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The Impact of the One-to-One Laptop Initiative on Teacher Perceptions of Instructional Delivery and Student Engagement in Middle School Mathematics

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Approval Page

This dissertation was submitted by La'Ronda Long Whiteside under the direction of the persons listed below. It was submitted to the Gardner-Webb University School of Education and approved in fulfillment of the requirements for the degree of Doctor of Education at Gardner-Webb University.

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Abstract

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This study examined the impact of the one-to-one laptop initiative on teacher perceptions of instructional delivery and student engagement in middle school mathematics. Teacher perceptions of the initiative vary. Several school districts in North Carolina have implemented the initiative and are examining the impact it has on teaching and learning. The one-to-one initiative has been an essential paradigm shift for several national and international schools. The learning environment of the one-to-one initiative immerses students in a curriculum that integrates technology in all subject areas.

Mathematics instruction in the 21st century has changed from subject specific to a more authentic integrated mathematics. Technology literacy is a vital part of this change.

Data for this study were gathered through the use of qualitative measures via an online survey. The survey was sent to middle school mathematics teachers in three rural school districts in North Carolina. The three school districts were in different phases of the implementation ranging from 1 year to 5 years.

Analysis of the data indicated a moderate impact of the one-to-one initiative on teacher perceptions of instructional delivery and student engagement. Teachers were most satisfied with the variety of online resources and programs available for instruction. The concern with regards to student engagement was inappropriate Internet use of the laptop by students. However, if implemented effectively, the one-to-one laptop initiative has the potential to enhance student collaboration, exploration, and inquiry and provide more opportunities for students to engage in a variety of higher-order thinking skills and activities.

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Chapter 1: Introduction

Oftentimes a teacher's instructional delivery may emulate the teaching of his or her favorite teacher: the *sage on a stage* (Laptops for Learning, 2004). Oglesby-Pitts (2010) had been teaching for 32 years when she wanted answers about effective teaching and decided to ask her first grade teacher:

> I needed to return and find the answer to some unanswered questions that I could not have possibly asked as a first grader. How did she get it right at first? How did she teach with fewer resources? How did she teach every child to read and enjoy learning? (p. 2)

Smart (2007) answered the question "Why I teach" with names of former teachers who took the time to care and listen, treated students with respect, and made learning fun. Beard (2010) described two favorite English teachers who inspired her to teach high school English. She wrote that when she decided to become a teacher she wanted to combine their love of the language and literature and make it fun for her students. Although this type of mimicking may have influenced teachers to go into the profession, this type of instruction may not provide today's youth with the knowledge, skills, and resources to compete in an ever-changing world. According to Wong and Wong (1998), many teachers may have been taught by ineffective teachers or teachers who were not up-to-date on the current research on effective teaching (p. 28). The factors that may influence teacher perceptions on instructional delivery and student engagement include teacher preparation, school climate, student readiness and parental involvement, relationships with coworkers, and available resources.

In *The Global Achievement Gap,* Tony Wagner (2008) discussed how different learning must be for today's young Americans. Wagner stated, "The overwhelming

majority of students today want learning to be active, not passive. They want to be challenged to think and to solve problems that do not have easy solutions. They want to know *why* they are being asked to learn something" (p. 199). If this is true, teacher preparation programs, schools, and Local Education Agencies (LEAs) will need to better emphasize the correlation of effective instructional delivery using technological tools and infusing 21st century skills into the traditional curriculum (Laptops for Learning, 2004).

Statement of the Problem

The *No Child Left Behind Act of 2001* (NCLB), the recession, and inadequate funding keep negative press about public education on the airways and on the front of pages of newspapers and magazines. According to Zuckerman (2011), the key to solving the United States education crisis is the "quality of teaching" (para. 1). Vockell (1993) was of the opinion that American schools are doing well and it is the children who fall short of expectations causing people as a whole to say that schools are failing. Chaker (2009) reported that schools across the country see technology as a way to rethink the way education is delivered and the *core* to keeping today's students engaged. Secretary of Education Arne Duncan (2010) stated, "In the 21st century, students must be fully engaged. This requires the use of technology tools and resources, involvement with interesting and relevant projects, and learning environments – including online environments – that are supportive and safe" (para. 26).

In this digital age, technological resources along with funding are extremely important to education (Chaker, 2009). Digital natives expect their world of information, music, and social interactions to be with them at all times including at school (Pitler, Flynn, & Gaddy, 2004). Teacher perception of technology integration for instruction and learning is a major component of 21st century learning (Partnership for 21st Century

Skills, 2010).

Teacher perception of technology integration for instruction and learning is essential. NCLB goals for Title II, Part D – Enhancing Education through Technology – encourage the effective integration of technology resources and systems with teacher training and curriculum development (Learning Point Associates, 2007). Researchers at Walden University (2010, p. 6) conducted a study concerning the myths of technology use among educators. The myths they cited were:

> Myth 1 – new teachers are more likely to use technology more frequently than veteran teachers;
>
> Myth 2 – only high-achieving students benefit from using technology;
>
> Myth 3 - teacher use of technology is less important to student learning;
>
> Myth 4 - teachers and administrators have shared understandings of classroom technology use and 21st century skills; and
>
> Myth 5 – teachers feel well prepared by their initial teacher preparation programs to effectively incorporate technology into classroom instruction and to foster 21st century skills.

The report summary suggested, "the more K-12 teachers use technology, the more they recognize and value its strong positive effects on student learning and engagement and its connection to 21st century skills" (Walden University, 2010, p. 1). They also contended that veteran teachers use technology just as equally as their novice peers, all students benefit by using technology, teachers who use technology report greater benefits to student learning, administrators have a stronger perception of the positive impact of technology use than teachers, and teachers place more value on advance training programs than preservice programs with regards to effectively incorporating technology

into classroom instruction (Walden University, 2010, p. 6).

Theoretical Framework

Educational theorist and mathematician Seymour Papert (1980) presented a vision of education through the collaboration of computers and children in his book *Mindstorms*. His studies of mathematics, computers, and Piaget's theory on cognitive development led him to propose the idea of changing mathematics instruction through the use of computers. Papert's theory of mathematics instruction was based on the constructivist learning environment. A constructivist learning environment is "a place where learners may work together and support each other as they use a variety of tools and information resources in their guided pursuit of learning goals and problem-solving activities" (Wilson, 1996, p. 5). Papert's theory suggested allowing children opportunities to construct their own learning through exploration while using computers as instruments for learning and for enhancing creativity (Papert).

