use lecture first.

Researcher: Describe your current comfort level with technology integration.

Joan: I am comfortable now using it. When I first started teaching we weren't using the computers. I would say now I am moderately comfortable. I learned a lot from teaching the kids different research sites and different programs.

Researcher: How has your comfort level changed, if at all, since the implementation of the one-to-one program?

Joan: I've learned more. I've learned more about the computer and websites in different programs and how I can use them with the subject I teach. A lot of research we look up is what scientists have learned because every day something new comes out. Once a week I go over this with

them. We might study AIDS or hepatitis or how food affects your body. And every week we look at something that's come up.

Researcher: What professional development have you participated in, which supports your delivery of instruction, in the one-to-one computing learning environment?

Joan: We've had so many at school. I've learned about integrating literacy by using a website called Discovery Ed. We've used Educate Me. We've been taught how to find different websites to use in our curriculum.

Researcher: What types of professional development experiences do you still desire, in order to become a more effective teacher in the one-to-one laptop classroom?

Joan: More computer skills. Websites to help with the teaching. I like to have more development on using the computer to research. I'd like to have the biology teachers in the county to get together and have meetings to see what would help us in our teaching.

Researcher: How do you become aware of new instructional strategies, particularly those incorporating the one-to-one devices?

Joan: By faculty Senate meetings and from the West Virginia Department of Education website. There are things on there that we can read.

Researcher: Please give some examples of how you discovered and integrated new instructional strategies, which were workable because of the one-to-one program.

Joan: I find sites my kids can use, by hit and miss, or by looking at the West Virginia Department of Education website. There are other teachers in the state that send things back and forth to other teachers and we can learn about things. There is a teacher who might find something and she sends it to me. If I find something I send it to her.

Researcher: Describe changes to your lesson planning process, if any, since the implementation of one-to-one.

Joan: I write in when I use the computer. There's not much you can write about that, you know? I list sites.

Researcher: How would you describe your pedagogy prior to the implementation of the one-to-one program, in terms of teacher-centered, more teacher-centered, equally teacher-centered/learner-centered, more learner-centered, learner-centered? Please provide anecdotal support.

Joan: More learner-centered because the kids were discussing groups a lot and come up with things.

Researcher: How would you describe your pedagogy since the implementation of the one-to-one program, in terms of teacher-centered, more teacher-centered, equally teacher-centered/learner-centered, more learner-centered, learner-centered? Please provide anecdotal support.

Joan: More learner-centered now because of the computers. The computers give the students more resources at their discretion to use.

Researcher: Describe any changes to the level of rigor in your curriculum since implementing the one-to-one program.

Joan: I think when you use technology you go in more detail and you do more things that you wouldn't do if you have them. More in-depth. We do more in-depth studies on the subject. It's increased.

Researcher: Describe any changes to your curriculum in regard to relevance to real world experiences, since the implementation to the one-to-one program.

Joan: I get things on there like cancer research and T-cell research and how they are improving the medical field. I go into that. More kinds of diseases, I go into that. Like how food affects health. I did that this morning. Never eat white bread. I eat wheat bread. Kids don't realize that. We eat wheat in school now.

Researcher: How has the one-to-one program impacted the state/district-adopted curriculum?

Joan: There's nothing. The new content standards are so vague you just have to know what to do yourself. I'm using the current standards. They dictate what the curriculum is.

Researcher: **How has the state/district-adopted curriculum impacted the instructional strategies, which make use of the one-to-one technology?**

Joan: Before we didn't have the means to look for more detail on the subject but now we have the resources on the computer to go in more depth studies.

Researcher: **Compare and contrast learner engagement of the pre-implementation to the post-implementation learning environments.**

Joan: Before, we have the computers, you had to keep on the kids more to get the research done, like when we were in the library. You would have to get onto them more to get busy because they were just learning this method. Now they have the computer in hand and you mention the subject and they automatically start typing trying to learn more about it, you know what I'm saying? More engagement now. They want to know more about the subject.

Researcher: **Do you believe the one-to-one program has enhanced the learning experiences for your students? Please provide anecdotal support.**

Joan: Yes. I do. I might throw out two or three sentences about a subject and the students go right to the computer and look it up. They'll find something and raise their hand and tell me what they've learned. It's enhanced it.

Researcher: **Do you believe there are ways the one-to-one program has negatively affected student learning? Please explain.**

Joan: Yes. They want to get on other sites. You have to really watch them. That's why think it's good, like on cells alive.com, it makes them think like they're playing the game. But they're learning about plant and animal cells.

Researcher: **Describe any skills your students are developing because of the one-to-one laptop environment.**

Joan: They listen more. They want to hear what you're saying more. They are more interested I think because they can learn more about the subject area than what they could before. If you didn't have the computer to go do more research on the subject you'd have to tell the students to go to the library. Now they can just type it in and I can research it as we go. We are studying mitosis and meiosis and they can look and see the movement on the computers. Before there was no movement. They'd rather see it and how it occurs then just look at pictures. It's really good on cells alive.com. It shows the movement.

Researcher: **Describe benefits and challenges to instruction and learning in the one-to-one computing learning environment.**

Joan: A benefit is you can go into more detail. The bad thing is kids can get off-task and go to other sites. That's the biggest challenge I have.

Researcher: **How does the one-to-one laptop program impact your ability to individualize instruction?**

Joan: The kids on Study Island are on their own pace. You can go around and help them and work with them on their own level, and their own speed.

Researcher: **In regard to the implementation of the one-to-one program, do you believe the benefits outweigh the challenges? Support your answer.**

Joan: Yes. Kids have them vast area where they can learn in more detail. They're more excited about the subject because they can learn more about it than they used to. In biology I use a lot of medical studies to show, like sickle cell anemia, they never heard of it before. They are amazed.

Researcher: **What changes to the current one-to-one program should be made to improve instruction and learning?**

Joan: Screens get broken and they leave them at home. I think it would be good if we had a couple computers set up in our science department and kids could check them out during that period. It would be nice. It could be an older computer they could check out. It would be really good if we just had two for each department. It would help I think. This morning I had a student who didn't have the computer. It was

turned in to be fixed. We can give them out and check them in at the end of the period.

Researcher: Please make any additional comments.

Joan: No.

Appendix J

Mary Intensive Interview Transcript

Researcher: **This school has implemented a one-to-one laptop program for all students. This study is a qualitative approach to determine how instructional strategies may have changed since the implementation. You will be asked a series of questions pertinent to your instructional practices, both pre implementation and post-implementation.**

Researcher: **Describe the instructional strategies commonly used in your classroom prior to the implementation of the one-to-one laptop program.**

Mary: Partner activities and group activities; large group discussion, where some kids participated and some did not. There was a lot of straight from the textbook teaching because the textbook was what we had available unless I ran things off on my own. This is using the materials in the textbook because I didn't have a way to pull the material up for kids unless I was running off magazine articles myself. Because even if we used the Smart Board that wasn't something they could take home with them and use. Questions at the bottom of the page. The tests were driven straight by the book and the text because they didn't have any outside sources. Writing prompts.

Researcher: **Rank the strategies you described as to frequency of implementation.**

Mary: Large group, we did daily. It was the easiest way I could ascertain what I'd ask them to do. But it wasn't really in depth. That is actually something we don't do as much anymore. Now we can do threads on Thinkfinity. Or we can do blogs. Online discussions. We can go in depth. It's free-thinking for them only guided by me. I love these computers.

Researcher: **Are any of these strategies no longer part of your repertoire?**

Mary: In the writing prompts we are now using the West Virginia Writes. I am also using the Microsoft Word more now, where they can have the prompt through Thinkfinity, or on the board and our Dropbox. It's made the writing better because they've had time to think about it and they can see it more clearly when they type it up rather than when the writing it down. Microsoft helps them with their punctuation and it helps them with their writing skills. I think writing is made better with the one-to-one, yes. I don't use the textbook as often as I used to because I can do more in-depth study with the stories online because there are so many resources out there which have the story right there online where you can read it and it has articles attached to it. It has historical facts attached to it and they can get so much more in depth in the story than what they used to. It used to feel like I was teaching a

mile wide and an inch deep and now I feel like I'm teaching still pretty wide but so much deeper. They are getting so much more out of it.

Researcher: Describe technology integration, as it would occur in your classroom prior to the one-to-one implementation, citing specific practices, tools, devices and resources.

Mary: I would put up articles and put them on the Smart Board. They would occasionally get to do research in a lab if we had a lab available. I couldn't really put anything online for them because a lot of them really didn't have computer access. Other than researching for my teaching myself the kids really didn't get to use the Smart Board.

Researcher: Would you rate the frequency of technology integration as high, moderate, or low?

Mary: I would say low, because I didn't have the technology available for them to use. I mean I had my own laptop and my Smart Board and a desktop, which was a 2003 upgraded to a 2007. That's all I had.

Researcher: Describe your process of determining when integration of technology was appropriate in your learning environment prior to the implementation of the one-to-one laptop program.

Mary: Whenever I felt they needed to research a time period, because that's how I taught units of stories, based on time periods and historic events. It was limited to the time I had available in a lab.

Researcher: **Describe the instructional strategies commonly used in your classroom since the implementation of the one-to-one laptop program.**

Mary: They research every story. They do background information on the authors. They answer questions that have been posted online. They can even respond to each other as well as ask my opinion and get my opinion on the questions. Sometimes they're in Thinkfinity and sometimes it's a direct email back and forth between just myself and the student, or we set up a Dropbox and we put stuff in there everyone has access to. I allow them to partner up, and because they have computers they can do their partner work on the computer online. They can put stuff in the Dropbox and work that way. Because their assignments are on the computer they can work outside the classroom and inside the classroom. We have also worked with another teacher's classroom at another high school. It was awesome. We are getting ready to do this after the beginning of the year. Students have even Face Timed to each other for discussions. With the other school, last year, we worked with the other class at the other school. Last year it was just a practice but we will be doing more this year. We use the West Virginia Writes, which is an awesome program. They can see their score and improve their score now that we have the one-to-one access. I give them different websites like the Read- Write- Think,

where they can go on and make cartoons. They can make Prezis, animated PowerPoints. These are multimedia products. They have stationary PowerPoints on their computers but they can go online and do animated stuff. They liked this better.

Researcher: Rank the strategies you described as to frequency of implementation.

Mary: The web research is number one, because we do it with every single story, then the collaboration and partner activities. They work better when they can bounce ideas off of someone. Then multimedia projects because they do them every couple of weeks. West Virginia Writes is done every nine weeks.

Researcher: Describe technology integration, as it occurs in your classroom, now that the one-to-one program has been implemented. Please cite specific practices, tools, devices and resources.

Mary: With the laptops everything goes into Dropbox. Everything they do, I mean, these kids were always losing their work but it's there. We use Thinkfinity. We share a Dropbox folder. All of their assignments are submitted within Dropbox. I can pull them out and put comments on them and put them back and they can correct them. It's not just used for the final assignment but it's used for ongoing assignment. I can pull it up and say, “This is not right. This is not right. Make corrections.” And I point out citations. Formative, but focusing on feedback. I use

the Elmo and Smart Board. The Smart Board displays bell ringers and assignments. We use it for videos and the kids use it for their Prezi presentations. They do work on the Smart Board in front of the class instead of the chalkboard. They use it for grammar correction of the writing. We've use those little mini-cameras so they can film themselves for presentations or for when we are doing, like, write your own story. They will film themselves. Besides Dropbox and Thinkfinity and Read-Write-Think, there are so many things we use. We use teacher rooms for communication with the kids and parents.

Researcher: **Would you rate the frequency of technology integration as high, moderate, or low?**

Mary: I would say high.

Researcher: **Describe your process of determining when integration of technology is appropriate in your learning environment, now that the one-to-one program has been implemented.**

Mary: When I feel like students need more depth in their knowledge, on any particular subject or area, it is appropriate. It is through research, it's the writing prompts, it's through online discussion, it's through them finding their own resources and sharing them with the class.

Researcher: **Describe your current comfort level with technology integration.**

Mary: I would say it is moderate but growing.

Researcher: **How has your comfort level changed, if at all, since the implementation of the one-to-one program?**

Mary: I get more comfortable the more we use it. I'm one of those people who get more comfortable with change the more we use it. I'm learning. I am one of those people who are afraid of change until I get comfortable with what is changing. I'm growing more comfortable as we use it along with the kids. I have kids who have never turned on the computer before they came to high school. I am one of those people who want to reach out and grab it but I sit back just a little to see how it's going to work, and then, I may not have a lot of confidence with my technical abilities, but once I learned I am ready to go.

Researcher: **What professional development have you participated in, which supports your delivery of instruction, in the one-to-one computing learning environment?**

Mary: The professional development with _____. He's shown us Thinkfinity. He showed me how to use Dropbox. The programs I use every day are the ones I've had professional development on. When you guys taught us the TeacherEase program and how it worked I used it. Another teacher has taught me so many things about the program she uses. I didn't know anything about Animate Me until I saw that. Another teacher showed me about the Prezis. So those were in-school professional developments. In Faculty Senate we been shown several

programs. Last summer they showed us all different programs for the Common Core. They showed us links to units we could use. There is a website that has been created for _____ County teachers by our instructional coaches.

Researcher: What types of professional development experiences do you still desire, in order to become a more effective teacher in the one-to-one laptop classroom?

Mary: I think I understand the programs I am using currently. I think I need to know how to teach the kids better computer skills. Because even though I am comfortable with it, they may not be, and I need to teach them. Some of them have no idea how to structure a research question and eliminate irrelevant websites. They don't know how to use the programs I want them to use. Even though they use Facebook and other things they may not know how to use the computer to do a specific assignment.

Researcher: How do you become aware of new instructional strategies, particularly those incorporating the one-to-one devices?

Mary: Other teachers; reading coaches, and my own research.

Researcher: Please give some examples of how you discovered and integrated new instructional strategies, which were workable because of the one-to-one program.

Mary: I learned about threads on Thinkfinity. Kids who never would have participated in a discussion, participate on Thinkfinity. I learned about it in a professional development and another teacher set down with me and helped me until I got it.

Researcher: Describe changes to your lesson planning process, if any, since the implementation of one-to-one.

Mary: I cover less material, but I cover it in a more in-depth manner, by adding in components I could not have before, like the online threads and the research online, the rewriting and reworking of student essays. I could not have got them graded then handed back to them in the amount of time it takes now. You don't see the textbook as often in my lesson plan anymore. I will spend more days dealing with one story than I used to because I have more stories or resources and can use more depth. You can find online videos included in my lesson plans I would never have used before. If I'm not here I have links in my lesson plans so the substitute can use them.

Researcher: How would you describe your pedagogy prior to the implementation of the one-to-one program, in terms of teacher-centered, more teacher-centered, equally teacher-centered/learner-centered, more learner-centered, learner-centered? Please provide anecdotal support.

Mary: I would say before the one-to-one it was more teacher-centered. In all honesty the like I was doing all of the work.

Researcher: How would you describe your pedagogy since the implementation of the one-to-one program, in terms of teacher-centered, more teacher-centered, equally teacher-centered/learner-centered, more learner-centered, learner-centered? Please provide anecdotal support.

Mary: My pedagogy now is more learner-centered. I feel more like a coach, helping them get to where they need to be, instead of being the one to say, “Just write this down. I’m going on.”

Researcher: Describe any changes to the level of rigor in your curriculum since implementing the one-to-one program.

Mary: I feel my rigor has increased, because they have more opportunities to learn, because they have more access to the research and two other people's thoughts. I expect more things from them. The level of thinking has to increase and it has to be higher. I think my level of questioning has gotten harder. I think I'm a harder teacher than I used to be. I don't think my students realize I'm hard, which is good, right?

Researcher: Describe any changes to your curriculum in regard to relevance to real world experiences, since the implementation to the one-to-one program.

Mary: We do a lot more of argumentative essay writing and a lot more informational text. We look at the events of the week. I keep them on track with what is going on now in the real world.

Researcher: How has the one-to-one program impacted the state/district-adopted curriculum?

Mary: I think it's easier for us to steer the kids in the direction of the Common Core, or what we call the Next Generation Standards, because we can pull from other states and what they use for Common Core. It's giving the kids a better chance to be equal with other kids in the country. I think it has impacted it in such a way that it has made our kids more relevant. I don't think our kids feel like they are in a fishbowl anymore. The Common Core Standards are made more teachable because of having the one-to-one laptops. It is changed our limits. We are less limited now. We can expand so much more than what we had been able to do before.

Researcher: How has the state/district-adopted curriculum impacted the instructional strategies, which make use of the one-to-one technology?

Mary: I think our adopted curriculum has been holding us back. I think the one-to-one has opened us up to go beyond the curriculum to better address it and to improve upon it. There is more impact of the one-to-

one on the curriculum than of the curriculum on the one-to-one initiative.

Researcher: Compare and contrast learner engagement of the pre-implementation to the post-implementation learning environments.

Mary: So many more kids are involved in the discussion now. I get so much more work than ever before. I had kids who never turned in papers to me before to now turn in things all the time. They were losing things all the time, before. They are more involved because they get to play games, they think, instead of learning. The videos pull them in. They find their own videos and bring them in to show me. They get so more engaged in what we are teaching.

Researcher: Do you believe the one-to-one program has enhanced the learning experiences for your students? Please provide anecdotal support.

Mary: Yes. A student brought in his own video. We showed it to the class. It not only enhanced his learning but it enhanced the learning of the whole class. I have students, who are turning in assignments, who did not do so before, so it has affected their learning. I have kids who are staying with me and after school and doing the online credit recovery and now feel like they can finally graduate.

Researcher: Do you believe there are ways the one-to-one program has negatively affected student learning? Please explain.