In 1985, Apple initiated research and development collaboration among public schools, colleges and universities, and research agencies to study how the routine use of technology by teachers and students might change teaching and learning. "Apple Classroom of Tomorrow (ACOT) identified effective models for teaching and learning with technology developing the professional lives of teachers, and diffusing innovation" (Dwyer, 1994, p. 3). The shift of teaching and learning changed for the seven sites where teachers and students received a computer for use at both school and home (see Table 1). Twenty years later, Part II of this study, Apple Classroom of Tomorrow-Today ($ACOT^2$, 2008) *Learning in the 21st Century,* identified changes that require schools to become more than *information repositories:* "Schools and educators must be well versed in core subjects, the broad range of interdisciplinary knowledge skills, and attitudes that

education and business leaders call '21st Century Skills,' and in teaching methods that engage and inspire students to learn" (p. 8).

The ACOT^2 (2008) project identified three major influences of 21st century learning: (1) globalization-increasing global interdependence and competition, technology innovations; (2) enable more engaged teaching and learning; and (3) provide 24 by 7 accesses to content and people, and research on how people learn (p. 9).

Table 1

Shifts Underlying New Student Competencies

	Instruction	Construction
Classroom Activity	Teacher-Centered Didactic	Learner-Centered Interactive
Teacher Role	Fact Teller Always Expert	Collaborator Sometimes Learner
Student Role	Listener Always Learner	Collaborator Sometimes Learner
Instructional Emphasis	Facts Memorization	Relationships Inquiry and Invention
Concept of Knowledge	Accumulation of Facts	Transformation of Facts
Demonstration of Success	Quantity	Quality of Understanding
Assessment	Norm-Referenced Multiple-Choice Items	Criterion-Referenced Portfolios and Performance
Technology Use	Drill and Practice	Communication, Collaboration, Information Access, Expression

Today's classroom has seen significant change due to the Internet. Students have been given a yellow light to explore the World Wide Web in hopes that they can use it responsibly for educational purposes. In the article *Navigating the Cs of Change* (McVerry, Zawilinski, & O'Byrne, 2009), the Cs of change deal with teaching online reading and research skills. Students are instructed to use the 21st century skills

(creativity, communication, collaboration, critical thinking, and comprehension) by navigating the Internet to explore authentic issues and encourage global citizenship while building on reading comprehension. This type of instruction increases the level of student engagement and collaboration.

In *The Global Achievement Gap*, Tony Wagner (2008) described how schools fail to teach the new survival skills needed to compete in the 21st century and offered suggestions about education reform:

> The overwhelming majority of students today want learning to be active, not passive. They want to be challenged to think and to solve problems that do not have easy solutions . . . they want more opportunities for creativity and self-expression. (pp. 199-200).

According to research by Raulston and Wright (2010), accountability measures for 21st century learning requires a stronger emphasis on technology, student engagement, and student achievement. Their study analyzed perceptions, attitudes, and instructional impact from a teacher laptop initiative.

Background and Significance of the Problem

In 1997, Seymour Papert convinced former governor of Maine, Dr. Angus King, that to make a difference in his state, he would need to invest in education and one way to do that was to have a one-to-one initiative (Lemke & Martin, 2003; Wikibooks, n.d.).

Dr. King is credited for leading his state to become the first to provide all 34,000 middle school students in Grades 7 and 8 with a laptop computer and wireless access to the Internet (Lemke & Martin, 2003). The policymakers in Maine saw the laptop initiative as a way to increase economic competiveness, reduce the inequity in access to computers and information between poor and wealthy families, raise student

achievement, and transform the quality of instruction (Zucker, 2005). The one-to-one initiatives became international and national trends with several states implementing their own version of the initiative (Schachter, 2004; Zucker, 2005). The limited number of research studies on one-to-one laptop initiatives report positive findings (Appel, 2006; Schachter, 2004; Zucker, 2005). However, opponents of the program questioned cost, inappropriate Internet use, student engagement, and public support (Stager, 2005). According to Appel (2006), the number of North American students participating in a one-to-one program was more than 500,000 and growing annually at 15%.

Beginning in 2006, North Carolina's one-to-one laptop initiatives increased across the state in many high schools (see Table 2).

> In August 2007, the North Carolina General Assembly recognized the value of laptop technology as a means to preparing North Carolina's most disadvantaged students for the demands of a modern workplace and a 21st century economy and passed House Bill 1473, The North Carolina 1:1 Learning Initiative. (North Carolina New Schools Project (NCNSP) Report, 2010, p. 1).

In 2003, Greene County Schools in North Carolina began a one-to-one initiative for students and teachers in Grades 6-12 (Chaker, 2009). The school system reported that after 5 years their college-going rate among high school students increased to 94% from 26% in 2003 (Chaker, 2009). Although most initiatives in North Carolina through the 1:1 Learning Technology Initiative (1:1 LTI) are implemented in high schools, several counties like Greene have included elementary and middle school students as well (Review of State and National Laptop Initiatives, 2011).

Table 2

North Carolina 1:1 LTI

District	Schools	Laptops to Teachers	Laptops to Students	DPI Funding	Golden Leaf Funding	SAS Funding
Wilson	Hunt HS	March 2007	September 2007	$482,000	$1,613,300	$169,317
Macon	Macon ECHS	November 2007	March 2008	$194,500	$1,797,256	$112,626
Nash-Rocky Mount	Nash-RM ECHS	November 2007	March 2008	$181,400		
Wayne	Wayne ECHS	November 2007	March 2008	$198,700		
Davidson	Davidson ECHS	November 2007	March 2008	$187,800		
Hoke	SandHoke ECHS	November 2007	March 2008	$242,900		
Rutherford	Rutherford ECHS	November 2007	March 2008	$214,900		
Edgecombe	Edgecombe ECHS North Edgecombe HS Tarboro HS SW Edgecombe	November 2007 September 2008	January 2009	$191,600 $137,600	$1,917,000	$48,107
Wilkes	East Wilkes HS North Wilkes HS Central Wilkes HS Career Tech HS Magnet HS	Spring 2009	Fall 2009	$152,600	$900,000	TBA
Chatham	Jordan-Matthews HS	Spring 2009	Fall 2009		$800,000	TBA
Whiteville City	Whiteville HS	Spring 2009	Fall 2009		$750,000	TBA
Asheville City	Asheville HS SILSA	TBA	TBA	$200,000		TBA
Mooresville GSD	Mooresville HS	December 2007	Sept. 2008	$165,000		

Purpose of the Study and Research Questions

The purpose of this study was to examine the impact of the one-to-one laptop initiative implementation on teacher perceptions of instructional delivery and student engagement in middle school mathematics classes in rural western North Carolina. The following questions were addressed in this study:

1. What is the impact of one-to-one laptop initiatives on teacher perceptions of instructional delivery in middle school mathematics?

2. What is the impact of the one-to-one laptop initiative on teacher perceptions of student engagement in middle school mathematics?

3. What do middle school mathematics teachers perceive as the benefits of having a one-to-one laptop initiative?

Definition of Terms

Digital natives. Digital natives are today's students who are native speakers of the digital language of computers, video games, and the Internet (Prensky, 2001).

Globalization. Globalization is closer integration of the countries and peoples of the world through enormous reduction of costs in transportation and communication and the increase of flows of goods, services, and knowledge (MindTools, 2011).

Instructional delivery. Instructional delivery is facilitating a lesson by effectively communicating knowledge and skills that motivate students to learn (CEDA Meta-Profession Project, 2010).

Middle school. Middle school is a school that houses students in Grades 6, 7, and 8; and some school districts include ninth grade (O'Donnell, 2011). For the purpose of this study, the reference of middle school pertains to sixth, seventh, and eighth grades only.

Professional development. Professional development is a learning opportunity for educators, which is focused on the skills needed to improve teaching and learning for educators and students (Mizell, 2010).

Student engagement. Student engagement refers to a "student's willingness, need, desire and compulsion to participate in, and be successful in, the learning process" (Bomia et al., 1997, p. 294).

Teacher dispositions. Teacher dispositions are attitudes, beliefs, and values that define a teacher's approach to instruction and student learning (Ranstrom, 2010).

Technology integration. Technology integration is "the blending of computer-related learning activities into curriculum to have students organize, demonstrate, and communicate information" (TechnoHella, 2011, para. 1).

One-to-one computing. One-to-one computing is providing a laptop computer, software, and Internet access to students and teachers to use at school and home (Lemke & Martin, 2003).

21st century classroom. A 21st century classroom includes wireless Internet, an interactive whiteboard, and digital content (Ash, 2011).

Summary

The importance of preparing students for the 21st century has become a battle cry for educators. It is believed that effective technology integration will provide schools with the necessary resources to assist students with creativity, innovation, and the skills to compete for future jobs. This study investigated how one-to-one computing effects teacher perceptions of instructional delivery and student engagement in middle school mathematics in rural western North Carolina school districts.

Chapter 2: Review of Related Literature

Introduction

Decades ago, Seymour Papert began talking about a computer for every student and its impact on learning (Dwyer, 1994; Papert, 1980; Stager, 2005). Apple took this idea and implemented an initiative of ubiquitous computing or one-to-one computing in 1985 (ACOT^2, 2008). Since this time, educators and policymakers have considered this growing paradigm shift as an opportunity to revolutionize the use of technology in reshaping classroom instruction and student learning (Pitler et al., 2004). This type of learning environment immerses students in a curriculum that integrates technology in all subject areas, ensures equal access to digital information for all students, provides 21st century classrooms, and promotes collaboration of school professionals to discover strategies needed to facilitate change (Rutherford County Schools [RCS], 2008a).

This literature review is organized into six sections. The first section presents an overview of various methods and strategies of instructional delivery. The second section explores the dispositions of teachers and middle school students concerning student engagement. The third section explains the importance of 21st century skills and technology integration on student engagement. The fourth section gives brief descriptions of one-to-one laptop initiatives across the nation, in particular, rural counties in North Carolina. In addition, the fourth section also describes an overview of the State of Maine's one-to-one laptop initiative and its impact on middle school teacher readiness. The fifth section explores mathematics instruction in middle school. The sixth section contains the chapter summary.

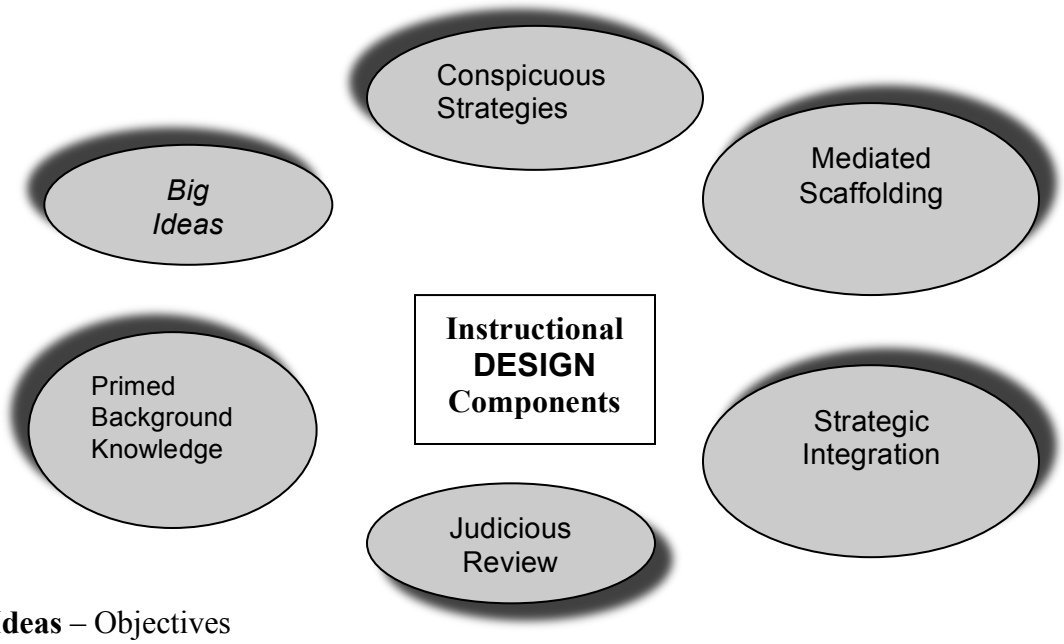
Instructional Delivery Methods and Strategies

The CEDA Meta-Profession Project (2010) defined instructional delivery as

facilitating a lesson by effectively communicating knowledge and skills that motivate students to learn. According to the American Association of Colleges for Teacher Education (AACTE) along with the Partnership for 21st Century Skills (P21, 2010), teacher preparation programs must continue to research and update their curriculum to produce highly trained teachers who are ready to provide effective instructional delivery that will influence the 21st century learner. "In late 2009, a shared sense of urgency prompted a group of deans to come together to consider how educator preparation programs might embed 21st century knowledge and skills more effectively in their program" (P21, 2010, p. 3). The collaborative purpose was to have ongoing dialogue about how to implement 21st century knowledge and skills and guide the development of resources and services to support educator programs (P21, 2010, p. 6). The National Council for Accreditation of Teacher Education (NCATE, 2007) developed professional standards for teacher candidates. Chapter 2, Standard 1: Candidate Knowledge, Skills, and Professional Dispositions states that the teacher candidate must know and demonstrate the content knowledge, pedagogical content knowledge, and professional dispositions to help all students learn. The NCATE (2007) standards suggest the highly trained teacher candidate will demonstrate knowledge through inquiry and critical analysis and this knowledge will be delivered to students in "challenging, clear and compelling ways, using real-world contexts and integrating technology appropriately" (p. 17).

The National Center on Accessing the General Curriculum (NCAC) (Hall, 2002) reported effective classroom practices depend on *explicit instruction* being essential for positive student learning. Explicit instruction is defined as a systematic instructional approach that includes two components: design and delivery. The design component

integrates big ideas (objectives), research-based strategies, scaffolding support, strategic integration, judicious review, and primed background knowledge. The delivery component involves appropriate pacing, adequate processing time, student response, monitoring, and feedback (Hall, 2002). The explicit instruction is defined in more detail for each component in Figures 1 and 2.