Mary: It's easier for students to become distracted. It depends on teacher vigilance.

Researcher: Describe any skills your students are developing because of the one-to-one laptop environment.

Mary: A better grasp of building sentences and paragraphs because of proofing tools in Microsoft Office; research skills; finding appropriate applications to help in learning; and better study skills.

Researcher: Describe benefits and challenges to instruction and learning in the one-to-one computing learning environment.

Mary: Benefits-They keep up with the work; more resources; and easily interact. Challenges-Keeping computers maintained and limited access at home.

Researcher: How does the one-to-one laptop program impact your ability to individualize instruction?

Mary: I create different assignments at different levels and set up discussions at different levels. It is like working with IEPs for every student. Study Island and Thinkfinity help.

Researcher: In regard to the implementation of the one-to-one program, do you believe the benefits outweigh the challenges? Support your answer.

Mary: Yes. We live in a technologically-based world. Students need to have skills to be successful beyond the school.

Researcher: What changes to the current one-to-one program should be made to improve instruction and learning?

Mary: Students should not be given administrative access. Students should not be able to download applications, which slow computers down. We need something like Nannynet.

Researcher: Please make any additional comments.

Mary: I love the one-to-one. It's beneficial to students and teachers. Writing is better because of the one-to-one resources.

Appendix K

Patricia Intensive Interview Transcript

Researcher: **This school has implemented a one-to-one laptop program for all students. This study is a qualitative approach to determine how instructional strategies may have changed since the implementation. You will be asked a series of questions pertinent to your instructional practices, both pre implementation and post-implementation.**

Researcher: **Describe the instructional strategies commonly used in your classroom prior to the implementation of the one-to-one laptop program.**

Patricia: Usually it was mainly, I was presenting information to them and trying to pull and resources I can find and print out because they didn't have a computer to look at it on. I would have to give them the information and it wasn't as learner-directed because it couldn't be individualized it was much harder to print out 30 copies of something than it is to put students on different things. Different handouts, and a lot of times, in English, we have multiple stories we want to compare and we would have to print off different copies and sometimes we would end up just comparing two. Whereas, online, we can compare multiple sources. Like, in lecture format, we could use PowerPoint. I did have the Smart Board, so it would be just some kind of visual aid.

Researcher: **Rank the strategies you described as to frequency of implementation.**

Patricia: It would be in the same order as I gave them: teacher presenting information; lecture\PowerPoint; give them resources or handouts. Not very learner-centered.

Researcher: **Are any of these strategies no longer part of your repertoire?**

Patricia: I still do direct instruction. Usually it's not as frequent. If you're watching a project, sometimes you have to go over and give them information that way, but now they can pull up on their personal computer what I have. They can have it in front of them instead of just having it on the board for them to look at.

Researcher: **Describe technology integration, as it would occur in your classroom prior to the one-to-one implementation, citing specific practices, tools, devices and resources.**

Patricia: We would try to get the computer lab but we had to share it. We would come up with the schedule and once a week we would go to the computer lab and use it in the English department. That worked out well then, but now it's hard for me to imagine just having to use a computer one day a week because we use them nonstop now. It's all we use. We used Audacity before and we had a mobile lab. We used it. And we made podcasts and webpages but it was hard because with the mobile lab, sometimes it was hard. We didn't have enough for

everyone and it was hard. It would take a lot longer to get everything accomplished. We had a Smart Board before. I tried to use as many interactive programs as what I could. We took virtual tours. For instance, when we studied Shakespeare, we took a virtual tour of the Globe so they could kind of see what it was like then and I would use it to show them information on my computer so they could see it. I think if you just hear something, you have to see it too.

Researcher: **Would you rate the frequency of technology integration as high, moderate, or low?**

Patricia: Compared to now, low.

Researcher: **Describe your process of determining when integration of technology was appropriate in your learning environment prior to the implementation of the one-to-one laptop program.**

Patricia: Well mainly it had to be limited to that one day a week. The Smart Board I used daily. I never did not use the Smart Board. I tried to bring in videos or some type of interactive thing on the Smart Board. We would play games sometimes and they could take turns playing the game on the board. But you don't have them all engaged at one time when you do that because they have to take turns.

Researcher: **Describe the instructional strategies commonly used in your classroom since the implementation of the one-to-one laptop program.**

Patricia: I'm a big fan of project-based learning and I think if you pair it with something you do in the real-world, students become engaged. We use multiple things online. We use Dropbox and that's how they turned in their assignments. We used Thinkfinity and I put the class online for the students. If the handout I have is digital, they can go to the computer and use it. For writing we use peer-review and students post their paper on to Thinkfinity, and their partner will download it on their computer and they will use Microsoft Word to track changes in the comment bubbles, to review the other person's paper, and they will post it back to the board and look at the changes. That way they can look at what their partner did and they can see other papers and try to improve. Whereas, before, you just exchanged papers and you can see everyone's. Sometimes you learn more seeing what everyone in your class is doing. If you think they can do it, you can do it too. We use Prezi and Windows Moviemaker. We make products. I don't give tests anymore. I do, but not like I did. We do presentations and we have a product. We always have some type of big projects to tie in what we are doing. Yes we have quizzes but just not in the sense it used to be. Used to, the majority of their grades would be an exam. You would read a story and you would discuss and deal with it and write a paper on it and do an exam. We do that too, but we also have a project and I try to have them tied into the real world. We didn't use Thinkfinity

before and we didn't use Dropbox before. We use Prezi now because it's all online and they can keep it. We try to stay away from PowerPoint because it's something I suspect they knew how to do for years. I try to teach them things that they can use in college. Of course, we use Microsoft Word for everything. Instead of handwriting things, they can type it now. I like the fact that if I have a rubric, I can post it to the page and they have it instead of having to make 200 copies. If they lose it or if they're absent they can get on Thinkfinity and they can get anything they need to get. I do so much. I could talk to you forever. We use Study Island also. We didn't do it before. West Virginia Writes is easier now because you can do it as much as you want. It's easy for me to show them exemplary essays because I can put them on there and they can have it on their computer. Like today, for instance, in my seventh period we did peer review yesterday so today they're going to look at an exemplary essay on that prompt and try to make their final copy look like that before they submit it to West Virginia Writes. Stuff like that was a lot harder before when you had to make copies all the time. You still have to use direct instruction to a point. You can't just turn them loose on something, I think. We collaborate on just about everything we do and the projects are always in groups. Occasionally, there's one alone, but most of the time they are in groups.

Researcher: **Rank the strategies you described as to frequency of implementation.**

Patricia: Cooperative learning; projects; peer review; then probably direct instruction. With things like Study Island you can kind of tailor. It's more individualized.

Researcher: **Describe technology integration, as it occurs in your classroom, now that the one-to-one program has been implemented. Please cite specific practices, tools, devices and resources.**

Patricia: On a daily basis we used the computers and we no longer use the textbook. The stories we use in English class, we usually link them to Thinkfinity and have them online. If it's a bigger text we use the book, to have it on paper as well, but we research it. We research everything. It's research-based. With informational text it's easier to have an online and they used the dictionary and the thesaurus online with their writing. Microsoft Word daily. We don't use paper but occasionally we do. We usually annotate text in Microsoft Word. You can copy and paste it in there and annotate using track changes and comment bubbles. It's all digital. There is no more losing the paper.

Researcher: **Would you rate the frequency of technology integration as high, moderate, or low?**

Patricia: High.

Researcher: **Describe your process of determining when integration of technology is appropriate in your learning environment, now that the one-to-one program has been implemented.**

Patricia: We use it every day. I just usually look at what we are going to be doing. I know if we're writing a paper we're going to be using the Internet and we're going to be using Microsoft Word. If we're doing a project I just look at different mediums. Do they need a video component? And if they do, we use Movie Maker. If not we use Prezi. I think PowerPoint is too elementary for the high school students so that's why we use anything but PowerPoint on our projects. A lot of times I let them choose the medium they will present their project in. A lot of times I let them choose the medium because some of them are more comfortable with different things.

Researcher: **Describe your current comfort level with technology integration.**

Patricia: I would say high.

Researcher: **How has your comfort level changed, if at all, since the implementation of the one-to-one program?**

Patricia: Yes. In the beginning you are scared to use it. You didn't know exactly what you are doing. When you are confined to a computer lab one day a week you can't work with something. A lot of times when doing something new, I learn with them on how to work up particular medium we are using. I discovered something new on Moviemaker

last week. I taught them and we are doing it together. Sometimes they find different things online to do they show me and we can use it. I think it helps I am open to them teaching me things as well in technology and we work together.

Researcher: **What professional development have you participated in, which supports your delivery of instruction, in the one-to-one computing learning environment?**

Patricia: We had _____ in and he did a Thinkfinity training. We've had trainings on Study Island. We've had trainings on writing. I've been a trainer in Common Core Standards and we brought technology into that. I went to a weekend podcast training.

Researcher: **What types of professional development experiences do you still desire, in order to become a more effective teacher in the one-to-one laptop classroom?**

Patricia: There is a wealth of programs out there I don't know about and I would like… I don't mean to say that I'm an expert, but sometimes it's stuff I already know. I wish they would come up with something or show me something we don't already know and that we can use. I would like to know more of how to work the Google webpages and some of the video programs. I would like to know how to work our media room and how to record a video program with the cameras we

have here. I'd love for someone to teach me how to do that because those kids would do really well with that.

Researcher: How do you become aware of new instructional strategies, particularly those incorporating the one-to-one devices?

Patricia: Other teachers; online; see on TV and the news; and sometimes the students.

Researcher: Please give some examples of how you discovered and integrated new instructional strategies, which were workable because of the one-to-one program.

Patricia: I think the online collaboration is good. For example, yesterday when we did peer-review, they didn't have to get out of their chairs. They posted their papers to Thinkfinity and I downloaded their partners' papers without having to shuffle around the room and trade papers and talk about it. They had it right they are. They can zap it right back to them. They immediately had feedback from their partner and from me because I can pull them up on Thinkfinity and look at them as well. It's a lot faster. You can scroll through and look at a feed on Thinkfinity faster than you can look at 30 papers. I learned this through trial and error. I had a college class on computers and it talked about track changes. We had to edit one of our own papers using track changes and the professors graded them through this. I thought I could use this and my kids will love it. They do love the comment bubbles and to

annotate text as well. I know sometimes with highlighters and writing with an ink pen gets old, they like digital. When they can put in a comment bubble and highlight on the computer and you can lookup a word instantly, instead of going to the dictionary, it's more their speed. Something I wrote up for the common core team: We're doing a lesson on the Odyssey and the students are doing a newscast. With Moviemaker you can record yourself right on Moviemaker with your laptop. I didn't know you could do that. Before we had two cameras and it took forever to record people. They can hit the record button and record their newscast. They've researched and they will deliver a newscast based on the Odyssey. They are going to take a scene from the story and say the character has angered the gods and it's caused a storm. They had to research a storm in the past five years. They could say it caused the typhoon to occur and they can do a newscast on the storm. We could never do that before. I came up with that because I thought I wanted to do something the students were interested in. A typhoon happened and we did an informational text reading on it one day. They were all interested and I thought they would like to research those storms. The Odyssey is full of all of these crazy things happening. I thought I would just put it all together.

Researcher: **Describe changes to your lesson planning process, if any, since the implementation of one-to-one.**

Patricia: It's almost easier in a way because when you had to find all the resources yourself without the computers you often wouldn't bring in as many resources. You're not going to have five different handouts when you're teaching 160 kids. It's just too much. But online you can link all of these things and they have it right there. You can get a lot more accomplished in a short period of time. Sometimes it is hard because planning projects is difficult. For the Odyssey I was just driving down the road listening to a newscast and I thought, "They can do a newscast. Fabulous!"

Researcher: How would you describe your pedagogy prior to the implementation of the one-to-one program, in terms of teacher-centered, more teacher-centered, equally teacher-centered/learner-centered, more learner-centered, learner-centered? Please provide anecdotal support.

Patricia: It was teacher-centered. It was mainly me giving information and I would explain how to do something and show them how to do something or model it and they would do it.

Researcher: How would you describe your pedagogy since the implementation of the one-to-one program, in terms of teacher-centered, more teacher-centered, equally teacher-centered/learner-centered, more learner-centered, learner-centered? Please provide anecdotal support.

Patricia: It's more learner-centered. In a project a student can present it the way they want to present it and you can find your area of expertise and it gives you a little more leeway instead of saying you have to do it a certain way. You can research. God bless Google. We Google everything. I'm not a teacher, that, if they ask me something, well I don't know everything. They'll ask me something and I say, "Well you can look it up," and they do. They get excited about it. When we were researching Caesar a girl wanted to know why they called it a C-section and we looked it up.

Researcher: Describe any changes to the level of rigor in your curriculum since implementing the one-to-one program.

Patricia: I think it's definitely more rigorous. The students don't realize it but they enjoy using technology. It is more rigorous. Five years ago if I asked a student to do a newscast they would've said, "Oh my gosh." Now they are kind of used to using the technology. And the levels of information they use, well, the text is harder. Times have changed.

Researcher: Describe any changes to your curriculum in regard to relevance to real world experiences, since the implementation to the one-to-one program.

Patricia: I try to always have a real-world aspect to projects if possible. I think it helps the students to relate to why it's important and it's often more engaging. My senior research project always includes a real-world

aspect. They research a social problem and they have to perform an event to try to solve that social problem. So if they research the hunger and poverty level here, they can have a food drive and donate food. It opens their eyes to a lot of things. Sometimes things are different when you see it.

Researcher: How has the one-to-one program impacted the state/district-adopted curriculum?

Patricia: We don't have textbooks anymore or I should say we have them but we don't use them. Well, we use to use the book. That's what we did. We had the book. Now there are certain stories that I like to have on paper, like the big plays you have to touch on. With the informational text, I might think of something and I can post it right then. I had my seniors read and article the other day and I was looking and I found one better and I responded with a better article. I had them to compare those two. You can do it within 10 minutes as to where you can't leave your kids and go to the office and make another copy. Now you can use what you find. You can find anything you want on the Internet. You can. You can download stories and there is so much out there. You can find informational text that has a lot to do with a piece of literature and have them side-by-side.

Researcher: **How has the state/district-adopted curriculum impacted the instructional strategies, which make use of the one-to-one technology?**

Patricia: The adopted curriculum is the Common Core. The Common Core Standards are all about technology. You have to look at a wider range and lexile levels have went up. A lot of the stories that students in the ninth grade are expected to read are now on a 10th or 11th grade level. Having computers makes it easier for me because before I would have to have two sets of books in my room and I would have to find a higher level books to get the stories. But now I can find them online. I think the curriculum is the standards and the medium is the textbook or the Internet. It's up to you how to teach it. That's what we are trying to do is to prepare them for college or career. That's what the Common Core tries to do and it's up to you how you do it. You can do it with the book or you can do it however you want to do it. I just think the computer makes it much easier.

Researcher: **Compare and contrast learner engagement of the pre-implementation to the post-implementation learning environments.**

Patricia: They are a lot more engaged now that they have a computer in front of them instead of when I'm just standing up there and talking about something. They like to be able to touch something, Everyone does.

No one wants to listen to someone talk for a long time. I thought my kids would freak out when I told them I wanted them to do a newscast because I'm always trying to come up with something crazy for them to do. They were so excited. I said, “You know you have to write a script first before you can do it.” They said, “It's amazing.” They had to do a video and they liked it. I had kids to come in the Mod yesterday just work on the script.

Researcher: Do you believe the one-to-one program has enhanced the learning experiences for your students? Please provide anecdotal support.

Patricia: Yes, definitely. There were kids who would sleep in class and you had to constantly tell them to get up but now that they have the computer they enjoy being able to actually do something.

Researcher: Do you believe there are ways the one-to-one program has negatively affected student learning? Please explain.

Patricia: You have to be vigilant in watching that they are not on something they shouldn't be on. But if you establish in your classroom, it will not be tolerated, early on, it's really not a problem. I don't have a major problem with it. But it is there. You have to teach online safety and credibility of sources. My students know what's credible and what's not. It's mainly up to the teacher to set the guidelines and boundaries. But to say it negatively affects learning, I don't think it does. Even if

you find a non-credible source, you are learning how to distinguish between the two.

Researcher: Describe any skills your students are developing because of the one-to-one laptop environment.

Patricia: Their typing skills are improving. Even with the ninth graders I can tell a difference in how well they can type now. In the beginning you have to teach them how to use Dropbox and how to attach things and how the email, and now they can just zip through it. They are a very technologically advanced generation but they don't know how to do anything but Facebook until you teach them. They know how to do social media and video games. They know how to do that, but Microsoft Word and all this other stuff, not as much.

Researcher: Describe benefits and challenges to instruction and learning in the one-to-one computing learning environment.

Patricia: Challenges would be monitoring what they are on. You have to be walking around and looking at what they're doing. The benefits are students have a wealth of information at their fingertips. They can Google anything and they're going to find lots of information. You can teach them how to find different sources of information, whereas before, all you had was the library or their computers at home. Now everyone has access to a computer and the Internet.

Researcher: **How does the one-to-one laptop program impact your ability to individualize instruction?**

Patricia: With Study Island, for instance, you can go on and have a student to take a pretest and you can go on and find out what their areas of weakness are. You can quickly assign them things based on what they're weak in. You might have four kids at a table and they might all be doing something different. The same thing with the project. They can use a different medium. Someone might want to do a video. Someone might want to do a presentation. Somebody might want to podcast. They are still doing the same thing but they can pick their area of expertise and use it. It makes them feel like they are more in control.

Researcher: **In regard to the implementation of the one-to-one program, do you believe the benefits outweigh the challenges? Support your answer.**

Patricia: Yes I do. They can be doing something they're not supposed to be doing. But even if they're just sitting there listening to you talk they might be asleep or they might be zoned out. It's just the same thing. I would rather them be engaged in doing something than have to worry about them clicking on a website and doing something they're not supposed to be doing.

Researcher: What changes to the current one-to-one program should be made to improve instruction and learning?

Patricia: All teachers need to be trained a little more on some programs that are available. A lot of times even if you do have trainings, it's kind of redundant occasionally. We need to bring in some different kinds of things that you can use in all classes. Different types of things. Not all teachers are going to take it upon themselves to learn something on their own as much as others would. That's a nice way of saying it. Sometimes we are getting more of the same thing, yes. For instance, the trainer may be coming in talking about Thinkfinity but then they go on to talk about Schoology.. You know, it's like, okay, it's pretty much the same thing. I don't know. Sometimes I think I feel like I can train the trainer. I don't mean that mean. I don't. I wish they'd split us up into groups. That's what I wish. You could have an advanced track. I feel like I'm one of the kids. I'm on my email saying, “Yes. Yes. I know how to do this.”

Researcher: Please make any additional comments.

Patricia: I think the instructional strategies are more rigorous and more relevant. You can pull up, with the touch of your fingertips, like the typhoon. I pulled it up and talked about it. It was a real-world news event and they were interested. They started talking about storms they did know about, that happened in the past. They are reading informational text.

You're connecting to real world and you're looking at CNN.com instead of Facebook. It's showing them different ways they can find new information. It makes you a more informed citizen to know about things like that. I think you need to know what's going on in the world, and if these kids are reading articles on that level… I love the computers and I honestly do question how I taught. Well I know how I taught before and it wasn't very good I think. It's just helped me tremendously. If the Internet is down, I feel like my heart hurts a little bit because I say, "What are we going to do? Oh my gosh." You become, not dependent on it, but you just use it so much that it's hard to imagine going on without it. One day my projector lamp blew and I couldn't teach. I couldn't. I said, "Oh my gosh! Am I going to have to use this chalk?" The other day I said, "Where am I going to draw this web for the essay?" And the kids said, "The chalkboard. Use the chalkboard."

Appendix L

Robert Intensive Interview Transcript

Researcher: **This school has implemented a one-to-one laptop program for all students. This study is a qualitative approach to determine how instructional strategies may have changed since the implementation. You will be asked a series of questions pertinent to your instructional practices, both pre implementation and post-implementation.**

Researcher: **Describe the instructional strategies commonly used in your classroom prior to the implementation of the one-to-one laptop program.**

Robert: I worked using a textbook and we did the Carnegie math. We use the Carnegie textbook. I instructed and had the students to work in small groups on the assignments in the book. Once or twice a week we would have to go to the computer lab. We had to wait for our turn. Sometimes we were limited how often we could actually be on the Carnegie online program because of the fact we had a go to the lab and work within that schedule. We worked at least once sometimes twice a week. Sometimes I would lecture and demonstrate on the board or on an overhead projector. A lot of times, once they had the instructions, they would divide up in small groups and help each other and I would

rotate around to the different groups. This is what we still tried to do to help each other. We just didn't have access to the computer lab.

Researcher: Rank the strategies you described as to frequency of implementation.

Robert: Modeling is very important. Group work, where they can work together and help each other. Then the actual online Carnegie, they get one day a week now to work on it but they have to work on it at home.

Researcher: Are any of these strategies no longer part of your repertoire?

Robert: I still did the same things. I have to model and work together in groups. They still have to do the online part. It hasn't changed.

Researcher: Describe technology integration, as it would occur in your classroom prior to the one-to-one implementation, citing specific practices, tools, devices and resources.

Robert: The Carnegie we had to do online, that would be the main thing. That was the biggest part of the program. It's called cognitive tutor. Occasionally I would use the smart board and put examples on the Smart Board for them to say.

Researcher: Would you rate the frequency of technology integration as high, moderate, or low?

Robert: Moderate.

Researcher: **Describe your process of determining when integration of technology was appropriate in your learning environment prior to the implementation of the one-to-one laptop program.**

Robert: I was required to use the technology for Carnegie. At first they told us we had to do it twice a week. They wanted 40% of her class to be the online program. Now they have cut it back to where they say 20%. We felt that was taking too much away from our instruction so we went to one day and require the students to do more work at home, which, without the one-to-one, we really couldn't do much.

Researcher: **Describe the instructional strategies commonly used in your classroom since the implementation of the one-to-one laptop program.**

Robert: The most important thing for me is in our transitional math class we don't have textbooks for the students. But in conceptual math there is a textbook but it is not something I use all the time. I look at the content standards and make sure I cover certain topics. Whereas, where the laptops come in, if I want them to do a certain topic and they need examples to go by, or instructions to follow, they can get it right on the laptop. For factoring trinomials, for example, and they need more examples will go to a certain website and they can find what they want. And also the students, when we were doing Carnegie, they could go online and get the actual textbook and skills practice book and all

those things online. It makes it more convenient. We can do things like Study Island and things like the pretest before I go into a topic I want to cover. We can go into it and see how they do. I post test on my own, but I can give them a post is from Study Island before I actually give them the test. Will he finish a topic they can do a practice test. (I can adjust how I instruct from this assessment). it makes it a lot easier. If they have a test already online they can do a test for me and I can see what they're having trouble understanding. I can see exactly what percentage of a certain problem they are missing and if 60 or 70% of my class is missing a specific question that means I need to cover some more. you have to do modeling and lecturing but now they can do other things like go to Study Island, they can look up examples on websites. There are different types of tests they can take like pretests and post-tests in addition to what ever I do. But the pretest is the best thing they can do. There are other sites I can find too like classroom.org. Carnegie learning.

Researcher: **Rank the strategies you described as to frequency of implementation.**

Robert: Modeling and group work are the most used. I model quite a bit because they have trouble understanding some of the concepts. In the group work they can help each other. In the cognitive tutor they have to do a set number of sections in the nine weeks, more for the honors

curriculum than the regular section but they do this more than they do the Study Island. Study Island would just be used at certain points. Cognitive tutor is something they do every week, however. Modeling is the most or direct instruction. Group work. Cognitive tutor. Study Island.

Researcher: **Describe technology integration, as it occurs in your classroom, now that the one-to-one program has been implemented. Please cite specific practices, tools, devices and resources.**

Robert: Mainly where I do the Carnegie in the Study Island that's the main things. Carnegie is at least 20% of the time. They use their laptop for the Carnegie. We don't go to the computer lab anymore because we don't need to. That is a big thing for an important thing right there. Because the kids would mess up things in the computer lab. One class might mess it up for the next class coming in and it would make it tough. When each kid has his own personal computer is responsible for he's not going to mess it up. He's going to take care of it. I don't go to the Smart Board all that much. I go to the blackboard. I put examples on the blackboard. I do that continually. Graphing calculators. We are using calculators all the time. Everything were doing were using a calculator. Kids cannot do math without calculators. They've gotten so used to it. It's not like it was back in the old days where we learned multiplication tables. I'm teaching these

kids have a factor. They got to know these two numbers are multiplied together and you get this answer. That's from your multiplication tables. I might say what two numbers can you multiplied together to get 54? There's different combinations but what pops in your head right off the bat. They don't automatically say 6×9. Because their calculator doesn't do things in reverse. If I given the calculator they can punch it in. I can see a big difference.

Researcher: Would you rate the frequency of technology integration as high, moderate, or low?

Robert: When it comes to the laptops I think it's a moderate amount. You know, doing the Carnegie and Study Island it's kind of moderate now compared to the instruction and the presentation in the modeling. But when you throw in the fact we use graphic calculators all the time, I would go above if there was something in between moderate and high, I would say upper moderate. It's not high because one on doing it all the time. There are other things we're doing.

Researcher: Describe your process of determining when integration of technology is appropriate in your learning environment, now that the one-to-one program has been implemented.

Robert: It's a requirement that we have to have Carnegie one day a week. So we have to have at least that 20% but depending on what were working on, if I feel like the students need examples of things… And a

couple of my classes we don't have textbooks so I can tell them to get examples… Here's what I need you to do… If we're factoring trinomials, I can take them to a certain website and I can say look there are examples right there. I tell them all the time they need to make use of the laptops for their home computers to look for examples and practice problems. Study Island is a good place for practice problems. If there is a test coming up they need to be practicing on some things like that at home. It's for test preparation.

Researcher: Describe your current comfort level with technology integration.

Robert: When I first came to this county my comfort level was kind of low that since I've been working with Carnegie over the years it's moved up to at least a moderate or a little above a moderate level and it's feeling more comfortable over time. I'm getting a lot more comfortable better than I was last year. Last year I was more comfortable than the year before. I would say I started up moderate but I'm getting or approaching a high level. I would never say very high. But I am approaching a higher level. Approaching high.

Researcher: How has your comfort level changed, if at all, since the implementation of the one-to-one program?

Robert: I'm getting better at it. I'm getting better at it all the time. When I first started I was kind of between low and moderate. In my last school I got used to the Carnegie and when I came here I got better at it. Now

I'm filling more comfortable. I feel very comfortable with the Carnegie but it's the other types of technology like some of the other teachers can just go right in there and jump on all of these things and put things in clouds and all that and that's not what I'm familiar with but as far as our technology program what to do with Carnegie and what to do with graphing calculators I'm fine with that. Where they put things in clouds and… I like to see things on pencil and paper when kids come into math I want to see things step-by-step. Having been to email me and send things to me in the cloud, I'm not familiar with all of that. Dropbox… I don't do drop box. They drop it in my hand and I put it in my briefcase and go home and go through it. My dropbox is my briefcase.

Researcher: **What professional development have you participated in, which supports your delivery of instruction, in the one-to-one computing learning environment?**

Robert: We've had our Carnegie training. There've been quite a few of those where they trained us what to do with the technology. We Programs here. At our school. We've gone up to the computer lab but I can't remember exactly what they were. I think one was on dropbox. They did talk about clouds and things.

Researcher: **What types of professional development experiences do you still desire, in order to become a more effective teacher in the one-to-one laptop classroom?**

Robert: These types of things I'm not familiar with… Any of those would be good for me. Just to get me up to working with the technical thing some of these other teachers can do it I don't do. It's not that I can't do them it's just that I haven't done them in the past and I'm not familiar with them. I can remember when my wife used to laugh at me and say she would have to drag me kicking and screaming into doing emails.

Researcher: **How do you become aware of new instructional strategies, particularly those incorporating the one-to-one devices?**

Robert: From the school here. The administration makes it available to us and shows us all of the new things that might be coming out. Carnegie sends us emails and information about things that are coming out.

Researcher: **Please give some examples of how you discovered and integrated new instructional strategies, which were workable because of the one-to-one program.**

Robert: The Study Island… That's something that sounds really good to me to get the kids involved in Study Island. I'm not sure how long it's been since they talk to us about Study Island. But it was here at school. I'll go in and look for handouts or study guides myself. If I'm working on trinomials, I'll go on the computer myself and type in factoring

trinomial worksheets and I can find all kinds of different sites I can go to and I can explore and find what I want. If you don't type in worksheet after the concept it might show you step-by-step how to do it. They can give examples. They can read it and print it out if they have access to a printer and have it. I just passed this on to my students in class. I told them how I did it and what I would type in and they could do the same thing. They can do it right in the classroom. If they say we need some examples I will say type it in on your computer. They might be doing something with pencil and paper but they have the examples on the computer to help them as they go through it. I've even had situations, where during the test, they may be confused and they can use the computer to find examples.

Researcher: **Describe changes to your lesson planning process, if any, since the implementation of one-to-one.**

Robert: Basically, my lesson plans of the same, for the most part. There was always something in there, where I put down we are using technology like Carnegie or Study Island or whatever were going to be doing with our technology.

Researcher: **How would you describe your pedagogy prior to the implementation of the one-to-one program, in terms of teacher-centered, more teacher-centered, equally teacher-**

centered/learner-centered, more learner-centered, learner-centered? Please provide anecdotal support.

Robert: More teacher-centered. I was probably more teacher centered. We do group work and I would walk around the groups and do the facilitation so it wasn't totally teacher centered but it was probably more teacher than group.

Researcher: How would you describe your pedagogy since the implementation of the one-to-one program, in terms of teacher-centered, more teacher-centered, equally teacher-centered/learner-centered, more learner-centered, learner-centered? Please provide anecdotal support.

Robert: Now it's kind of equal. It's more equal now. I still have to do a lot of instruction because the kids just don't understand and they don't have the background so I have to give it to them. But I try to whenever we do Carnegie in class, that student centered, and I want them to work together. I want them to work with a partner or integrate, especially whether doing the Carnegie or other things. I have kind of a… Fear is not a good word but apprehension… Making it more learner centered, because I go back to the same, the blind leading the blind. Like a basketball coach saying I'm here to facilitate and you guys decide what place you want to run… No you can't do that. You've got to organize

things and still be in charge. So it's got to be kind of equal. I don't want it to be just learner centered.

Researcher: Describe any changes to the level of rigor in your curriculum since implementing the one-to-one program.

Robert: Yes. Anytime you add something beneficial, like technology, you are stepping up your game a bit. I require the students to do more research and go more in depth because they have access to the Internet. There are sites that can help them understand the math more.

Researcher: Describe any changes to your curriculum in regard to relevance to real world experiences, since the implementation to the one-to-one program.

Robert: With the laptops, If I want to show how a mathematical concept is used in the real-world, I can find examples of jobs or experiences on the Internet. They can see it right there.

Researcher: How has the one-to-one program impacted the state/district-adopted curriculum?

Robert: We are able to use the online Carnegie Cognitive Tutor, any day we choose instead of having just one assigned day in the lab. On a snow day, we would miss school and could miss lab time. Since the students always have laptops they have access when they need it.

Researcher: **How has the state/district-adopted curriculum impacted the instructional strategies, which make use of the one-to-one technology?**

Robert: We have things in the Carnegie curriculum that must be done. There is an individual online component. So, the curriculum requires computer use by students.

Researcher: **Compare and contrast learner engagement of the pre-implementation to the post-implementation learning environments.**

Robert: I think the students take charge of their own pace now that we have computers. Some students can advance, as they need to. Some students struggle to be engaged, but for the most part I think there is more student engagement.

Researcher: **Do you believe the one-to-one program has enhanced the learning experiences for your students? Please provide anecdotal support.**

Robert: I think so. Instead of having the teacher teaching, and students giving back to the teacher, students are taking charge of their learning. Students can also learn at home because they have this tool.

Researcher: **Do you believe there are ways the one-to-one program has negatively affected student learning? Please explain.**

Robert: The only negative would be when students get off task, by getting on other sites for games and social media. That is determined by how

much a kid wants to work. In the past, those same students would have found other distractions.

Researcher: Describe any skills your students are developing because of the one-to-one laptop environment.

Robert: I think they have learned to access or locate available information more, now. It is available and quick for them.

Researcher: Describe benefits and challenges to instruction and learning in the one-to-one computing learning environment.

Robert: Benefits, for math classes, would include availability of examples of problems we are working on. Also, students can explore other learning websites to help them better understand the math. They can also learn at home because they take the computers home. Challenges would include managing the use in the classroom, keeping the students on the right sites. Sometimes they will log on to a site or a tool but they will not complete the tasks they have been assigned to on that site.

Researcher: How does the one-to-one laptop program impact your ability to individualize instruction?

Robert: If I know a student is having problems with a topic, I can put them on Study Island or another tutorial program to address those weaknesses.

Researcher: In regard to the implementation of the one-to-one program, do you believe the benefits outweigh the challenges? Support your answer.

Robert: Definitely. I think it is the wave of the future. We are giving them the future, now.

Researcher: What changes to the current one-to-one program should be made to improve instruction and learning?

Robert: We need to provide more resources, or to expand the library of applications that are available to the students and the teachers. We need to use the technology more to give them real world experiences. We could also improve the hardware. Some of the students will say, "I don't have my laptop." It will be because they are having it repaired.

Researcher: Please make any additional comments.

Robert: No.

Appendix M

Shirley Intensive Interview Transcript

Researcher: **This school has implemented a one-to-one laptop program for all students. This study is a qualitative approach to determine how instructional strategies may have changed since the implementation. You will be asked a series of questions pertinent to your instructional practices, both pre implementation and post-implementation.**

Researcher: **Describe the instructional strategies commonly used in your classroom prior to the implementation of the one-to-one laptop program.**

Shirley: In my classroom prior to the implementation of the one-to-one laptop program my instructional strategies included the use of maps, graphs, charts, textbooks, and any online resources I could find to give to the students. I would lecture. I would lecture quite a bit to give the students information they would not normally have access to. We would try to do some small group or large group activities. It's a little harder because you have to print everything for the kids or they would have to look things up. We would try to do small activities or projects, but it was a lot harder to do these things because we had to make sure there was enough resources so everyone can access it. The variety and choice was a lot less before we have the laptops.

Researcher: **Rank the strategies you described as to frequency of implementation.**

Shirley: Lecture most, to make sure kids got the historical content. I would use maps and graphs next so that the students to get the geography skills they needed. We would analyze documents. Making copies to make sure everyone had them all the time made it difficult. The least used was project-based learning and small and large group activities.

Researcher: **Are any of these strategies no longer part of your repertoire?**

Shirley: I rarely ever lecture. Even if there's not content my students can access I can create a PowerPoint my students can access and I can put it in the online classroom settings we use now so that they can look into that. I'm able to work with the students more one-to-one on things they don't understand. So I rarely lecture anymore.