Big Ideas – Objectives

Conspicuous Strategies – Good strategies

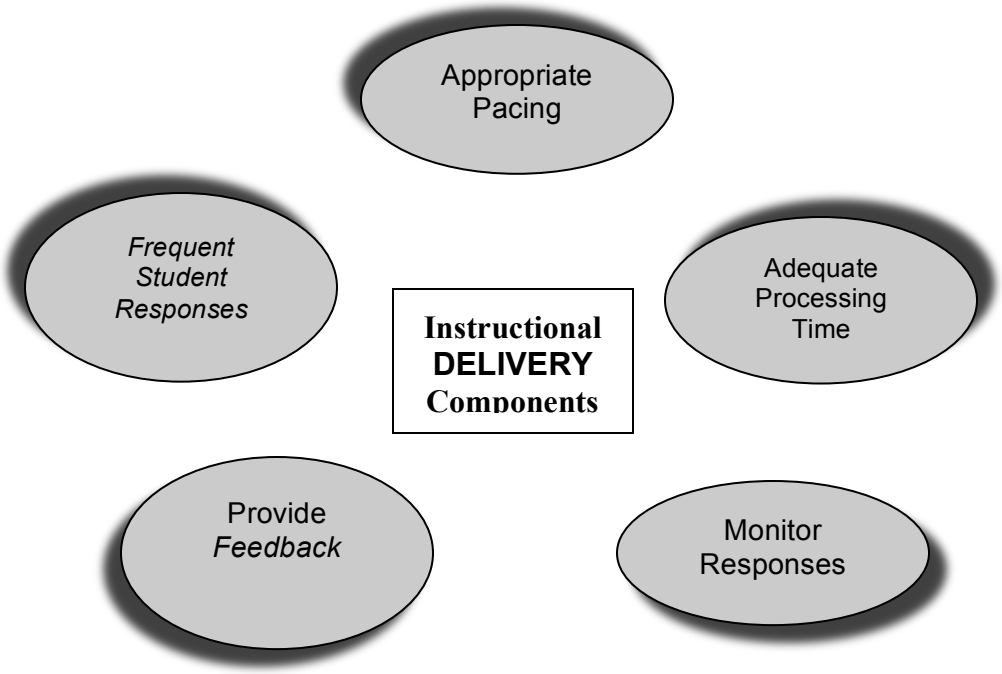
Mediated Scaffolding – Provide direct teaching at the student's level to promote success

Strategic Integration – Gives the learner opportunity to successfully integrate objectives

Judicious Review – Delivery of useful information that is conceptual and procedural

Primed Background Knowledge – Increase knowledge by accessing prior knowledge

Figure 1. Standard Instructional Design Components Essential to All Explicit Instructional Episodes.



Frequent Student Response – Active participation and engagement

Appropriate Pacing – Brisk pace = more information, high time on task, less disruptions

Adequate Processing Time – "Think Time" to process important information

Monitor Responses – Watching and listening provides teacher with assessment data

Provide Feedback – Be specific with immediate feedback on responses

Figure 2. Standard Instructional Delivery Components Essential to All Explicit Instructional Episodes.

Project-based learning (PBL) is "an instructional approach built upon authentic learning activities that engages student interest and motivation" (PBL, n.d., para. 1). PBL is an instructional delivery method that teaches 21st century skills such as communication, presentation, organization, self-assessment, collaborative participation, and leadership skills. Teachers are utilizing available 21st century technological resources to enhance PBL. U.S. Secretary of Education Arne Duncan (2010) stated, "In the 21st century, educators must be given and be prepared to use technology tools; they

must be collaborators in learning – constantly seeking knowledge and acquiring new skills along with their students" (para. 27).

Instructional delivery is defined (Scaffolding, 2011) as *scaffolding* for students with special needs: "Scaffolding is a word, like chunking, that describes how instruction is planned and delivered to students receiving special education services" (para.1). The online dictionary (Scaffolding, 2011) also defined scaffolding as facilitating learning by modeling and activating prior knowledge before introducing a new lesson. Today, there are many websites with educational strategies for teachers to use that may assist them with instructional delivery. One such website, Teaching as Leadership (2008), described lesson planning and instructional delivery methods:

> Instructional delivery methods that many teachers use are lecture, modeling, questions and answers (Q & A), inquiry based, discovery learning, and projects. Modeling is a common instructional delivery method. This is popular at the Pre-K-elementary level. However, at the middle school, teachers model how to dissect frogs and solve quadratic equations in algebra. Lecturing is used to present knowledge-based objectives and can be often found at the secondary and post-graduate levels. (p. 105)

Instructional delivery is also defined as "effectively engaging students in learning by using a variety of instructional strategies in order to meet individual learning needs" (Virginia Department of Education, 2010, p. 1). In this study by the Virginia Department of Education (2010), key elements of effective instructional delivery were identified. The elements were differentiation, variety, cognitive challenge, student engagement, and recognizing pattern of student learning and staying opportunistic (p. 1) (Table 3).

Table 3

Instructional Delivery Elements

Area	Focus
Differentiation	The teacher uses multiple instructional materials, activities, strategies, and assessment techniques to meet students' needs and maximize the learning of all students.
Variety	The teacher implements a variety of classroom techniques, and strategies also enhance student motivation and decreases discipline problems.
Cognitive Challenge	The teacher provides in-depth explanations of academic content and covers higher-order concepts and skills thoroughly.
Student Engagement	The teacher is supportive and persistent in keeping students on task and encouraging them to actively integrate new information with prior learning.
Recognizing Pattern of Student Learning and Staying Opportunistic	The teacher recognizes the schema or pattern in student learning, and makes inferences about the situation (such as identifying the difficulties the students are having), and promptly adjusts the materials, learning activities, and assessment techniques to maximize student learning.
Questioning	The teacher uses multiple levels (particularly higher cognitive levels) of questioning to stimulate student thinking and monitor student learning.
Relevance	The learning process and the outcomes of learning have authentic 'bearing' on student's life.

This research revealed that teachers who have similar professional qualifications instruct differently. Also, the study suggested the differences of effective teachers and ineffective teachers did not lie in the amount of knowledge, degrees, or years of experience, but in the manner in which they delivered the knowledge and skills while interacting with the students in their classrooms (Virginia Department of Education, 2010). Sample performance indicators for the instructional delivery of teachers presented

by the Virginia Department of Education (2010, p. 3) were:

1. Engages and maintains students in active learning;
2. Builds upon students' existing knowledge;
3. Differentiates instruction to meet the students' needs;
4. Reinforces learning goals consistently throughout the lesson;
5. Uses a variety of effective instructional strategies and resources;
6. Uses instructional technology to enhance student learning; and
7. Communicates clearly and checks for understanding.