Researcher: **Describe technology integration, as it would occur in your classroom prior to the one-to-one implementation, citing specific practices, tools, devices and resources.**

Shirley: We would work with the people in the business lab and the teacher who was in charge of scheduling time in our computer lab to try to get in time at least once every other week, so the students would have access to technology. Whenever we did that, it was good if the students were there that day. If they were not there on that day we had to try to schedule a time they could make up what was in the lab,

whether it was research for a project or research for an essay or a paper they were doing or just regular computing. It was very difficult to do especially if those kids were absent. It made it really hard to integrate technology on a consistent basis. It was hard to use online programs. Even here, we use online resources for College Summit in our social studies classes. It was difficult because there is a computer component with it. When we could schedule that computer lab time once a week or once every two weeks some of that time had to be used to work on the College Summit material. It was hard when kids were absent getting them to have that same experience as others and trying to replicate it. When we went to the lab I would do web quests with the kids that were related to what ever content standards we were covering at that time, to give them as much practice as I could with the technology. A lot of times with the web quest it sends them to different websites and they have to do independent research and then create a final product from that. So I probably use web quests quite a bit when I was in the lab. The kids usually only got to use PowerPoint in creating a project because if they did have computers at home that's probably a program they would have on the computer but it limited the types of tools and devices we could actually use. Because if you couldn't get finished in that 45 minutes it was hard to go home and finish it on their own. We would use the Smart Board. Kids got

exposed the Smart Board in middle school. We have our document cameras where we could be analyzing things with students and they can see it in real time.

Researcher: Would you rate the frequency of technology integration as high, moderate, or low?

Shirley: I would say student use was probably really low, but the use myself was moderate because I would try to show them as many things as I could and expose them to as many programs as I could, because I could use things like Prezi, myself, and I could use different sites which would help them. I could even review things with Quizlet. I could do that, but their usage was low.

Researcher: Describe your process of determining when integration of technology was appropriate in your learning environment prior to the implementation of the one-to-one laptop program.

Shirley: If it was students using it, I would have to create my lesson plans based on the availability of the lab. That really determined when my students were going to use it, when I could get into the lab. When I would use it though, it would depend on what I was using. If I was using the Smart Board it was because we did a web quest together in class and I would have kids go up there and manipulate and move through the web quest in groups together. Or if I was going to lecture I would use the Prezi or PowerPoint or document camera if I was

teaching them how to analyze documents or answer questions related to charts and graphs and maps and being able to do that with them. It would really depend on what content standards I was teaching at the time and how I could fit technology into one of the lessons being taught at the time. I think that if you're looking at appropriateness as to when teachers should use it, I feel that even before the one-to-one, the teacher should use it anytime they can to enhance the learning of the student. If you're just using technology for the sake of using it, then it's not an appropriate place to use. It has to be to enhance the learning of your students. If it's not, you shouldn't use it.

Researcher: **Describe the instructional strategies commonly used in your classroom since the implementation of the one-to-one laptop program.**

Shirley: Now that the kids have the one-to-one laptops there is little lecture in my classroom. When I do lecture it's not at the beginning of the new lesson but it is to summarize a wrap-up to make sure the kids understood and got the meaning and understanding they need to get in the whole purpose of the lesson. There's a lot of group work done in my class now, even if it is just groups of two or small groups or groups of four or large groups. And having the collaborative furniture in the classroom has really enhanced and made having and using the one-to-one laptops easier. I now use Thinkfinity online classroom for all of

my classes. I use it for my regular, honors, and AP classes. I really like it because each day they have a daily discussion question and that gets them focused on what we are currently studying or learning. It gets their ideas flowing. My kids, who wouldn't participate in classroom discussion before, now participate in the discussion online because of the whole anonymity of it and not having the fear of what someone is going to say as to their response. It's also made it to where if you have kids who are not in school, for whatever reason, they know they can log onto Thinkfinity and see what was posted on that day and answer the question. I can host any documents I need for kids to access there. Kids can collaborate together on their projects now. When we do that the kids like to use Prezi because of the collaborative nature. It lets them all be on there at the same time and create something and see it go from the very basic to the final finished product. It makes my job as a teacher much easier because I can actually work with my students now in discovering the information and it's not just me spitting the information out and having the students spit it back to me. They're able to take what they learn and actually produce things and show their understanding of what they've done. My kids make movies now. They make little animated cartoons. They make brochures. My class, even last week, did a tour of Greece and the kids were able to take

ownership of their learning. Once they can do that, they are more invested in and engaged.

Researcher: **Rank the strategies you described as to frequency of implementation.**

Shirley: I think the thing I use the most with my students would be the Thinkfinity classroom to have daily discussion threads with my students. Then probably the next would be small group projects for two people or larger groups. When that happens I use several different programs with my kids. I taught them to use Photostory and Movie Maker and Prezi. When I give them the choice they don't just choose PowerPoint because what they want everyone to see is what they know how to do and what they can do with the knowledge they have. They want to showcase it in the best light. The very least thing I do now is lecturing. Any lecture that happens now is not with the traditional PowerPoint but it is to sum up what we've learned and what we can take away from this unit or whatever we are studying. The one thing, though, I still focus on is using document-based questions with my students and whole document analysis and how you analyze a document and how you take that analysis and apply it to questions that are asked about the document. And how you can take your understanding of the document and create a well-written essay with proper citation and things like that. It's allowed us to take advantage of

our humanities block at our school where the students are not only analyzing documents in my classes and writing essays they are also getting their literacy components of the Next-Generation Standards as well. I do this quite often. It does rank higher than lecturing. Lecturing is at the bottom of my totem pole now.

Researcher: **Describe technology integration, as it occurs in your classroom, now that the one-to-one program has been implemented. Please cite specific practices, tools, devices and resources.**

Shirley: Technology integration in my classroom now… As soon as my kids get their computers they create a Dropbox and they can store all of their work and all of their classes in individual folders for their teachers in Dropbox. We absolutely love Dropbox. Will be talked about this before they take their essays placed them in Dropbox we can give them feedback and type them on the document put it back in the Dropbox and the students can see how they did. They also create an account in Thinkfinity. From day one, once they have the laptops, they are exposed to technology. It is an everyday thing. Now we come into our classroom, what you see is the students opening their laptops because they know every day there is a question of daily discussion question they have to respond to and they may have to respond to their classmates. They know they may have to defend their response and things like that. The next thing they do is look to see if there is an

announcement about what is happening in class today because the online classroom allows us to post announcements for kids. We can do polls with kids, do surveys with kids. So they may be looking at what they have to answer or a survey or poll. In my classroom now you see a lot more of the collaborative nature of learning. It's let's learn things together instead of just having the teacher to give me information and I'll memorize it and give it back to her next week. With the collaborative, the next thing we introduce them to is Prezi or Movie Maker where they can work together online and take their understanding and interpretation of materials and then put it together in a project. A lot of times they use Movie Maker or Photostory or Prezi or Voki to make their animated cartoons. With our one-to-one technology program we have our Mac users who may use iMovie and things, which really showcase the talent the kids actually have and what they were not able to show before the one-to-one technology. The one-to-one technology program has made it to where our students are no longer afraid of technology anymore. They know it's okay if I don't know how to do it right now because I've got someone here who can help me learn this program and if I don't know how to do it I can get in my group with other kids as we work collaboratively and they could show me what I need to know as well.

Researcher: **Would you rate the frequency of technology integration as high, moderate, or low?**

Shirley: It would be high. It's daily in my classroom. Not just daily as in we're going to get our computers out and take notes today or just look at a computer screen, but we are actively engaged in using this technology. It's appropriate and it has a purpose and it enhances our learning and our understanding of our materials.

Researcher: **Describe your process of determining when integration of technology is appropriate in your learning environment, now that the one-to-one program has been implemented.**

Shirley: Still I think the whole appropriate thing means we should think about if it is not enhancing the learning of the student we shouldn't use it. If it is a distraction or for just using it to say we can make a Prezi or a movie, then it's taking away from the whole purpose as to why you have technology. To me that whole purpose is to enhance their learning. If it's not relevant, do not use it. But probably the biggest thing I've been able to tell anyone, who has come to me, now that I've done this for several years now, don't force it if it doesn't belong there. If you do force that, it's just going to be a mess. There are times, I think, it would be so easy just to put a link to this in Thinkfinity and then I will have five kids come to me that day and say I don't have a computer. Then I say, "Okay. I've got to back up here." Technology is

to enhance, and if it's not enhancing… It's not just to make your life easier. And that's what I have to know, and back up and say, "Okay. It's not just to make my life easier." And the fact I don't have to make 30 copies of something or what ever, it's got to enhance the learning all students. If it's not, it's time to back up a little bit and make adjustments.

Researcher: Describe your current comfort level with technology integration.

Shirley: Even though I use it all the time I'm learning so many new programs. My comfort level probably isn't at the highest level it could be because technology is ever changing. If you're not willing to participate in the professional development that is coming out, you can't teach it to other students and allow them to be comfortable using it. One of the new things we've been exposing the students to is Microsoft One Note. I was very antsy about One Note when it came out. One of my students said, "Can we use One Note? Because the other teachers are using One Note." I wasn't comfortable using One Note but they were using One Note and I had to learn it. I wasn't comfortable with that. And I said to myself, "Just because you're not comfortable with it, should you look at students and say you can't use that?" The whole purpose of technology is that it enhances their learning and not what I'm most comfortable with. I think for me it's more trying to stay on top of the

newest things that are coming out because if I don't use it my kids are exposed to it and they won't be able to use it.

Researcher: How has your comfort level changed, if at all, since the implementation of the one-to-one program?

Shirley: It's increasing because the kids are more familiar with it. And with the kids being more familiar with it, you have to become more familiar with it. You have to know the ins and outs of what is being used. I desire to know more technology greater than before. I didn't use a lot of technology before and now I'm just amazed at all the things that are out there that can really enhance your lessons and what I'm used to, teaching students and what they can do with it. The more that I'm exposed to it, the more they are exposed to it, and the more my level of comfort increases. I'm not afraid to try new things with them. If it doesn't work, it doesn't work. We realize, okay, that was an epic fail and if we want to use something like this we have to try a different avenue. But it's good we were exposed to it and we tried it. I think that it's been a good thing with our students, That they are willing to learn new things. Even with me as a teacher, not being afraid of those new things that are coming out there, like One Note, I didn't like it before. But it's a great organizational tool for kids. I became willing to try things and it increased my comfort level.

Researcher: **What professional development have you participated in, which supports your delivery of instruction, in the one-to-one computing learning environment?**

Shirley: I have participated in Thinkfinity training by _____. I participated in digital portfolio training. I've attended trainings for AP classes that focused on technology components and how to use online resources to help students score higher on the AP exams. I went to training for our online textbooks we use in the social studies department. I went to training to learn how to use the online classroom, which goes with our online textbooks. I had training in the Google tools like Google Calendar and Google Docs and things of that nature.

Researcher: **What types of professional development experiences do you still desire, in order to become a more effective teacher in the one-to-one laptop classroom?**

Shirley: I need One Note training. Since the students are using this more and more, I need training on that. I think it would be nice to have a refresher to try to incorporate the Smart Board as more of an interactive tool with students in the classroom. When Smart Boards were first placed in the classroom, we had trainings to show us the basic things on how they operate, but I think sometimes we forget that our kids coming up have not been exposed to how that can be used

interactively and with their laptops and with each other. I think that would help.

Researcher: How do you become aware of new instructional strategies, particularly those incorporating the one-to-one devices?

Shirley: I am a member of the listserv, which sends technology ideas. Our technology integration specialist always forwards technology ideas. There is also the Digital Learning Day website. Once you register with that site, they will send you periodic emails about different ways to incorporate technology in the classroom. I went to Mooresville, North Carolina. I was in four days of training on one-to-one technology about tools we could use with our students as we started our one-to-one program, here. I've had Study Island training also. I've had TeacherEase training.

Researcher: Please give some examples of how you discovered and integrated new instructional strategies, which were workable because of the one-to-one program.

Shirley: I went to a training at the board office. I don't remember what the training was initially for, but they had technology people from the state who presented some of the sessions. _____ was one of them and he presented on Thinkfinity classrooms and how you could use a social networking site and turn it into an online learning tool for your students, which will actually engage them in the process. The

format is similar to some of the social networking sites they use. After I went to that I started using it with my classes. Instead of it being a social networking site I set mine up as more of an online classroom similar to a blackboard course. We went to Mooresville and saw how effective Study Island was for remediation and the whole tutoring process and preparation for state testing and ACT testing and AP testing. We share that with our administration and secured funds and implemented Study Island in our classrooms. This would not have been possible before the one-to-one program.

Researcher: **Describe changes to your lesson planning process, if any, since the implementation of one-to-one.**

Shirley: When I put together my lessons now, I still have the focus of my content standards. The next thing I look at with the one-to-one is, "Will technology enhance the learning of my students?" If so, how can I incorporate this into my unit or into my weekly or daily lesson? Before, scheduling lab time or finding lab time caused technology not to be so much of a focus. That's been a big change for me. Now it is one of the first things I look at: how can we incorporate this.

Researcher: **How would you describe your pedagogy prior to the implementation of the one-to-one program, in terms of teacher-centered, more teacher-centered, equally teacher-**

centered/learner-centered, more learner-centered, learner-centered? Please provide anecdotal support.

Shirley: Before the one-to-one program I would say I was more teacher-centered. I still do project-based learning with my students but in order to get to a project I had to start out with lecturing to students and giving them the background information, giving them anything they just couldn't find a textbook on their own. Even their projects were more teacher-centered than they were student-centered or learner-centered because most of their information came straight from me and not something they could just go in discover on their own. A lot of the projects had to fit a certain mold where everyone had to do a poster or everyone needed to create the same thing because the options weren't available. It was more my choice than their choice. It was more teacher-centered.

Researcher: How would you describe your pedagogy since the implementation of the one-to-one program, in terms of teacher-centered, more teacher-centered, equally teacher-centered/learner-centered, more learner-centered, learner-centered? Please provide anecdotal support.

Shirley: I think my pedagogy now is more learner-centered because now I'm able to engage with the kids and interact with the kids and say, you know, for example, we've been studying ancient Greece. I say we're

going to study ancient Greece and I want you to use all the resources available to you and put together a tour of ancient Greece for someone who is never been to Greece. They would have to go out and find the information instead of me telling them, “Long ago in ancient Greece… “ They are more excited about it. The reason I didn't say it was just learner- centered is because I still struggle with just letting them go. I still have to go back and see if they've left out anything pertinent. I still feel I have to go back to some of my old ways and say, “Well this is great, but we still need this and this and this.” I think it is more learner-centered than it was but I don't think it is solely learner-centered. Sometimes, they hit it out of the park and they cover everything. But, for example, with ancient Greece, in their groups if they don't discover that ancient Greece is where democracy originated, I would still have to go back and teach them about where democracy came from and why it's important. I would still have to do that.

Researcher: **Describe any changes to the level of rigor in your curriculum since implementing the one-to-one program.**

Shirley: I think with implementing the one-to-one, the level of rigor has increased quite a bit in my classroom. I don't feel like it's very rigorous if I'm just up there telling the kids, “This is what you need to know why it's important, so just memorize it and we will have a test next week and you can spit it back to me.” I think it becomes very rigorous

when they are having to come out and discover it for themselves… "Okay, these are the important concepts and how does it relate to me or the present day or why is it important?" It's a big thing in social studies you get with kids. "Why are we studying this and why do we have to know this?" For example, in my US history class, we just went over the American Revolution. We talked about the American Revolution happening and then the French Revolution happening. The students discovered the American Revolution happened and then the French helped us and saw the revolution was successful and thought maybe this can be done. They made that connection. That really increases the rigor in the classroom when they can make their own connections.

Researcher: **Describe any changes to your curriculum in regard to relevance to real world experiences, since the implementation to the one-to-one program.**

Shirley: I think this is where we've seen a big increase. Not just in my classroom but in our entire school. One of the best examples schoolwide last year, we were able to have the kids do an interdisciplinary project with the kids during an election. The kids were able to do political commercials for their candidates and they were also able to watch on TV and know what was going on with their candidates. For the first time they were able to pay attention to what

was going on in their world and they were coming back in creating things on their own representing the real things that are happening. In my social studies class last year… My kids think, “Social studies and history. Why do we have to study something in the past?” We looked at the start of the Industrial Revolution and how the society of America changed with the Industrial Revolution and they were able to see how this is why we have a diverse culture in the United States. They were able to make a connection as to why we offer a Spanish class in a high school. We may have come from a Puritan-base but we have other countries, and explorers like Spain and Portugal. And now students might say, “Now I know the reason we have a Spanish class in high school.” I have my kids go out, and because of the access they have with technology, we had looked at Jason Reese and how the other half lives, and I pose the question to them, “Do we still have the other half still today?” During that time our students saw we have rich and we have poor and they came back and told me, “Well, no. We still have the other half but now the other half is really two halves.“ Because they were able to discover in this world we live in today we have three distinct social classes. We have an upper class a middle-class and the lower class. Where before, the middle class never existed. Then I'm able to pose the question, “What led to the development of the middle class?” Then they are able to do the research and get online and find

out why do we have a middle class today. We had that working class and all the time back to World War I and going to war, and then men who were in the workforce went to war and the women came in. And these are the connections they make as to why we have these things that we have today. I don't think that would be possible for them without having this much access to technology as we do now. They find it fascinating especially in classes where they can go online and do the research and it's not just people from West Virginia, not just their view of things. They see things from the point of view of other nations and other places and realize they do live in a global society and world. By teachers of said this year after year, but when they have access to this for themselves they see there's a whole big world out there.

Researcher: How has the one-to-one program impacted the state/district-adopted curriculum?

Shirley: Yes. Social studies just went through a new textbook adoption for this school year. Whenever we were looking at the materials that were available we focused on digital materials that were available instead of print materials. With doing that we had more things available to us as far as what we could adopt for our students and for our district. We adopted an online textbook. With that online textbook we adopted an online classroom for students as well, so any primary sources or

secondary sources that we need them to analyze, they're right there on the site. The textbook is there and we don't have to worry about a printed textbook that wears out. It's always in the same condition and allows the students to take advantage of the one-to-one program we have, daily in their classes and at home as well. I served on the committee to adopt our textbooks for social studies, and in adopting that.

Researcher: How has the state/district-adopted curriculum impacted the instructional strategies, which make use of the one-to-one technology?

Shirley: With the new adopted curriculum in social studies, one of the ways we been able to make use of our one-to-one technology is using the online classroom we have with the curriculum. The textbook has, for every unit the students are doing, a technology project they can do in relation to the unit. It gives you more options to help incorporate the technology in the new curriculum.

Researcher: Compare and contrast learner engagement of the pre-implementation to the post-implementation learning environments.

Shirley: I feel like my students are more engaged now with the new technology available to us than they were previously. Before, I really think they didn't see why they should study social studies. With the new

technology we have available they realize they live in a Global society and they can make the real-world connections. They tend to be more engaged in what they're studying, knowing why they are studying what they are studying.

Researcher: Do you believe the one-to-one program has enhanced the learning experiences for your students? Please provide anecdotal support.

Shirley: I think it has enhanced the learning experience for our students. One of the biggest things is, especially in US history, a lot of times students struggle with understanding the past. And understanding why things occur the way they have throughout the decades. In one of the projects we were able to do because of the one-to-one program I was having my students go into their own community and photograph their community and show how their community has changed throughout the years. And they can use the one-to-one technology to look back through the archives to see what their community looked like several years ago compared to today and look at the changes and tell why the changes have occurred the way to have occurred.

Researcher: Do you believe there are ways the one-to-one program has negatively affected student learning? Please explain.

Shirley: I think may be the only negative things that could be out there would be, with having the one-to-one technology available, they are open to the world. Having to teach those students to use the technology

responsibly and making sure they are using it in a way that is impacting their learning in a positive manner, It takes some time away in class when you're having to redirect them from sites they shouldn't be on. Even though there's that small negative aspect, the positive things that come with the technology outweigh that. And I think it's how we look at that negative and deal with that negative because they do respond well when you have to redirect them when they're off task or when they're on something they don't need to be on. And so I think it's about monitoring and implementing it and making sure you're using it in a positive manner and keeping them engaged in what they're doing. So the negative aspects don't creep in.

Researcher: **Describe any skills your students are developing because of the one-to-one laptop environment.**

Shirley: I think may be the only negative things that could be out there would be, with having the one-to-one technology available, they are open to the world. Having to teach those students to use the technology responsibly and making sure they are using it in a way that is impacting their learning in a positive manner, It takes some time away in class when you're having to redirect them from sites they shouldn't be on. Even though there's that small negative aspect, the positive things that come with the technology outweigh that. And I think it's

how we look at that negative and deal with that negative because they do respond well when you have to redirect them when they're off task or when they're on something they don't need to be on. And so I think it's about monitoring and implementing it and making sure you're using it in a positive manner and keeping them engaged in what they're doing. So the negative aspects don't creep in.

Researcher: Describe benefits and challenges to instruction and learning in the one-to-one computing learning environment.

Shirley: The biggest benefits, especially with my content in social studies, would be that it keeps them connected to the area outside of just their classroom and West Virginia. They realize they live in a global society and that we all have to be responsible citizens, and not just responsible citizens in our classroom and home, but even online and in our whole digital community. But you have to be careful of what you put out there and how you put it out there because everyone can see it and it kind of reflects on you. I think our biggest challenges would be making sure that all kids have their computing devices when they need to. It's been a struggle sometimes, when you have a classroom full of 30 kids, and five of them have to have their computers repaired for whatever reason, that whole turnaround time of getting it out and getting it fixed and then getting it back and into the students hands. When they are without it we can give them things to help with

whatever they're doing, but the learning isn't really the same and the experiences the same as with the kids who have their computers. I hear quite often, “Oh I can't do that I don't have my computer today.” It's almost like the world doesn't exist if they don't have their computer. We can't function or operate and we must have a computer. I don't think it's just the students. I think the office hears that whenever the Internet is out, or whatever, teachers calling and saying the Internet is out and when is it going to be back on. Because we've become accustomed to having this type of environment and changing the way that we teach because of it, when we don't have access to it it's like, “What are we going to do now?” Because we’re not just as pencil and textbook learners that we used to be.

Researcher: How does the one-to-one laptop program impact your ability to individualize instruction?

Shirley: I really like this aspect of the one-to-one program because of the programs we been able to adopt along with it. We use Study Island. I love the fact that with Study Island it's tailored to each individual student. You can assign each student the same assignment but, depending on how they interpret the assignment and how well they do and what questions are asked, it adapts to their own individual needs. We also have the online credit recovery program that we wouldn't be able to take advantage of on such a large scale, if our students didn't

have their own laptops. That program is wonderful as well because you are able to look at what the kids didn't get when they took the course originally, and then they can complete the program just by mastering the skills and content standards they didn't master the first time around, in order to recover that credit. I also love the advantages it gives us when we assign a project because we can assign somebody options. And the students have a choice of what they can do in order to showcase what they have learned or what they are learning or how they can apply what they've learned. It doesn't have to be everybody turns in a paper or everyone makes a poster board or everyone makes a movie or a PowerPoint or anything, but it gives them so many option for the kids to showcase their best talents.

Researcher: **In regard to the implementation of the one-to-one program, do you believe the benefits outweigh the challenges? Support your answer.**

Shirley: I do believe the benefits outweigh the challenges. When our students leave here, whether they go on to a two-year program or four-year university or a technical training school or straight to the workforce, they are going to have to know how to use computers in a matter what they do. Not only use them, but use them effectively and responsibly. By having access to that in high school it teaches the children the skills they need once they leave here. It teaches them they do live in a global

society we are all connected and they have to be able to function in that society, I believe. The one-to-one program helps them do that. So I think that benefit alone outweighs any challenges we face with the computers.

Researcher: What changes to the current one-to-one program should be made to improve instruction and learning?

Shirley: I think maybe we need to get more teachers in our building involved in professional development on how to incorporate more technology in the classroom and to do it in an effective way. I think that it's harder sometimes for people who are comfortable with technology and are used to using technology on a daily basis, to use it in an effective manner. Something that's really not what we can do here in the school would be to increase the turnaround time for students whenever their computers are turned in to be fixed. Getting that computer back into their hands or even getting the mobile apps we currently have updated to where those kids, whenever they have to turn in their computer for repairs, they can come to the mobile labs and check those out and that way they still have access to that technology.

Researcher: Please make any additional comments.

Shirley: I think one of the most important things with this one to one program, especially in our school, I think we see student attendance improve, I think we've seen student achievement improve because of some of the

programs they have available with the one-to-one. But not only that, for example, the other day I had a student who wasn't in class and I used the Thinkfinity online classroom. The very next day she came to me and said, “I know I wasn't here yesterday but I knew I had to look on Thinkfinity and I knew we had our daily discussion questions and I still participated in that discussion.“ I commented to her and said, “I realized that you did that and I've given you your credit for it,” and I commended her for doing that. We have students on a regular basis that for whatever reason cannot be in school but still participate in the classroom and in that learning experience. They're still getting that benefit. I don't know that if we did not provide those computers for them, that they can have at home, to be able to still participate and still engage in whatever lessons are being done. I think that's been a wonderful thing for our students and our school.

Appendix N

Teacher Focus Group Transcript

Researcher: **What ways do the one-to-one laptops make instruction & learning better?**

Patricia: Dropbox. With the ability for kids to get their papers to you through Dropbox… grade it and give it back to them, and you have to worry about having a stack of papers you lose. It's right there.

Dorothy: For me as a teacher, it makes my planning more flexible. I don't have to wait for the computer lab. I can plan my lessons knowing they'll have their laptops with them.

Betty: We can do more project-based learning because we don't have to worry about getting the computer lab, so we can do more project-based learning.

Barbara: It gives them access to information, whereas they wouldn't have had the depth of information they can get with computers now.

Patricia: You can look up anything at any time.

James: I've been using it for spreadsheets and my physics and advanced chemistry. I just go in and delete cells when they don't do it correctly. Then they can go back and look at it. I don't give a grade until it's there. I just delete what I don't like and tell them to fix it.

Patricia: With Thinkfinity we can print any document we want them to have on there for them to download on the computers and I don't have to make

1 million copies of something. If they lose the copy or they're not at school they can contact me and I will say check Thinkfinity and they can have it.

James: We still have a lot of students who don't want to do it off the Thinkfinity. They want a piece of paper handed to them and to work from that.

Patricia: They can still print out if they want to do that. They have that option.

Researcher: What problems do having the laptops cause?

Joan: So many computers are broken and left at home. I think we ought to have two or three laptops sitting in the science area the kids can check out and use it with the rest of the kids.

Betty: That has been the issue.

James: If each class had a couple extras.

Shirley: We had that charging problem too. They're not bringing them charged or the battery life is not sustaining because they try to run multiple programs at once, or having multiple windows open at a time… That becomes difficult, too, especially in your classroom. When you only have some outlets available. How do you look at one child and say, "Yes, you can charge yours," then look at another and say, "You can't because I don't have another outlet". I think a charging issue becomes a problem.

James: In the chemistry lab I have 30 outlets so I can charge 60 computers at one time. The only thing is you have to watch about tripping on the cords.

Barbara: Then too it is the space. To come in my classroom you will see a bunch huddled here and a bunch huddled over here, because we only have three different locations in our classroom, which is accessible to the kids for charging.

Shirley: In this classroom [indicating the present location] we used to have power poles because of the computer lab that was here before. When they were gone, the kids really were devastated. They wanted to know where they were going to charge their computers. And I said, "Well you are supposed to charge them home". It was an issue of not having much power remaining, so they were devastated, when those polls weren't here. Maybe it's something we want to look at… Making more outlets available because more teachers are using computers in the one-to-one setting, and there are times the kids are doing research and they have to have three different programs running at the same time, and they have to be able to go back and forth between them and to manipulate them and that drains the battery. So we have to look at how we get past that obstacle.

Patricia: Sometimes they're running out of memory on the computers. We had that with the ninth graders. The seniors, who were the first group…

they've been running out of memory. We been able to fix it but… Were talking about the hard drive space. They're not able to save all of the documents.

Shirley: My class had a new program they had to download and they couldn't do it because they didn't have enough space. We had to have a lot of the computers looked at to see if we can fix them. The technology integration specialist didn't say why they had run out of space. She was able to fix them but if she had gone out of the building for training or was gone for some reason we would've had useless computers.

Barbara: Teachers being able to see the students' screens and to know they are on what they're supposed to be on.

Shirley: I think it would be easier if we had some type of monitoring software. We are all monitoring in our rooms but sometimes especially in our collaborative settings they can see you coming and they quickly move away from it. You know this because they are clicking on buttons. If you can't see everyone's screen at one time, it makes it more difficult to make sure everyone is whether supposed to be and they are safely doing what they are supposed to.

Barbara: I've gone so far as to say hands up and you can see them go [raises hands] and wanting to click close on something, and you say, "no, keep your hands up". Sure enough they are on something that is supposed to be on.

James: In a large class, the size I have, it gets to be a problem, especially working with spreadsheets and trying to show them how to do something, and I've got one student here or five, and then there is another 20 trying to do something else. I will help a group then you will say, “Have you got that?” And they said, “yes,” and then you find out, no, they don't. You still have to do that one-on-one with them. It's tough when you have the classes, getting down to do the one-on-one. I am still having to teach students how to use Dropbox.

Barbara: Monitoring them is important to make sure they were on task.

Dorothy: It's about classroom management.

Shirley: They can access so much because there is so much out there on the Internet. So to me it's a big safety thing.

James: That might be related to what we talked about earlier where teachers could have a super program on their computers to be able to monitor the students computers. To find out what they are actually doing.

Patricia: Yes and may be project that on the Smart Board.

Barbara: Yes. Even if I was helping someone else I could look up at the Smart Board and see if everyone is where they are supposed to be.

Betty: That's what I was going to say. Because were not at our computers a majority of the time. If you’re up teaching, it would have to be projected somewhere where you could monitor it.

Barbara: Preferably not on my SmartBoard, because I need to use it, but to at least have the monitoring projected somewhere.

James: It's difficult with ninth graders. This is the first time I've seen seniors… Usually they are trustworthy… But I have some students, if you're not looking over their shoulder they will just do what they want to do.

Dorothy: I have a problem in my class because math still uses pencil and paper and I have kids who come in my class without pencil and paper. They are not coming in prepared. I've had kids come in and comment saying this is the first time I've used pencil and paper all day.

Robert: It's the same way my classes.

Barbara: Showing work. They have to show the process. I do a little bit of math and science classes. It's the same thing… The ability to show their work. They have a hard time making the transition from classes where they mostly use the computer to going into other types of classes.

[All nodding in agreement.]

Barbara: They kind of feel entitled to have their computer. It's like, it's theirs. And they can have it open when they want.

Shirley: For teachers, what happens with us… I know sometimes were calling the office because the Internet is out… Were calling asking what's going on because we almost forget how to teach without the technology. One day I had to just break out the old textbooks and

thought, “What am I going to do?” We use them so much and were dependent on the computers and if we are dependent on them the students are dependent on them.

Patricia: I called the office the other day because I needed to write something on the Smart Board and it wasn't working. And I said, “How am I going to do this? Going to write this up so you can see it?” And the students said, “Use the chalkboard _____.” You really forget.

Researcher: What should be changed about the laptop program?

Patricia: I think we need a technician here.

Barbara: Some kind of technician on staff. Some kind of technical support on-site.

Shirley: I think it's difficult for us also because our technology integration specialist does a good job in working on problems with kids and trying to get the computers back out, but look at her job title. She is to be in our classrooms and help us to integrate the technology and to help our students, when so much of her time is having to be spent on the repair of computers. Her help with integration is lacking because she has to spend so much time on the repairs.

Dorothy: I think the students sometimes misuse the computers because they did not earn them. I've seen students, myself, pluck the keys off of keyboards.

Barbara: I had students who are having problems with keyboards and a student said it takes so long to get a keyboard replaced I might as well smash it and I might get a new one.

Dorothy: It's the entitlement.

Patricia: I think something more needs to happen to them when they getting trouble, misusing the computer because they are not afraid.

Shirley: I think our hands are tied sometimes. I know we have been giving monetary penalties for some of the things they do to the computers but if you had a child who couldn't pay for that anyway, then they are just like, "I'll just do without my computer."

Barbara: And those are the children who would need the computers the most. The ones who would not normally be able to afford a computer.

Patricia: That's the thing when you catch them doing something they're not supposed to be doing or being on the site they're not supposed to be on and you take it away then you're hurting them and you're hurting yourself as a teacher because you can't give them that assignment.

James: And we also need some more network printers. Like when they're doing ACT registration and it's all online and they need to print something out, they're all coming in, and you don't have enough toner or not enough paper.

Betty: We've also been having problems with Dropbox this year. They will think they put something in Dropbox and then it's not there.

James: They have problems locating folders on Dropbox. Or saving to folders on Dropbox. One student had two folders.

Patricia: I run out of space sometimes on Dropbox.

Shirley: As far as the technology crutch, especially with the freshman, they will say, “I don't have my computer, so I can't do my stuff.” I will say to my students, “I've spoken with the librarian and she's expecting you to come up and she is going to help you find what you need.” They will say, “I don't want to go to the library.” I will say, “You don't have a choice.” They think if they don't have their computers all learning stops.

Researcher: What are your professional-development needs, relative to teaching in the one-to-one laptop environment?

Betty: I was going to address that with the negative aspects of the one-to-one program. We still have a lot of people who have professional development needs because I have a lot of students who will come in and say, “Well this is the first time I've had this out today.” I do think there is still a need for professional development. Does everyone agree?

Dorothy: Especially in the math. Like I've said before, we don't use them in math because we don't know what's available out there for the math. We have a few programs like Study Island and Thinkfinity that we can implement.

Barbara: Content specific training. Knowing what software is available for science. Even in doing the math component of science we need to have something available for kids to be able to handwrite or put the math on the computer before we are going to be completely one-to-one.

Betty: The thing that concerns me, like with the math, is that we are teaching the students to rely on these computers… The colleges are not integrated with this technology. They don't have the same resources we have. Professional development will not have to stop with us but should transition to those in college. Kids will have to do what they are expected to do in college to get their degree. In every field I've looked at in college it is not so much technology-based, is it?

Barbara: Science is moving there.

James: One of the things we encounter with science is there are excellent resources out there but making them available to the students seems to be a problem. Buying a piece of software and then having to put it on every computer individually… We need to be able to put it somewhere on a network.

Barbara: Another thing with professional development… I would like us to have… With some of the software and things we've bought… All of our programs are not uniform. They don't all work with one another. If I put something on Thinkfinity and it's a PDF file that the loaded up copy and paste to put in a Word file… Some of the laptops some of the

laptops can edit the Adobe files and some cannot so some of the kids have to copy and paste and do it that way and then work around… Having a uniformity, as far as our software, I think if we had that it be amazing. All of our computers need to have the same capability. The newer computers have the availability of PDF editing. The older ones do not.