Bloom's Taxonomy has been around for over 50 years. In 1956, educational researcher Benjamin Bloom and a group of educational psychologists found over 90% of questions asked by teachers required students to think at the lowest possible level (Rudnicki, n.d.). The taxonomy contains three overlapping domains: cognitive, affective, and psychomotor. Many educators are familiar with and use the cognitive domain for lesson planning and instructional delivery (Waxler, 2005). Forehand (2005) defined Bloom's Taxonomy as a "multi-tiered model of classifying thinking according to six cognitive levels of complexity" (p. 2). The cognitive domain is identified by six levels (from lowest to highest): knowledge, comprehension, application, analysis, synthesis, and evaluation (Waxler, 2005). According to Waxler (2005), "There are many ways in which teachers can use Bloom's Taxonomy to help create more focused lesson plans and help students use higher order thinking skills" (para. 4). The cognitive domain is used to help teachers decide how to effectively deliver instruction to students at all levels.

Lorin Anderson, former student of Bloom, led a group of researchers to revise the categories of the taxonomy to add relevance for 21st century learners (teachers and students) by changing the nouns to verb forms. The following changes made by

Anderson and David Krathwohl were: (1) knowledge to remembering, (2) comprehension to understanding, (3) application to applying, (4) analysis to analyzing, (5) synthesis to evaluating, (6) and evaluation to creating (Forehand, 2005).

The changes (Appendix A) show the original and revised Bloom charts of the six levels within the cognitive domain describing multiple levels of learning to promote higher order thinking (edit302.wordpress.com) and higher order thinking skills (westminster-blended-learning.wikispaces.com).

Marzano, Pickering, and Pollock (2001) examined decades of research to determine which teaching strategies have the most positive effects on student learning and identified nine strategies as being most effective:

1. Identifying similarities and differences. This strategy focuses on the mental processes that students can use to understand information;
2. Summarizing and note taking. This strategy requires students to be able to synthesize information in written form;
3. Reinforcing effort and providing recognition strategy addresses students' attitudes and beliefs (dispositions);
4. Homework and practice provides students an opportunity to practice, review, and apply knowledge;
5. Nonlinguistic representations enhance a student's ability to represent and elaborate on knowledge;
6. Cooperative learning provides students opportunities to engage and interact with each other;
7. Setting objectives and providing feedback establishes a direction for learning and for regular feedback;

8. Generating and testing hypotheses includes processes such as systems analysis, invention, inquiry, decision making, and problem solving; and

9. Cues, questions, and advance organizers give students the opportunity to connect and activate prior knowledge.

Marzano et al., like Bloom, concluded that students must be actively engaged in their learning and use effective instructional strategies that will most likely improve student achievement across the curriculum. The method of instructional delivery by yesterday's teachers will not be enough for today's students (Wagner, 2008).

Wagner (2008) interviewed many middle and high school teachers (as well as business owners) who stressed two concerns about today's youth – apathy and work ethic. He concluded that closing the global achievement gap and preparing students for work in the 21st century requires the classroom environment to change. In order for this change to be effective, classrooms will need to foster productive engagement. Teaching at the content-based level and learning basic work skills using outdated resources are counterproductive. The new workforce requires different, more innovated ideology (Canton, 2006; Friedman, 2005; Wagner, 2008).

Dispositions

Professional dispositions, as defined by NCATE (2007), are "attitudes, values, and beliefs demonstrated through both verbal and non-verbal behaviors as educators interact with students, families, colleagues, and communities. These positive behaviors support student learning and development" (p. 2). Mark Wasicsko, director of The National Network for the Study of Educator Dispositions (NNSED), organized effective teacher dispositions into four measurable domains: (1) teachers perceive themselves as effective, (2) they believe that all students can learn, (3) they have a broad frame of

reference and see a larger purpose for what they do, and (4) they look at the people element (Hallam, 2009).

Ridnouer (2006) believed managing with heart by accepting preteens and teenagers as they are, balancing care and discipline, interacting with students and parents, communicating expectations effectively, handling common challenges with respect, and building trust will help teachers connect with students and increase engagement. Breaux and Breaux (2004) believed for a teacher to be effective (at any level), job expectations and responsibilities boil down to ensuring success for every student. They also stated that teacher perceptions of their own learning will essentially drive instructional delivery in the classroom and there may be nothing that motivates and inspires an effective teacher more than witnessing student success. "None of us ever learned anything at any level other than our own. It is only when we achieve and experience success at our own level that we can move forward" (Breaux & Breaux, p. 43).

Being an effective teacher involves more than teaching a subject. According to Ridnouer (2006), "Before we begin to think about curriculum, we must make a connection with our students and establish a classroom environment in which they feel safe, physically and intellectually" (p. 9). She emphasized that successful teaching and learning happens when schools reinforce the traditions and core values that maintain and support learning for all students. Firchow (n.d) stated, "researchers have found that students anticipating the move to middle school worry about three aspects of the change; logistical, social, and academics" (para. 1).

To activate learning, Sullo (2007) recommended that middle school teachers develop positive relationships with students, engage students in the educational environment by conducting regular class meetings, prioritize what students should be

able to do and know, communicate clear expectations, and be prepared and have a plan for student resistance. Meaningful learning activities are essential for student motivation and engagement. Reeves (2011) wrote that these activities are the "public face of instruction" (p. 156) and this is what engages students in receiving information, processing it, and making it useful.

Dispositions of middle school students are complicated. The California Department of Education (1989) did a study on characteristics of middle grade students. The findings suggested middle school students are:

1. Intellectually – at risk, intensely curious, prefer active over passive learning experience
2. Physically – at risk, mature at varying rates of speed, disturbed by body changes, have ravenous appetites, and lack physical health
3. Psychologically – at risk, erratic and inconsistent behavior, moody, searching for individuality, and hopeful
4. Socially – at risk, challenges authority, loyal to peers, want significant adult affirmation, rebellious towards parents, and strive to define sex role characteristics
5. Morally and ethically – at risk, essential idealistic, has large unanswerable questions, and reflective about their feelings (California Department of Education, p. 144).

Wormeli (2011) described middle school students as

> fiercely curious and independent, yet almost paradoxically, they crave social connection. They make insightful, candid observations about their learning, themselves, and the adults who guide them. They realize for the first time how

> wrong or misinformed adults can be, and they're not sure what to make of it. (p. 49).

Today, the challenge for middle school teachers will be to effectively deal with all or many of these characteristics or dispositions on a daily basis. They, likewise, must deal with increased requirements from local, state, and national mandates; stay abreast of technological changes; and enable students to experience success.

The research by the Center for Comprehensive School Reform and Improvement (2008) pointed out that middle school students are reluctant to engage in difficult material for fear of failure. The research suggested that to increase engagement and purpose for learning for middle-level students, teachers should relate instruction to the students' lives through real world applications; allow students to have a choice in learning through literary selection, digital media, and problem-based projects; and make learning authentic.