Joan: Some professional development should be in basic computing skills, teaching basic computer skills. Not all of our freshmen have a basic computing class. In the beginning when they get their computers you have to spend so much time teaching them basic skills.

James: They need to know operational skills. Some do not know how to add a printer. They need to know things connected to the operating system.

Betty: Some don't even know how to email.

Patricia: They need to know how to add attachments and how to send it and things.

Barbara: When they are saving things from the Internet it is amusing. They say that and don't know where they saved. They will say they have saved it to the computer and I will say, “What file?” They will say, “I don't know. I just pressed save.” That's always a big issue.

James: I've had to teach them lessons on saving files.

[Researcher: So are you saying you need professional development on teaching them the skills?]

[They agree yes.]

Barbara: I think, with the freshman, maybe in freshman orientation they can have a computer orientation. To have them set up their Dropboxes.

Patricia: It takes days to take care of this.

Betty: Then they don't know their passwords.

Shirley: Sometimes the students need the professional development.

James: They need instruction on how to manage the device.

Barbara: I would love to have science-specific or biology-specific professional development. That would be awesome.

[Researcher tried to bring everyone back to topic by asking participants to name a professional development session they benefited from]

Dorothy: Study Island.

Shirley: Thinkfinity.

Barbara: Dropbox.

Joan: SAS in schools.

Betty: Dropbox.

[Researcher asked participants to name a professional development they did not benefit from.]

Patricia: It gets redundant I think.

Barbara: Yes.

Patricia: It's like we already know this. Show was something else.

Betty: When we have a professional development they focus on teachers who are not used to using a computer. We think, “Well, we've had that before.” We will sit there and not do anything because we've had it before. We are more advanced. There is a need for beginning level teachers. They may divide us that way but not address more advanced levels.

Researcher: How was technology used in your teaching before every student had a laptop?

Robert: Well in math we had to do Carnegie, so we had to take them to the math lab, but having the laptops makes it so much easier. If my day to get the lab was Friday, I can only go on Friday. If I need to do something on Wednesday, I couldn't get in. Some students need you to slow down your pace and at first you are scheduled but now it makes it easier.

Shirley: I would think in math, it would make it easier for you teachers to individualize as far as pace because of its having their own computers. If you are only there one day you have to have everyone moved at the same pace.

Robert: Now they can take them home and do things at home.

[Researcher tried to bring participants back to the topic by asking them about the classroom and instructional strategies.]

Dorothy: It made the information more accessible to the students.

Patricia: And it leveled the playing field.

Betty: We can open up new activities we couldn't before. I think all of our lesson plans now reflect technology. Couldn't do that before.

Barbara: Before, in my classroom, the only resource I had was my textbook. I had a couple of computers I could let students use but that was it. We had to do library time. But now it frees us up. We don't have to schedule lab time. Before it was structured around what was available but now it's not.

Betty: I used the Smart Board before and it made me feel like I was a teacher who used technology.

Dorothy: I used the Elmo every day and calculators. I did integrate a lot of technology before the computers came.

Barbara: We used responders and the document camera. We also used kindles. We also used computer labs and the mobile labs.

James: We have a lot of photo gates that we were able to use with the students.

Betty: We did integrate technology before, but the biggest part of that was using the Smart Board. We would use computers when we could get to them.

Researcher: What types of learning activities, using the laptops, happen in your classrooms?

James: They can Skype and do chemistry at the same time. [All laugh].

Barbara: The one thing I like is that there are so many simulations of different diagrams and videos… I had a girl one day I saw doing something suspicious, and I walked over there and I saw she was looking up videos on how to solve calibration problems. That was great.

Betty: I think we can better address advanced students. I have an advanced placement class and they are fantastic writers, but they have a problem with subject verb agreement. We can go to Study Island now and assign particular students remedial work they can do, instead of taking class time to do that. I'm having another student do advanced placement work in a regular section because she is an advanced student and she is not taking the advanced placement class.

James: They have instant access. I might be talking about hydrogen and I mentioned the Hindenburg, and someone asked, "What is that?" I said, "Google it." And they were amazed at that. I told them no American airships burned. They asked why and I told them to look it up and they discovered they used helium.

Joan: We use cellsalive.com. It has more detail. There is more research you can get into. It will show pictures that show divisions of the body cells and the germ cells and shows each phase and how it divides.

Shirley: In mine and _____'s class we did an interdisciplinary lesson between psychology and anatomy, where the kids did a dissection of a sheep's eye. Before we actually dissected we went online and did a virtual

dissection, so they would know what they were looking for what they did. That even allows for more interdisciplinary lessons where you can tie in other fields to your subject. Then with _____ and I, in our humanities block, we can work together and not be in the same classroom.

Betty: Now we have to integrate a lot of historical documents in our content. A lot of things I didn't know myself, I had been able to collaborate some interdisciplinary, but we've had to learn things ourselves and now were doing research projects and we are learning with them. Now I connect historical documents with my literature just about every time we do a project.

Patricia: We Google everything. They will ask you something and sometimes you don't know and you don't need to pretend you do. I just say Google it.

Betty: We have to teach them how do validate sources. To ask to write this and how reputable they are. Is this someone you want to listen to on that subject? A historian will know more about history than I do so if my students can find an article on research on the Gettysburg address, they can find research on their, if they can get it from the historian it’s more reputable.

Barbara: Before we had the laptops I was afraid to assign things, which required Internet research or doing Power Points because a lot of them didn't

have the computers at home. The one-to-one computers leveled the playing field. Now they can do all of these things. We do these things more.

Patricia: I think it teaches them to be able to evaluate information as well. For freshman in high school to be able to say I found the source but I don't think it's credible I saw something else though that I can use. That's a big thing.

Shirley: Students are now used to looking at sources saying, “Is it valid? I have to cite this.” I think before one-to-one they thought that stops in English, but now they're having to do it in other classes. In social studies I reinforce that type of thinking more. They have to ask why they can or cannot use something. Today, they were doing a project and they were looking up information and one of the students said, “We can't use that. It came from Wikipedia. It's not reliable.” So in other classes they are realizing the importance of evaluating the information.

[Researcher: Daily, you are using the laptops in your classrooms to do what?]

Robert: I use the technology to get examples of what were doing. I can do certain things on the board, but when they go home, unless they took really good notes they will be lost. When we are class and working on something I tell them they can Google it.

James: It varies in class the class, but a lot of it is the data reporting, using spreadsheets, organizing information, that's what we've been doing. Sometimes I still just want to grab the chalk and explain.

Betty: We use it for collaboration with each other online, using Thinkfinity. My bellringer activities vary. I will post a question on Thinkfinity that relates to what were working on. It's a discussion thread.

Patricia: I agree with her. It's constant collaboration. They work together in groups. If one of their group members is absent they post their stuff on Thinkfinity and they can still work together, even if they are not there. With Prezi they can work together. They're sitting at a table and all of them are working on the same project, together at the same time. It's saved online. Doesn't matter if something happens to your computer, it is there. I am paperless in my classroom. Occasionally we may use paper and pencil but mostly we annotate electronically.

Barbara: My favorite thing is being paperless. We're entirely paperless. Before I just had stacks of papers and stacks of papers.

James: Kids, more this year than last year, are using their computers for note taking and organization for class.

Barbara: They use One Note.

Dorothy: I don't use mine daily but mostly the Carnegie classes do use the computers. [Inaudible speech]

Joan: We do take notes and we do research. We research advancements in medicine using the laptops.

Shirley: We do use the laptops daily. When my kids come in they get on Thinkfinity and do the discussion question. They communicate back and forth. I just got on Thinkfinity during today's lunch, and there was a message from the Thinkfinity people commending our students for their thought processes, because they monitor the discussions. I also stress the collaborative nature of our students doing projects together using the laptops.

Researcher: What other types of learning activities, not using laptops, happen in your classrooms?

Patricia: We do silent reading sometimes not using the computers. Sometimes they read things, which are not on the computers.

Betty: If they do, that is their choice.

Dorothy: I still do exactly the same things as I used to.

Patricia: Some documents, we do analyze on paper.

Robert: I use a lot of math worksheets I find online.

James: I still do straight lecture. You know, chalk and talk. Especially when we're getting ready to start new material. We also do a lot of hands-on labs… Building models in physics classes. You can't just do it on the computer. But they do record the data on the computer.

Betty: Same thing. We do the modeling and the direct instruction. If students have an issue, you have to stop. Even if they are researching, they may come across the wrong information and you have to stop and talk about it. It is also imperative that you model in writing essays.

Researcher: Are there more activities using the computers than not?

Dorothy: More without.

Robert: More without.

Joan: In science, more with.

Barbara: More with.

James: Without.

Patricia: More with.

Betty: More with definitely.

Shirley: In social studies it is more with. Before the computers we did not even have maps in our classrooms. There are geography CSOs that you have to cover. The online textbook facilitates daily use. The online textbook came with online classroom platforms. To the English people I want to say there are many historical documents. You will be looking for them, so tell me. We have them already on our online textbook. We can put them on Thinkfinity for you to access. It's thousands and thousands of resources.

Researcher: Has there been a change relative to a teacher-centered or learner-centered classroom? Explain.

James: I think it is definitely more learner centered.

[All agree.]

Barbara: It is but I'm not totally.

[Researcher asks if that is true for all. No one agreed they were totally learner centered.)

Dorothy: The Carnegie classes… The curriculum is designed that way to be learner centered. The teacher is the facilitator. If something is to be taught you pick a student to be the expert. The teacher is always in the background.

Betty: Isn't that learner centered?

James: By the students teaching it reinforces what they already know and they get better at it. I've been doing more that in creating spreadsheets. I will take some students and asked them to help others. They will work together to build the spreadsheets. They will help the partners get their spreadsheets together.

Barbara: I feel like I still have to lecture.

Joan: When you start something new you have to.

Betty: Even when kids are presenting you still have to go back and reinforce it. In our lesson planning we set limits on the time you spend on something. Even when I do the learner centered, I still fill I have to clarify these things as correct.

Patricia: How do you have 35 things going on at the same time in one room? You can some days but not every day.

Dorothy: In math class, you let the math tell you if you are correct or not. The teacher doesn't tell you, the math does.

Joan: It's not like that in all classes.

Patricia: We use rubrics.

Betty: Were talking about being learner-centered. When a couple of us were gone for three days out of a classroom for a training, I thought I had my class organized and I thought the kids would be able to do this. I've linked things on Thinkfinity. But even my good students didn't fare too well with that. They didn't do well without the teacher.

Patricia: They are not mature enough to do it on their own without someone helping them.

[Researcher asked them to relate this to the one-to-one technology.]

James: I think it's making them more involved in the learning process in some cases. We still have too many sitting on the sidelines, though.

[Researcher: How in control are they, when it comes to being aware of their performance?]

Barbara: Oh, TeacherEase.

Patricia: They are obsessed with TeacherEase. They tell you they turn something in and they will sit and hit refresh until it updates. They will say, “It’s not on here.” [Pretends to click a button] “It’s not on here.”

[Pretends to click a button] “It’s not on here.” [Pretends to click a button]

Barbara: One thing with Dropbox is it timestamps it. If they put it in there, I can tell when they put it in. I can see whether or not it is late.

Patricia: My students asked me to put things on Thinkfinity now.

Barbara: Like, if I find a good diagram or drawing online, my students will ask me if I would put it on Thinkfinity, so they can look at it at home. Or sometimes I will put learning games on there.

[Researcher: I need to confirm something. Because they are involved in the process, how is that affecting what they do? Are they picking and choosing what they actually do?]

James: They have always done that. But more now.

Barbara: They will look and say, “Well that's worth more and so I'll do this instead of doing that.”

James: I tell them at the college level they may have to do that. If they have two exams and one is more important than the other… They have to make those types of choices.

Shirley: When I had to be out of class because of a training, I made a matrix, which had a statement that said they had to get a certain score to complete the project. It said these are the activities they had to choose from in order to get the points. It was like a tic-tac-toe board. Some of the harder things were worth more points than other activities. They

realized some of them could give them the points they needed and gave them the choice of what grade they wanted. It was still the same content but some of the activities were harder and worth more points. I did have some honor students who settle for C rather than do some of the harder activities.

Barbara: That's where the maturity level comes in. From the teacher's standpoint, if the content is covered that's good. But some of the students don't have the maturity level.

Betty: To be honest with you, some of those same students, whether they wanted their A or not, would have probably done enough work to have gotten a C in the first place. At least they are thinking about it.

Patricia: I like having a choice. I like for someone to say you can either write a paper or do a presentation or do a recording… Everyone gets to choose what they are better with.

Researcher: In what ways do the laptops give your students access to classroom content and materials?

Patricia: TeacherEase; Thinkfinity; Carnegie.

Barbara: Study Island.

Joan: SAS in school.

Barbara: My primary sources are on Thinkfinity.

Shirley: Mine are on my online classroom. Their online documents and resources are all in the online classroom.

Barbara: For some of her classes we have Study Island resources, but not all.

Researcher: Are textbooks used more or less, now that students have laptops?

[All say less, except for math teachers.]

Patricia: Most are on the computer, but when we have a big play or long story, we use the book. I'm sorry. You have to touch it.

James: I have.

Betty: I never use it. Well, I would say the only time I use the textbook is what were doing a long novel.

[Researcher: Let me rephrase this. Because you have the one-to-one computers, do you use the textbooks less?]

[All say less except for the math teachers.]

Robert: It depends on the class, whether or not we use textbooks less because of laptops. With the algebra two, I use Carnegie. So I use the book. But with another class where I have no textbook I use online resources.

[Researcher asked, by subject area, the same question. Language arts replied "a lot less". Science replied, "a lot less".]

James: It hasn't impacted me a lot. I always tried to stay away from the textbook before.

Patricia: I like to have the choice. I like to know I can link a story to other resources. Or I can use paper if I want to.

Shirley: [Social studies] I never use the textbook because I have the online textbook.

Researcher: How has the laptop program affected how paper textbooks are used?

Shirley: The only time we would use a paper textbook in social studies would be if the kid did not have access to a computer for whatever reason, because we can also access that textbook on CD. They don't just have to have Internet access. We don't use our textbooks to do review questions and such.

Dorothy: We do use our textbooks because they are consumables.

Barbara: I did use my textbook once this year and pull math activities connected to my science because it did have some really good resources.

Betty: I would say most of us use it just for resource.

Researcher: How do the laptops help you communicate student performance or give feedback?

[Patricia, Betty, Shirley, Barbara, and Dorothy indicated TeacherEase.]

Patricia: Study Island for formative assessment. The "track changes" feature in Microsoft Word. Discussion posts on Thinkfinity to respond to the students' thoughts.

[All teacher seem to support answer]

Researcher: How do you believe the laptop program affects student learning outside of school?

Patricia: They can have access to the same materials at home as they do at school.

Barbara: Most everyone yes.

Joan: Not everyone.

Dorothy: Actually, in my case with the Carnegie, I found it is mostly everyone.

Betty: Not all of our kids have Internet access at home, though. If I have something I wanted to use on Thinkfinity and they don't have Internet access at home, I will have them to copy and paste it into a Word document so that they will be able to have it.

Barbara: I try to always make it where whatever I put on their they can download it at school so they can have it when they go home.

Patricia: I always ask my kids, “What do you need to do if you don't have Internet access at home and need more time?” They will say, “Come to mods.”

[Researcher: Outside of school, are they learning?]

Dorothy: Mine are, if they have Internet access.

Barbara: They have the capability of doing if they want to.

Betty: I have kids who are still learning if they are absent from school.

Barbara: I've had kids come back to school after missing three days and hand me their work.

Patricia: So do I. I've had kids to contact me when they are absent and tell me they already have their work complete.

Dorothy: Or TeacherEase. They can look on TeacherEase and find out what they are missing.

Betty: Even at home they can collaborate with one another. If they are working on a Prezi they are able to collaborate online from where ever they are. After all, they certainly know how to collaborate on Facebook. So on Thinkfinity they can as well.

[Researcher: So they do have opportunity to learn. Is that because of the laptops?]

[All affirm with, “Yes,” or “Absolutely”.]

James: Additional opportunities.

Betty: I think they recognize they have these opportunities.

Shirley: I think they do too.

Barbara: I don't think they appreciated.

Dorothy: Some of them do. I can speak for my daughter and she does appreciate.

Barbara: It's possible that a majority of students don't realize what they have access to.

Dorothy: My daughter would be lost if her computer was taken away.

Patricia: The freshman could not wait to get their computers. Now that they have them they are thankful. If the computer breaks down, they are devastated. They don't like having to use pencil and paper because they are not used to it.

Betty: The parents contact me if their students have broken computers. I have been signing out some of the mobile lab computers to students who need them. It is really hard for them without their computers.

Barbara: They fall behind.

Dorothy: The computer lab rooms are becoming more obsolete in school.

Shirley: So is the library.

Patricia: I hate taking all the freshman to the library, so I try to find ways to do those activities using laptops. But I know I need to take them to the library.

Betty: Yes they have to have that experience for college.

James: We have so much technology here, but you can go to other places and they may have the technology but they have it shoved in the corner where it is difficult to use.

Patricia: We've gone to trainings at schools up north and they are flabbergasted we have the resources we do.

Dorothy: I think we are way ahead. They had just moved the math Praxis test to be done online at one university. The colleges are getting there they are just so far behind. And we are so far ahead.

James: It is just like with the responders we have been using. I know of places where they are just starting to use those in college.

Researcher: How do you think your students feel about the laptops?

James: They love the experience but they are a little aggravated with the quality of the laptop.