Marc Prensky (2001) was one of the earlier authors of the term *digital natives* or students growing up with digital technology. He described this new group of students as *native* speakers of the digital language through video games, computers, and the Internet. Students today are used to having information in real time, networking with peers, receiving instant gratification, and playing games instead of serious work. Due to this change in the new learners, some teachers (digital immigrants) are struggling to engage students (Prensky). The problem may lie in the delivery method. Prensky suggested that today's teachers must learn to communicate in the "language and style of their students" (p. 4). One math example a teacher could use to motivate students would involve the interactive board and/or computer programs/games for visual stimulation, drill and practice, and/or statistical analysis.

Adolescents learn best, according to Beamon (2001), when learning is interactive, purposeful, and provides meaningful engagement. This happens when the learning environment involves students in real-life issues of relevance, provides current resources such as technology to challenge students' cognitive curiosity, and deepen their knowledge and understanding of specific subject.

21st Century Skills

The significance of having 21st century education and learning revolves around the notion that schooling as we have known it must change to keep pace with the demands of the new economy (P21, 2002). The Atomic Learning, Inc., a professional development affiliate of the P21, reports many schools use their web-based program because it supports the integration of 21st century skills into all aspects of teaching and learning (Atomic Learning, 2009). Atomic Learning describes 21st century concepts and skills as eight interwoven areas: (1) *creativity and innovation* require the teacher to model creative ways to teach that will inspire students to make connections in an innovative way (i.e., drawing a flower, creating a power point on the life cycle of a frog, researching the creation of Google); (2) *communication and collaboration* encourages teachers to provide opportunities to students that allow collaboration, self-assessment, and responsible access to digital tools; (3) *research and information fluency* gives the teacher valuable information to present to students on the proper use of digital tools and guidelines for valid research; (4) *critical thinking and problem solving* will help students make wise, informed decisions on the use of tools such as cell phones, computers, digital and flip cameras, and factual sources of information to use for research; (5) a *good digital citizen* is responsible by using email, blogs, wikis, and other digital resources in an appropriate, safe, and ethical manner. Informing the students of when and how to use these tools will

hopefully help them understand how they themselves are connected to the world; (6) *technology literacy* is critical in this media-rich society; (7) a variety of *professional growth and leadership opportunities* on technology (including Atomic Learning) presented through seminars, tutorials, webinars, and online modules are available; (8) the *21st century themes* encompass global awareness, financial and civic literacy, and integration of problem solving and decision making (Atomic Learning, 2009).

Although students still need to plan how to identify factual resources, having the worldwide web at their fingertips makes the retrieval of this information faster and more efficient. Teachers' instructional delivery has evolved from the chalkboard and lecturing to the interactive white board and facilitating. Teachers are asked to be reflective and to find a confident level of competency for planning meaningful lessons using the various technological resources (Atomic Learning, 2009).

The P21 (2010) suggested there are three significant realities American education systems must change to prepare students for the 21st century economy: (1) the United States faces two student achievement gaps. Closing the *academic achievement gap* among lowest- and highest-performing students (as well as the poorest and more affluent students) has been the focus for the U.S. for over a decade, but equally important is the *global achievement gap* between the U.S. students and their international peers; (2) fundamental changes in the economy, jobs, and businesses have reshaped workplaces and the nature of work. More than 80% of jobs are in the service sector and technology has supported these changes; and (3) fundamental changes in the economy, jobs, and businesses are driving new, different skill demands. "Today, more than ever, individuals must be able to perform non-routine, creative tasks if they are to succeed" (P21, p. 7).

A unique school development group, the New Technology Foundation (NTF)

helps school designers and developers across the country create a new culture for learning using 21st century skills and concepts. Bob Pearlman (2009), former Director of Strategic Planning for NTF, described how 21st century learning looks different than what many may remember from traditional classrooms. He wrote,

> Walk into a classroom at a New Technology High School and you will see what we call Students at Work – students writing journals online, doing research on the Internet, meeting in groups to plan and make their websites and their digital media presentations, and evaluating their peers for collaboration and presentation skills (Pearlman, p. 15).

Students and teachers are actively engaged in the learning process.

One-to-One Initiative

> Teachers in one-to-one laptop environments may begin a lesson like this: Students, please open your laptops and download your assignment from Angel. Once you have completed the assignment on the IXL math program, save it and then click the "turn in" button to get a completion grade. Periodically, check the timer on the Promethean board to gage your progress. If you do not finish during class, please complete tonight and turn in by 9:00 PM.

This is an example of a paperless math assignment given to sixth graders who use school-issued laptops in a technology-rich classroom. It has been 27 years since Apple initiated this idea of allowing teachers and students the use of two computers, one at school and one at home (Dwyer 1994, p. 4). "The Apple Classroom of Tomorrow (ACOT) program has come a long way since the myopic days of the mid-80s. We know today that the problem of bringing technology meaningfully into schools is both human and technological" (Dwyer, 1994, p. 7). One of the goals of NCLB's Title II, Part D –

Enhancing Education through Technology (2002) was to encourage the effective integration of technology resources and systems with curriculum development and teacher training (Learning Point Associates, 2007). Across the country, many school systems have successfully implemented the one-to-one laptop initiative in their middle and/or high schools (Laptops for Learning, 2004; Zucker, 2005).

The number of laptop initiatives in the country is increasing since the first implementation in Maine. In 2004, after 2 years of the Maine implementation, over 30 counties and school districts in 20 states made significant investments in the implementation of one-to-one or ubiquitous computing as a clear path to providing 21st century skills and technological literacy (Barrios et al., 2004; Zucker, 2005). Henrico County, Virginia, and the state of Maine made the largest investment in the early years of the one-to-one initiatives by equipping 25,000 and 34,000 students respectively with laptops. The estimated cost of one laptop was $1,300. Dr. Mark A. Edwards, former superintendent of schools for Henrico County, Virginia, and current superintendent of Mooresville Graded District, North Carolina, believed that students learn best and are more engaged in an environment where students have 24/7 universal access to dynamic, current content (Barrios et al., 2004).

Greene County, North Carolina, has reported success with the one-to-one laptop implementation. In 2003, the county purchased 3,500 laptops for students in Grades 6-12. Over the next 5 years, the county reported favorable results. Test scores increased and the high school dropout rate decreased. The number of high school seniors applying to college doubled and employment increased due to industries locating to the county (www.gcsedu.org).

Lee County, North Carolina, felt strongly about the impact of the one-to-one

initiative on their students. As a result, they recently expanded the initiative from students in the middle schools to include all third through twelfth graders – which is approximately 7,500 students (Moss, 2011). The Board of Education in Lee County believed that a one-to-one initiative was a way to help enhance the community's marketability and support economic development as well as prepare students for 21st century learning (Moss, 2011). Dr. Jeff Moss (2011), former school superintendent, stated, "Recognizing that students' lives are filled with interactive computer games, cell phones and other technologies, school leaders realized that engaging students in the learning process meant providing similar technologies in the classroom and at home" (p. 12).