Dorothy: I would have to disagree. My daughter feels her laptop is great. As a parent, if I were to have to buy a computer for my daughter, I would have to buy the software, like Microsoft Office. She did have her own laptop before, but she didn't have all of the software. Her computer also runs a very good speed. It's faster than my computer. She loves it.

Patricia: I'm really glad we finally got computers that will do the same things our students laptops do. Before, I didn't have the same version of Movie Maker and some of the other things the students had.

Barbara: I think they are really proud they are part of this program. They are proud they are part of a school that gets to do this.

Betty: We do have some who say they hate having to do all of this computer stuff, but most of them are excited about it.

Shirley: That's because some of them don't like to think. They want you to just think for them.

[Researcher: How do they see your role now as a teacher?]

Betty: I know I have heard the comment where someone says but you are supposed to be standing up teaching, and I will say teaching is different now, especially in the one-to-one environment. But I think the students and everyone are realizing this.

Barbara: I feel they feel like they are more in control of their education now that they have the laptops. As a teacher, we guide our students. We are still teachers but we are more like a guide. The students get to take the reins and have more control over the process.

Betty: They say they hate Study Island.

Shirley: They may say they hate it, but when you talk to them about it, they talk about how it has helped them.

Patricia: Yes. Some of the students who took the ACT commented the English section of the test was much like Study Island.

Betty: Yes. I've had students say that as well.

Patricia: We had a student who recently got the highest score on the state police exam because of his English score and he credited Study Island.

[Researcher asked participants to comment on the new laptops teachers received at the end of the previous school year.]

Patricia: I had to demonstrate certain things using a student's computer because mine was not as good. But now that I have a similar computer it is helped.

Researcher: What else do you want to say about the one-to-one laptop program?

Joan: With the one-to-one program I feel we can work more with the individual instead of a group. I feel it is more one on one, helping students at their level.

Robert: I feel the same way. With the Carnegie curriculum using the computers we are allowed to facilitate and help the students at their level.

James: Sometimes I feel it's like survival. They learn at such a rate… If you don't stay up on things they are ahead of you.

Betty: We are having to adapt at the speed they are learning.

James: Or we have to move ahead of them, if at all possible.

Betty: You would think the learner-centered activities would be easier on the teacher, but I think it's harder. We are rushing to keep up.

Shirley: I think I am more of a collaborator, because of the one-to-one program.

James: I think we have more flexibility in instructional strategies.

Dorothy: For me, it hasn't changed much at all. I still use my bell ringers and exit slips, group work and student as an expert. The only thing for me, which is different, is the way one-to-one technology has given me more flexibility in my planning and extra enrichment for my students.

Barbara: I still use all of that stuff, but the way I do it is different now instead of having it on paper. I now use the computer. I used Thinkfinity and Dropbox. I feel more compelled to do bigger projects. I didn't feel comfortable with it before because I didn't feel all kids have equal opportunities. But now I've incorporated these more and I am doing more PBL's.

James: That's what I do. And it's because I think the flexibility has changed. It's changed everything.

Patricia: I think I know my students on a different level than I did before. Before, when it was just direct instruction and I was lecturing, I would just give it to them and I wanted them to do it. I feel like, now, I am more with them. I'm sitting at a table with them. My students feel, maybe not like equal to me, but more like me, and not as afraid to ask questions.

Betty: And you know their weaknesses. But now our kids know their weaknesses as well and they can tell us what they need help on.

Shirley: I just feel I'm in more collaboration with my students. We collaborate in our whole learning process together. I'm sitting with them and doing things more one-on-one. I'm seeing what their individual needs are as I am working together with them. I am a collaborator now that we have the one-to-one technology.

Appendix O

Student Focus Group Transcript

Researcher: What ways do the one-to-one laptops make learning better?

Matthew: We can use our laptops to find more library information and expand on what our book normally gives us. We've moved on to the e-book technology and don't have the drag around certain books. We just use our laptops.

Christopher: I go through seven periods where I don't need anything but my laptop. I don't need pencil or paper until I get to eighth. It's math class. Calculus. I don't use my computer much at all in math.

Matthew: Except for Study Island.

Joshua: Everything's organized for you. It's right there. There is no more losing paper or not having a worksheet with you. It's all online.

Ashley: We don't answer questions from our textbook anymore. We actually get online and do research. Instead of reading a lesson in the textbook and doing six questions at the end, we're doing more elaborate work.

Matthew: Hands-on projects.

Christopher: And presentations.

Jessica: A lot of essays.

Michael: It's harder and easier at the same time. We're not just searching the book for information. We're looking for other places for information.

Researcher: What problems do having the laptops cause?

Ashley: Sometimes they crash. They can mess up and you can lose all of your information and then you are up a creek without a paddle.

Matthew: The physical damage to the machines has been extensive due to irresponsibility of some of the underclassmen. As for our class it's not been as bad. We're seniors.

Jessica: Keeping them charged.

Ashley: Yes. They go dead.

Michael: A lot of it is just your responsibility.

Matthew: If you charge your laptop before you get to bed.

Ashley: Or bring your charger with you.

Joshua: If you charge your laptop before you go to bed it still goes dead before lunch sometimes.

Taylor: Mine doesn't.

Christopher: I think it's hard when you're looking stuff up because there's so much stuff out there… Narrowing it down. Your assignments can be harder sometimes because of that. They are more rigorous.

Matthew: But we can also look up information faster than having to look through an index of the book. We can Google.

Ashley: Sometimes kids get on websites they shouldn't be on and teachers are freaking out. But if you are a good student and you normally do your work you're going to do what you're supposed to do. Again, it's about responsibility.

Jessica: Sometimes people forget the laptops at home and they just sit there all day and don't do any work.

Christopher: Bookwork.

Emily: Paper and pencil.

Researcher: What should be changed about the laptop program?

Ashley: I don't think everything should revolve around laptops. I use my laptop in every class but math, but I think in our classes we should have more options. Not every kid is technologically advanced. They don't really know how to use their laptop to make all these fancy projects. I think they ought to be able to make other types of products.

Matthew: We need a class… Perhaps we could go to the auditorium and have a seminar about how to do some of these functions and tasks for the presentations. I think a one or two hour class would help so all students can learn how to do certain functions.

Ashley: Some of them have a hard time making a PowerPoint. They ask other people to help them learn.

Emily: I've had people to help me learn to do things.

Ashley: I think you should be able to do different kinds of things. Sometimes you can do a Prezi. Other times you can do a tri-fold board. Some people do better with actually creating something with their hands.

Matthew: You can make things on your computer and print them out and then use them for your board. That's kind of doing things both ways.

Ashley: I think we need to do different things because sometimes it's like looking at the same thing. Each week we have presentations we have to make. If all of the students are assigned to do a PowerPoint on the same book they all sort of look the same. Whereas, if you could bring in a board, or objects to pass around the class, each kid could be doing something different. It would be different approaches to show it instead of just Power Points.

Joshua: In classes where we have options they are still technology-based. You can do a Prezi, a movie, or PowerPoint. Those are your three choices.

Christopher: Like in math, I don't think we need to use the laptops.

Matthew: You need your brain.

Ashley: If you did use your computer, you would just be typing in the problems in getting the answers, which is hard, because you might not know how to put in all of the symbols, but it would still be pointless.

Matthew: You wouldn't be learning. You would just be plugging in numbers.

Joshua: I think we need better connectivity. Sometimes the Wi-Fi crashes. That's why I think we need better Wi-Fi. I haven't noticed it that much this year, but last year was pretty bad.

Matthew: Better battery.

Joshua: It gets frustrating when it stops working, the Wi-Fi, and you’re working on something.

Matthew: This is the biggest technological advancement our school has experienced since it was built. You would expect there would be some problems.

Ashley: I think there needs to be a regular maintenance schedule for our laptops. I think every few months we would be able to bring our laptops in and have them checked out to make sure they're running as fast as they can. After so long and after doing so many projects on them they slow down.

Matthew: All the RAM seems to get taken up.

Jessica: And we need faster service. You're working on a small desk and the computer gets knocked off and you get a busted screen and it takes weeks to get it back. When you do take it in for repairs, you lose all your stuff. You get a loaner… if there is one.

Ashley: We can keep from losing our stuff by putting it in Dropbox.

Jessica: But if you're in the middle of doing it and it messes up you lose it. You would depend on your auto-save, but if your screen is busted you can't see what you're doing.

Researcher: What was learning like before having the laptops?

Taylor: It was way more simpler.

Matthew: It was reading chapter after chapter and answering questions at the end of the chapter.

Researcher: **How was technology used in your learning before every student had a laptop?**

Ashley: It's like more busy work, I would say. I mean you got something out of it but it was more busy work before we got the computers. You couldn't really make a project before because you couldn't get all of the information you needed. We had to come to the library a lot. There were only seven computers.

Matthew: In our chemistry class our laptops have allowed us to calculate our answers even before we do the experiments. It's safer. We know what to expect. On our spreadsheets we can type in what, let's say our elements, what their weight is and we calculate what its mass will be when we had this compound to it so it is a lot more safer for us. We can find out what we are looking for in our solution. Before everything was done by hand. If you messed up you messed up. With the laptops we have the spreadsheet capabilities and we can go in and already know our answer and if we feel like we've made a mistake the computer will tell us when we input each specific piece of information.

Ashley: Like before in English class when we had to read a book, instead, now we can get online and make a PowerPoint or have the resources even to make a poster. It would take a week and a half longer to do anything for it because you'd either have to write out your entire essay for it and get in front of the class and read your essay or you would have to go to

the library to get all your stuff for it and it would take a really long time just to be able to do one project and we may have only been able to do a few projects over the entire year because we didn't have a lot of resources to do them.

[Researcher: How long have you had these laptops?]

Matthew: Two years.

[Researcher: Is there anything else you can tell me related to your class work?]

Samantha: Everything is so much faster now. You learn more. You learn more things without having only a book, which slows you down. Before it took two weeks to cover a chapter in the book. Now you can get on the computer, it's just faster.

Brittany: Everything was slower before. We would take notes. You have to write down everything the teacher was saying. It's a lot easier to type now. It's best to type than to write. But when you're writing, you remember more of what you write, more than typing. I think, anyway.

Researcher: What types of learning activities, using the laptops, happen in your classrooms?

Joshua: They are everything. They are your textbook, your notebook, your note cards, anything you need in the classroom you have on the computer… unless you're in math.

Matthew: Used to, you'd have to have, let's say… carry materials for every class, now, you have a laptop that is only that thick.

Ashley: You would have to bring in your textbook. You would have to bring in your notebook. You would have to bring in your folder that you kept everything in. You have to bring in your flash drive to take to the library. You just had to have everything. It was a lot more responsibility than to keep up with all of that than it is to keep up with your laptop.

Taylor: And since were not allowed to carry a backpack, it's a lot easier to carry a laptop.

[Researcher: You talk about things that you do, but let's move toward specific activities or tools. Think about all the ways you have used the technology since the laptops. Think about your assignments.]

Ashley: We use Thinkfinity. Your teachers can post your assignments in there and you can reply with answer to your assignments. We do a lot of bell ringers on Thinkfinity. The essential question would be on there and we could answer it. We use Dropbox for all of our different classes. We have all of our work in our Dropbox.

Christopher: Study Island. Teachers will give lessons based on what were doing at that time. Normally they give 10 to 15 questions that we have to pass. Most teachers will set it to if you get an 80 or so on it then that is an A. We do all subjects. Mostly we use it in our psychology class and in English class.

Ashley: We have ACT prep, which is on there too.

Taylor: Right now we are making a video to be used as a tutorial.

Jessica: We use Movie Maker for that. TeacherEase is where we check our grades. Our teachers put our assignments on their and we know what we missed when we miss school. We can check that and go in and see what we've missed. We know our grade all the time. We know what we had in there.

Taylor: We can see things we haven't turned in, you know, your missing work. You always know what you have in there.

Christopher: Why do we still have midterms? When we have to go into our class and pick up our midterm report? When we always know what we have?

Matthew: We are also able to connect with people outside of our school. Let's say we need a professor, or a doctorate level person or representatives of the legislature. When we did the mock election we were able to understand the electoral process within the topic of Pres. Obama versus Mitt Romney in last year's election. We were able to re-create or reenact town hall debates with the help of Republican and Democratic representatives. We had a better understanding of how our government works.

Joshua: It's helped me connect to people who could help me prepare for my Yeager scholarship application getting references for it.

Matthew: We've talked to our College Summit writing coaches to help us fill out college applications.

[Researcher: You've mentioned Dropbox. What are the ways you use that?]

Ashley: With Dropbox, no matter what computer you are on, you have access. Like, if you have to get a loaner computer. If you have all of the things on your laptop saved to your Dropbox. You can just get online on the new computer and log on to your Dropbox and have access to all of your assignments you have saved to your Dropbox. You have access from anywhere.

Joshua: We share folders with our teachers. They correct the assignments of the them back in Dropbox. We can see what we've done wrong. We don't have to waste paper by printing it off.

Matthew: On a weekend or a break the teacher can go in and edit it. I might get a message that says, "your essay in your class has been edited, please check". They can leave notes on it and we can go in and edit it and then turn it in again.

Christopher: _____ does that a lot.

Ashley: And _____ does that a lot.

Michael: _____ would send back our assignments with remarks.

Matthew: Some teachers haven't really messed with technology a lot before these two years.

[Researcher: What other things have you done using the laptops?]

Joshua: Thinkfinity lets us contact students who are here at school when we are off sick or at a doctor's appointment or something. We can send a message to one of the other kids through Thinkfinity and they can tell is what we've missed. Or we can message our teacher and they can tell us.

Taylor: Most of the time the assignments already on and we can look at that at home and know what we need to do.

Ashley: I remember when we first picked up on Thinkfinity we had a big assignment one day and my friend missed school. The assignment was right there online. She wasn't in school but she was right there with us answering the discussion thread and participating with those of us who were here. She did that from her house.

[Researcher: Has that happened more than once?]

[All say yes.]

Ashley: We haven't used Thinkfinity as much this year.

Emily: _____ uses it a lot.

Jessica: I answered discussion questions from home too.

[Researcher: Is there anything else you've been using?]

Emily: Prezi. We use Prezi.

Christopher: I use Keynote for my presentations.

Matthew: Final Cut Pro. We also have CAD software for our robotics.

Christopher: IMovie.

Taylor: Spark notes.

Christopher: I use Spark Notes a lot.

Joshua: They have notes for your Shakespeare. So if we are assigned to read Othello for our English class, we can follow up by reading the notes and understand it better.

[Researcher: What about productivity software, like an office suite?]

Jessica: Microsoft.

Ashley: We use word and One Note all the time.

Christopher: Spreadsheets are used a lot especially in chemistry.

Researcher: What other types of learning activities, not using laptops, happen in your classrooms?

Matthew: Psychological experiments.

Ashley: Yeah.

Matthew: We go over a topic on our computer on our e-book the school bought for us and after we go over our topic _____ has us to conduct an experiment based on what we just read. It's really a hands-on experience of that topic.

[Researcher: But you started out with the laptop.]

Joshua: Yes. We take notes on the laptop, but we discuss it openly. And then we do the experiment. But sometimes we will do the experiment beforehand not really knowing what were doing and then we will look at the laptop and the e-book.

Emily: We don't do a lot without our laptops.

Taylor: Well in nursing we put on gloves and do hands on activities.

Emily: You're right. We don't use the laptops a lot in nursing. Except for WIN.

Jessica: WIN is a program for the career technical students. We use it in our classes.

Brittany: We use it in our career technical classes, where we are going to be completers.

Amanda: It helps you for the test that is given at the end of the year. The one you have to take to be a completer.

Samantha: We do that a lot.

Amanda: In Careers in Education classes we do a lot of hands-on work. We might build models of a preschool classroom. We make bulletin boards and things like that. We don't use our laptops a lot in doing that. We do a lot of things without using our laptops in class.

Christopher: Really, the things you are not doing with the laptop in your classes are pretty much by choice. You can decide when you don't want to use a laptop. Like, you can do bell ringers on paper if you want to.

Ashley: Yes. You can take notes if you want to one paper. It's just more efficient to do it on the laptop.

Christopher: Like I said, it's a choice.

Michael: If you're not using your laptop it's because you're doing hands-on stuff. Besides that, it all starts with the laptop. Except for the math classes.

Christopher: But don't they do Carnegie sometimes?

Ashley: That's in the first classes. If you're in trig or something else, you don't.

Jessica: Carnegie is happening in algebra one in algebra two.

Christopher: And geometry.

Matthew: Pre-calc and calculus don't.

[Researcher: How many of you use Carnegie for math? What did you use it for?]

Jessica: Graphing a lot.

Joshua: It was supposed to give us practice with what the teachers had taught.

Ashley: I think Carnegie is really similar to Study Island.

Amanda: We had Carnegie back in eighth grade.

Ashley: Yeah. We went to the computer lab to do it.

Amanda: We used the computer labs with Carnegie a lot. Before we had our laptops.

[Researcher: So when you all did it, you did it in the labs. This was before the one-to-one?]

Emily: I did it last year when we had our laptops. We would pick a day out of the week to do it on our laptops.

Matthew: The bad thing about it before was doing it in the lab, and if you didn't have a computer at home you were limited to when the teacher had the day in the lab.

Emily: You would have to complete a lesson.

Amanda: So if you missed that day, you were behind.

Taylor: Or, if you just couldn't pass the lesson.

[Researcher: So did the teachers go to the lab whenever they needed to?]

Emily: They had to share with other classes.

Ashley: We would go every Wednesday.

Emily: One or two days a week.

Christopher: A day a week or so.

[Researcher: Is your writing always on the computer?]

Joshua: It doesn't have to be. It's your choice if you want to do it on the computer. Most teachers prefer to have it typed and turned in over Dropbox.