The Mooresville Graded School District (MGSD) in Iredell County, North Carolina, has also reported successful outcomes with the implementation of the one-to-one initiative. According to their website, Mooresville began their digital conversion in the winter of the 2007-2008 school year. The goals of the implementation were to (1) close the digital divide, (2) provide relevant instruction, (3) increase 21st century readiness, (4) provide real world experience, (5) enhance instructional practices, and (6) improve academic achievement. Phase I of the implementation involved laptop carts in all high school English I classes and laptops for all certified staff in the district. In 2008-2009, Phase II of the implementation put laptops in the hands of all students in Grades 9-12 and half of the students in Grades 4-6. Two years after implementation, MGSD was ranked eighth in the State of North Carolina with an 81.8% overall composite on state test scores. This was a 7% composite gain on all end-of-course (EOC) and end-of-grade (EOG) test scores. Also, suspensions decreased by 50% and the district made 53 of 54 Adequate Yearly Progress (AYP) goals (www.mgsd.k12.nc.us). By the third year (2009-

2010), Mooresville was ranked fourth in the state with an increase of 13% composite gain or 86% proficiency on all EOC/EOG test scores and was one of the six school districts (of 115) to make all their AYP goals. As a result of this success, MGSD has been visited by hundreds of people from 35 states who are interested in their successful integration of technology (www.5.mgsd.k12.nc.us).

By January 2010, there had not been much research on the outcomes of one-to-one computing (Bebell & O'Dwyer, 2010). In the Journal of Technology, Learning, and Assessment, Bebell and O'Dwyer (2010) published a paper on the effectiveness of one-to-one computing models for improving instruction and student achievement. The authors used four empirical studies to highlight *emerging themes* and focus on *subsequent results* (Bebell & O'Dwyer). The important themes that seemed to be present in the studies of successful implementations were effective instructional delivery, relevant professional development, supportive school and district leadership, and an increase in student engagement. In addition, the studies noted the potential for one-to-one computing models to transform education (Bebell & O'Dwyer). Likewise, researchers of a study on implementation fidelity of technology immersion (Shapley, Sheehan, Maloney, & Caranikas-Walker, 2010), revealed teacher buy-in was crucial due to students' experiences with technology at the school level are largely dictated by the teachers' beliefs and perceptions of technology.

Not all one-to-one initiatives show significant gains or garner success stories, mainly due to limited broadband infrastructure, funding, ineffective staff development, and public buy-in (Appel, 2006; Schachter, 2004; Stager, 2005). But the ones that have experienced success give a roadmap for many other school districts seeking ways to increase technological opportunities for global competiveness and prepare students for

21st century learning. Urban and rural school districts across the country are strategically finding ways to implement one-to-one initiatives to promote innovation, creativity, and produce workers who will be able to compete for jobs with companies investing in 21st century concepts and skills.

In spite of the cutbacks from state and local agencies, a seemingly mass exodus of citizens due to unemployment, and the working class hovering right above the poverty line, Rutherford County Schools (RCS) in Rutherford County, North Carolina, decided to jump on the digital conversion bandwagon (Rutherford County Schools [RCS], 2008b). For 3 years, the school district worked with business leaders, the Golden Leaf Foundation, Dr. Angus King (former governor of Maine), and community supporters to make the implementation of a one-to-initiative a reality and prepare for future economic growth (Rutherford County Schools [RCS] 2008a).

In 2010, Facebook announced that it would build a data center in Rutherford County, North Carolina (Baugman, 2010). Former Lt. Governor of North Carolina and Rutherford County native, Walter Dalton, stated, "Facebook is a big message that an international company has done its due diligence and said we're here and ready to compete" (Baughman, 2010). At that time, they only had three data centers worldwide. This was great news for the county. This coincided with the RCS Going G.L.O.B.A.L. (Growing Learning Opportunities Beyond All Limits) initiative to provide a laptop computer for sixth- through twelfth-grade students. The goals of the Going G.L.O.B.A.L. initiative were to revolutionize education in Rutherford County, increase student competiveness for education and employment, and prepare a viable workforce for today's businesses and industries (RCS, 2011). All certified teachers received an Apple MacBook in October 2010, and by February 2011, RCS provided professional

development for certified teachers before giving every student in Grades 6-12 a new Apple MacBook to use at school and at home (RCS, 2011).

Dr. Angus King, former governor of Maine (1995-2003), is credited for implementing the country's first one-to-one laptop initiative in 2002 by equipping seventh- and eighth-grade students in the state with a laptop to use at school and home (Lemke & Martin, 2003).

> How did this happen in Maine? The initiative began with a Governor (Angus King) looking for a way to ensure economic viability for Maine in the 21st century; a visionary (Seymour Papert, MIT professor and Maine resident) who was extremely persuasive about the power of ubiquitous computing; a state legislature willing to openly research the idea; and an education community primed to team up with creative partners (Apple Computer, state universities, and the Gates Foundation) to bring the idea to scale with quality. (Lemke & Martin, 2003, p. 1).

Dr. King embarked on a bold new initiative in hopes that it would prepare Maine's students for a rapidly changing world and move the state ahead of others in regard to technology literacy (Silvernail & Lane, 2004). The governor stated,

> For more than 100 years, Maine has always been in the bottom third of states in prosperity, income, education, and opportunity for our kids. In my 30 years of working on Maine economic issues, no idea has had as much potential for leapfrogging the other states and putting Maine in a position of national leadership as this one – giving our students a portable, Internet-ready computer as a basic tool for learning. (Zucker, 2005, p. 1).

Maine's state legislators and the governor commissioned a joint task force to conduct an

investigation surrounding any issues concerning the program (Silvernail & Lane, 2004). The task force looked at all aspects of the initiative such as estimated cost, teacher training, evaluation, and timeline; as well as defined goals – equity of access to technology, thorough integration with Maine's curriculum, economic development, professional development, sustainability, equitable sharing in cost, and local participation (Wikibooks, n.d.). After the 2000-2001 investigation, policymakers agreed to a pilot program in 2001 (Lemke & Martin, 2003). Full implementation (all middle school students and teachers in the state) of the program went into effect during the 2003-2004 school year. A few facts about the early years of the Maine Learning Technology Initiative (MLTI) are found in Table 4.