Christopher: Sometimes, although we haven't had it in a while, I use West Virginia Writes.

Researcher: Are there more activities using the computers than not?

Joshua: Definitely.

[All Said yes.]

Researcher: Do you have more control over how you learn, now that you have the laptops? Explain.

Matthew: We can do it at our own pace. Like if we have Carnegie. We can go one at 5 o'clock and do one lesson and then two hours later we can do the second lesson if we wanted to.

Taylor: And if you don't understand completely what the teacher is saying you can go on the Internet and find out what's going on.

[Researcher: Do you all ever do that right during class?]

[Most all said yes.]

Emily: I don't work well you're at school I do most of my work at home.

Taylor: Me either. With everyone here I can't really focus all the time I need to work at home.

Brittany: Sometimes students share things they worked on with other students that they might be able to use. Like, if were taking notes or something not everyone will take notes. So one student might take the notes and share with everyone else.

Taylor: That's bad if you use something of someone else's and copy and pasted and change the name to yours.

Ashley: That can be good in ways to. If the kid misses school that day you can give the notes to her. That way you're not behind on your lesson because you have the notes the other kid took.

Matthew: Sometimes the teacher will post their Power Points or whatever the presentation is on Thinkfinity or Dropbox.

Christopher: I would say you do have more control over how you learn, but your teacher is still in control of what you're supposed to learn. But how you learn, yes.

Ashley: You have more of an option on your computer like when the teacher is giving you notes you can look online to get more information or if the teacher gives you an assignment and you have several different options of how to make the presentation for them. You have more control over what you used to learn.

Christopher: Your teachers still set the assignments. It's not like you're making your own assignments.

Ashley: To a certain extent you can. If you don't understand what's going on there are so many online places you can go to get more information.

Samantha: On TeacherEase you're able to look at what you're missing and you can decide what assignments you're going to do. You can decide whether you're going to make it up or not.

Emily: You always know what your grade is.

Joshua: You know if you need to put in a little more effort in this class and if you're good in the other class you can pull back a little bit and not stress out. It lets you know how many days you have to get this assignment in or how many you can get by with.

Ashley: And if you think the grade you got wasn't right you can go back and talk to the teacher and ask what you did wrong with this and what you can fix.

Jessica: Or, if you turn something in, or think you've turned something in, you can go to the teacher and make sure they find it in your Dropbox.

Taylor: That happens to me a lot. Cause in Dropbox you're supposed to name your assignment a certain thing and sometimes you name it something different in the teacher has a hard time finding it.

Jessica: They will overlook it and they will put it in the missing work and you turned it in.

Emily: Just like yesterday in one class I was supposed to have a 93 and when the teacher put the grade on it, I had an F. I went and looked at it and then I asked her and she told me she didn't have one of my assignments. If I didn't have TeacherEase, I wouldn't have known that.

[Researcher: So you're looking at TeacherEase and you are looking at your grade and your making choices about what you're going to do what you're not?]

[All are nodding their heads yes.]

Jessica: If you have an A in a class and you're still missing something…

Amanda: And you're okay with that you may not make up that one assignment.

Matthew: It could still be more points on your GPA.

Taylor: If you're doing badly, the teachers not going to back up whole class to get what you've missed, so you get on there, on TeacherEase, and decide which you're going to do.

Ashley: Teachers say all the time how you are responsible for your work and if you miss this or that, well, maybe you forgot to ask. If you have TeacherEase, you can find out for yourself.

[Researcher asks the current question again.]

Joshua: The laptops give you more resources to find another way to look at the situation.

Samantha: You can find just about anything on the Internet that you need to know.

Matthew: It helps make your projects better and you can better understand what you're talking about.

Researcher: How is this different from before having laptops?

Ashley: Before you didn't really have the extra resources to be able to look up something. For instance if you were studying rhetorical strategies in English and the teacher gave you an example. Well you may not have understood the example. But now you can get on the Internet and look at different ways rhetorical strategies come together, but then we only have what the teacher said… what was in the book. It was harder to get the outside information.

Matthew: The main thing is you used to have to write everything down on paper and you only write it down once and you turned it into your teacher. If it got lost you had to redo it. But now you have copies on your computer you can just resend. It's easier on us if something happens.

Researcher: In what ways do the laptops give you access to classroom content and materials?

Joshua: Everything is online, no matter where you are. Whether you are at home or here in another class you can get online and see what the teacher has planned for the day and work on. It's always available to you.

Christopher: Not for some teachers, but for most teachers.

Ashley: If you're doing something in a textbook, it might say tomorrow in the AP psychology book page 10, and there may be questions assigned. If it's a big project they will probably talk to you about it and give you information.

Samantha: _____ will always post a link to what we are doing and show us some examples, which will help us out.

Christopher: Some of the textbooks are online.

Ashley: Most of them.

Joshua: You can always email your teachers and ask them for help even if you're not in the class at that time, you can contact them.

Taylor: Sometimes an assignment is due the end of the day or the next day. You might not be able to turn a paper in from home, but you can put it in Dropbox and give your teacher assignments.

[Researcher asks about content outside the text.]

Amanda: In Spanish we use quizlet.com. It helps us because we can do lessons on there to help us understand.

Matthew: We are able to cover more with our e-books.

Researcher: Are textbooks used more or less, now that students have laptops?

[All say textbooks are used less.]

Emily: Except for nursing. We don't use the computer as much.

Researcher: How has the laptop program affected how paper textbooks are used?

Christopher: Well the textbooks are online. We are using the computer as a book.

Emily: The nursing book isn't online.

Christopher: Come to think of it, there are just two of my classes, which have a complete online text.

Matthew: But those are classes, which require a book.

Ashley: Teachers may have a book but they are finding things you can use with it instead of just using straight textbook.

Emily: We've not even opened the textbook in chemistry.

Jessica: We have books in anatomy we don't really use them.

Joshua: The books just really backup information given. The book is just another resource.

[Researcher: What about the paper textbooks?]

Ashley: The only book I have is from pre-calc. We don't really learn things from the book. But there are practice problems in the books

Taylor: In nursing our teacher will show us what will be on our tests and we can highlight this things in our books.

Matthew: In calculus we have formulas in our textbooks, but our teacher and other teachers around the world are showing simpler ways to solve the equations.

Researcher: How do the laptops help you to know how you are performing in your classes?

Ashley: As we've said, TeacherEase. All our assignments and our grades are on there. We just have to get online and know what we're missing.

Taylor: TeacherEase also gives you different grades at the bottom of the screen. It can show you what your homework grade is and your test grade, so you can see where you are weak.

Emily: I check TeacherEase everyday.

[Researcher: What about your parents?]

Joshua: Every day.

Ashley: 24/7.

Jessica: My mom can't turn the computer on.

[Researcher: What about ways other than TeacherEase?]

Emily: They edit our papers and give us corrections.

Christopher: If they haven't edited it they will at least talk to you.

Ashley: If they edit it, they normally highlight it and annotate it in Word.

Researcher: How has the laptop program affected your learning outside the school?

Emily: We learn at home.

Joshua: You have access to your textbook. A lot of times you might not be able take it home with you, if it's a hard copy, because there may not be enough textbooks for all the kids to take them home. In our AP psychology class we have to do chapter outlines.

Ashley: Because the textbooks are online we can do this chapter outlines at home if we have our computers.

Amanda: I feel like I don't even have to be at school sometimes. I can get my laptop and get on there and if I don't understand something I can email my teacher and they can email me back. They can tell me what I need to do.

Ashley: I'm probably learning as much outside as I am inside.

Taylor: When I'm at school, sometimes I don't want to learn. I just want to talk to my friends. When I'm at home I worked really hard.

Joshua: A lot of our work takes too much time to finish in class and so we have to take it home.

Ashley: Even if the teachers do give you a lecture in class, odds are, everything they told you, you will be able to find on your computer anyway, so why not do it at the house?

Jessica: In one of my teachers' classes, when we are taking notes, in the middle of her lecture she will say all of this is on TeacherEase.

[Researcher: Has there ever been a time when you found a resource online that help you understand the content or maybe someone told you about a resource?]

Jessica: On Study Island, when my teacher was gone, she assigned something about radicals, and I found a resource online that gave me more information.

Brittany: In chemistry, there are a bunch of websites, which help you learn about the elements, and electron configurations.

Ashley: My math teacher has mentioned Khan Academy to us.

Christopher: Oh yeah, in calculus. My teacher told me to look up some calculus stuff on that.

Ashley: I think someone told me it can help you with your ACT prep, too.

Taylor: I was having trouble with doing my works cited pages and I was able to Google and get help.

[Researcher: I am straying away from the question, but what is more important? Is it more important just to be able to do something you are required to do, or more to know why and how?]

Christopher: Of course it's more important to know how or why, but there are more things, which help us to do what were supposed to do.

Amanda: Yeah. It's only going to go up with the laptops, so you are always going to have something to use.

Ashley: Yeah. You may have to do a works cited page, and while it is important to know how to do it, you can just go online and type in what format you want and put in your information, and you have it. I mean, I still know how to do it.

Amanda: Yeah you can just do it on your computer.

[Researcher: Your teachers are still teaching you how to format those, right?]

Joshua: Yes. But you still might not understand.

Researcher: Are there differences in how the laptops are used in all your classes? Describe the differences.

Ashley: In English class, we have a lot of Study Island to do. In certain classes you may use things more than in others. Some classes might use Study Island a lot. Some teachers are more Thinkfinity than others. It just depends on the teacher.

Christopher: One of my teachers uses a lot of clips. In current events, she will use video clips.

Taylor: One of my teachers likes to do a lot of Thinkfinity and Power Points.

Christopher: My science teacher uses his Smart Board a lot. He draws a lot of stuff on his Smart Board.

[Researcher: Is there one thing that everyone does?]

Christopher: TeacherEase.

Ashley: They all use their Smart Board to project things on but it just depends on what program they are more comfortable with using the Smart Board. That's what they use.

Jessica: Most of them use Study Island.

[Majority of participants are nodding.]

Samantha: We use a lot.

Ashley: Pretty much. Sometimes Study Island is monotonous after you do it so long.

Joshua: It depends on the class using it in. It is what you put into it.

Ashley: If you don't want to put an effort into it, it won't help you.

Matthew: I learned calculus On Study Island.

Joshua: It helped me bring up my ACT scores in English.

[Researcher: Can you come up with some categories of how teachers are using the laptops in classrooms?]

Michael: Discussion boards.

Emily: A notebook.

Joshua: As a calculator in some classes.

Samantha: It's a way to search for more information.

Christopher: Textbooks.

Ashley: There are very few classes where you don't do assignments on the computer. The laptops are such a big part of our school now. If you forget to take your laptop to school and there isn't another computer for you to use, you might as well stay home.

Researcher: How do you think your teachers feel about the laptops?

Ashley: They love them.

Christopher: I think the more we have them around the teachers get more comfortable with them.

Ashley: One of my teachers, he didn't like the laptops that much.

Amanda: Sometimes they are just used to the things they have always done.

Ashley: Yes. That's just the way they've always taught. But when the teachers are able to go to a lot of these trainings they find out what's going on.

Joshua: It makes a difference when the teacher is trained how to use the different programs.

Taylor: The teachers talk to us about the trainings they go to.

Ashley: They talk to us when they come back. A lot of the demonstrations my teacher is using in her psychology class came from trainings she went to.

Ashley: Sometimes they don't love them because of irresponsibility of students.

Jessica: That's a lot of the reason.

Taylor: Sometimes we forget our passwords. I'm one of those.

Amanda: They love them because they get to take their laptops home and grade papers online instead of having to pack all the papers home and maybe lose them.

Jessica: It's harder to lose homework now.

Ashley: The only excuse you can make now is to say your Dropbox did not work. The teachers feel like it's not as much responsibility on them now. It used to be the teacher would say, “You didn't turn in a paper,” and the kid would say, “You lost it”. Now that you have a laptop it is your responsibility. You can put it in Dropbox.

[Researcher: Do you feel the teachers see a difference in the amount of work they have to do or the kind of work they have to do?]

Ashley: I feel like the word is probably the same for them because they still have to grade all of the papers. You still have to open up every single document and go over every single paper.

Jessica: I think it's easier because now teachers aren’t having to read sloppy handwriting. It is all typed.

Taylor: Yeah. Like before when I didn't know the answers to something I would just kind of scribble on the paper.

Matthew: Teachers can more quickly know who has done all of their work. They can take attendance much quicker as well. And if a student disrupts class, instead of writing it on paper, they can just click, click, click, and send a behavior log.

Amanda: They can give you a deadline and if it isn't in Dropbox by that time they will know it is late.

Ashley: Every time you turn something in on Dropbox the teachers get a notification on their screen. They can see the date and time.

Researcher: What else do you want to say about the one-to-one laptop program?

Joshua: A lot of our classes have become more project-based. It's all about doing your own research and building your project.

Jessica: We have more essays now.

Joshua: I think we have more now because it doesn't take as long. We use one document and rewrite and edit it.

Matthew: Having the laptops has made high school exciting and fun.

Ashley: The laptops have made a big difference in the way we've learned. The students who came before us and used textbooks only probably got a good education but we may know more about what we've learned because we have more resources.

Taylor: I'm one of those lazy kids, who, if you give me a whole chapter to find the answer to a question I'm not going to read it. Now that I have the

computer I just look for what I need to know. I don't have to read as much.

Joshua: I have two Dropboxes from previous years and if I need something I've already done I can go back and pull it from those Dropboxes. I have all of my past resources.

Ashley: It helps you keep up more with what is going on in the world because the world keeps advancing and technology keeps advancing. Now that we have the laptops were able to keep up. It's preparing us for after we graduate.

Matthew: I think it's brought us all closer together because of doing projects together as peers.

Brittany: I think our teachers act more as guides now that we have the laptops.

Amanda: I think it's helped me more than my sister. She needs a teacher to just teach her and tell her what to do and do it in class. When she gets home she might do her homework. Now teachers may lecture more in class and tell you to do the work at home.

Taylor: Before the laptops I got a lot of bad grades. Now I know more about what I'm supposed to be doing. I see TeacherEase all of the time. And things are better.

Ashley: The laptops have changed everything. We've gone from using a notebook and a textbook to being able to have the computer and the

Internet and all of these power points and presentations. It gives you a bigger variety of things you can do to learn. You are not limited.

Appendix P

ICOT (ISTE, 2011) Classroom Observation Data: Teacher Role

The researcher recorded the teacher's role on the ICOT instrument during the classroom observations. The categories of lecturing and modeling were considered teacher-centered instruction; while interactive direction, facilitating/coaching, and moderating discussion were considered as learner centered activities.

Observation #	Teacher	Lecturing (TC)	Modeling (TC)	Interactive Direction (LC)	Facilitate/ Coaching (LC)	Moderate Discussion (LC)
1	Barbara	1	0	0	1	1
2	Barbara	1	0	0	0	1
3	Betty	0	0	1	0	0
4	Betty	1	0	1	1	1
5	Dorothy	0	1	0	1	1
6	Dorothy	0	0	1	1	0
7	James	1	0	0	1	1
8	James	1	0	0	0	1
9	Joan	0	0	0	1	0
10	Joan	0	0	0	1	0
11	Mary	0	0	0	1	1
12	Mary	0	0	0	1	0
13	Patricia	0	1	1	1	0
14	Patricia	1	0	0	1	1
15	Robert	0	1	0	1	1
16	Robert	1	1	0	0	1
17	Shirley	0	0	1	0	0
18	Shirley	0	0	1	1	0

Total Teacher-Centered Occurrences: 11

Total Learner-Centered Occurrences: 29

Teacher	(TC) Occurences	(LC) Occurrences
Barbara	2	3
Betty	1	4
Dorothy	1	4
James	2	3
Joan	0	2
Mary	0	3
Patricia	2	4
Robert	3	3
Shirley	0	3

Appendix Q

ICOT (ISTE, 2011) Classroom Observation Data: Technology Use by Teachers and Students

Obs. #	Teacher	Teacher % use	Student % use
1	Barbara	1.09	1.09
2	Barbara	0	1.11
3	Betty	0.98	1.08
4	Betty	0.86	0.96
5	Dorothy	1.04	1.04
6	Dorothy	0.29	1.07
7	James	0.8	0.36
8	James	1.09	1.09
9	Joan	0	1.1
10	Joan	0	1.04
11	Mary	1.05	1.05
12	Mary	0.49	1.09
13	Patricia	1.1	1.1
14	Patricia	1.06	1.06
15	Robert	0	1.1
16	Robert	0	0.29
17	Shirley	0.6	0.9
18	Shirley	0.1	1.08

The ICOT instrument calculates the "% of teacher use" by the formula "(# of checked teacher time periods x 3) / Duration".

The ICOT instrument calculates the "% of student use" by the formula "(# of checked student time periods x 3) / Duration".

VITA

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EDUCATION

December, 2003	Bachelor of Science, Education West Virginia State University Institute, West Virginia
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PROFESSIONAL EXPERIENCES

2010-Present	Principal, Tug Valley High School Mingo County Schools Williamson, West Virginia
2008-2010	Principal, Williamson High School Mingo County Schools Williamson, WV
2004-2008	Teacher Mingo County Schools Williamson, West Virginia
2004-2006	Adjunct Instructor, Online Course Developer Southern West Virginia Community & Technical College Williamson, West Virginia
1996-Present	Pastor Living Water Church Williamson, West Virginia

HONORS

2012	Kiwanian of the Year Williamson Kiwanis Club Williamson, West Virginia
2013	Kiwanian of the Year Williamson Kiwanis Club Williamson, West Virginia
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