Table 4

Maine Learning Technology Initiative – Facts

Date of Implementation:
Demonstration/Exploration (Pilot) Program: 2001-2002 school year
Year 1 Implementation (7th grade and demo sites only): 2002-2003 school year
Full Implementation: 2003-2004 school year

Students Currently Involved:
33,000 7th and 8th graders statewide

Teachers Currently Involved:
3,000 teachers

Number of Schools:
243 schools statewide

Technology Use:
Apple iBooks, Airport wireless

Actual Cost:
$37.2 Million

Some Challenges:
- Sustainability
- Assessment of impact beyond test scores
- Rate of capacity-building for educators to leverage the investment
- Ability of the state to retain students in New Economy jobs

Unanticipated Results:
- Students are becoming respectful, responsible "ambassador" of the program
- Teacher skepticism is down and student retention is up
- Parent-student communication is improving

Lemke and Martin (2003) provided in a preliminary report seven questions after the first year of implementation in Maine. The following questions were addressed:

1. Why did educational policymakers in Maine focus on ubiquitous computing for seventh and eighth graders (p. 4)? The key factors that influenced their decision were economic viability, closing the digital divide, and higher

academic achievement.

2. What trends are emerging in national, state, and local policies that impact ubiquitous computing in Maine (p. 7)? The policymakers identified five national trends: high-stakes accountability, lack of student access to technology, budget cuts in education, standards-based learning, and renewed focus on highly qualified teachers. State and local trends were identified as pilot programs (one-to-one district initiative), scope and focus (district allowing students to checkout laptops and internet access), and technology (a single vendor as the provider – Maine entered into a 4-year, $37.2 million contract with Apple Computer).
3. What do Maine's policymakers expect will be the outcome of their state's ubiquitous computing initiative? Are these expectations the same as or different from those of educators? How are they aligned to Maine's overall education agenda (p. 11)? The expectations were surprisingly similar – increase economic viability, increase student engagement and achievement, improve technology literacy and other 21st century skills, and improve teaching. The expectations also were greatly aligned with Maine's education agenda.
4. What funding mechanisms support ubiquitous computing in Maine (p. 15)? State policymakers funded the initiative with excess revenue.
5. What is the impact of ubiquitous computing on local school policies in Maine (p. 17)? Only two new forms were created for school use – acceptable use policy and professional development policy.
6. What were the unintended consequences, negative and positive, of the laptop

initiative in Maine (p. 21)? The positives were students becoming respectful, responsible ambassadors of the program, teacher skepticism decreased, teacher retention increased, and parent-student communication improved.

7. What are the next steps for Maine (p. 23)? To continue with the program and seek alternative funding.

The Impact of Maine's One-to-One Laptop Program on Middle School Teachers and Students research summary report by the University of Southern Maine Office (Silvernail & Lane, 2004) indicated that a large majority of Maine's middle schools had successfully implemented the one-to-one laptop program, and there was substantial self-reported evidence that student learning had increased and improved (p. iii). Some of the evidence collected and analyzed during the initial phase indicated:

1. Teachers used laptops to develop lessons, conduct research, and communicate with colleagues.

2. Teachers' usage was 20 to 30% higher for teachers with advanced degrees or who had participated in four or more professional development activities.

3. Students reported using the laptops most frequently in finding information (90%), organizing information (63%), and taking class notes (57%).

4. Student usage of laptops for completing class work was higher for students who took laptops home.

5. Over 70% of the teachers surveyed reported that the laptops helped them more effectively meet curriculum goals and individualize student curriculum needs.

6. More than 4 of 5 teachers surveyed reported that students are more engaged in their learning, more actively involved in their own learning, and produced better quality work.

7. More than 70% of the students surveyed reported that the laptops helped them to better organize and to get their work done more quickly and with better quality.

8. Teachers reported all types of students were more engaged in their learning and more motivated to learn; particularly at-risk and special needs children.

9. Teachers reported that the greatest obstacles in integrating the laptop technology more into the curriculum and instruction were the lack of technical support, the lack of more professional development opportunities, and the lack of time (p. iii).

Beaudry (2004), a professor at the University of Southern Maine, also conducted a qualitative case study of Mountain River Middle School. The focus of the study was to observe teachers as they adapted to a change in the learning environment of the classroom. He specifically wanted to know if teachers were making the connection. He asked three questions through surveys and interviews:

1. How are the laptops being used?
2. What is the impact of using the laptops?
3. Are there obstacles to full implementation of the Maine Laptop Initiative?

According to Beaudry's (2004) research, the laptops were used to communicate by email with colleagues (55%) and assess student work (21%). The positive impact, as noted from 60% of teachers, was lesson presentation, creating integrated lessons, and teacher-teacher collaboration. The obstacles of using the laptops were significant amounts of time needed to provide immediate feedback to students and assessing student performance (Beaudry, p. 17). Beaudry concluded that teachers and students have been energized by the use of the laptops. Although he observed positive student/teacher engagement, Beaudry believed the effectiveness of the initiative rested on teacher

instructional delivery and student achievement.

After 8 years of the Maine Learning Technology Initiative (MLTI), overall evaluation of the laptop initiative has provided evidence that, indeed, there has been an impact on teaching and learning in Maine's middle schools (Silvernail, Pinkham, Wintle, Walker, & Bartlett, 2011). Surveys were conducted on student and teacher use, factors related to use levels, benefits of the program, and impact on learning. The findings suggested the use levels are reaching a *tipping point* in several disciplines such as language arts, social studies, and science. Approximately 80% of students surveyed reported using laptops at a high level (4 or more hours a week) in those areas. However, in math almost half of the students reported never using laptops (Silvernail et al., 2011). Similar findings were reported from teachers as well. Math teachers reported significantly lower laptop use (74%) compared to the average for the other disciplines (85%). This was critical information due to the importance of mathematics and the plethora of interactive programs available for teachers and students. Also, it appeared the laptops were not being used at a high degree of frequency for 21st century skills integration across all disciplines, differentiation in instruction, and for conducting formative assessments (Silvernail et al., 2011).

Linkage between teacher and school characteristics and use levels were only modestly related so that the variables (age, experience, discipline, philosophy) could not be used to give definitive findings. When teachers were asked about the benefits of the laptops, many indicated that the laptops are important teaching tools, keep students more engaged and active in their learning, and they could not imagine teaching without them. Students concurred with teachers (Silvernail et al., 2011).

As mentioned earlier, the use of laptops was less frequent in mathematics. In a

2004 study on middle school mathematics, a total of 56 schools were randomly assigned to a group (experimental or controlled) to provide professional development intervention. This study was designed to help math teachers with content knowledge and pedagogical practices to improve student knowledge and understanding (Silvernail et al., 2011). Teachers in the experimental group participated in professional development in the areas of content, pedagogy, technology integration, and professional learning community (PLC). After the 20-month study, students in the experimental group outperformed their peers on state tests and teachers increased their own content knowledge and increased their use of technology (Silvernail et al., 2011). The results indicated that teachers who received intense research-based professional development on mathematics content, pedagogy, and knowledge were able to effectively use technology to deliver instruction with positive student achievement outcomes.

Middle School Mathematics

Successful mathematics instruction has been one of the major goals for National Council of Teachers of Mathematics (NCTM). Their mission is to be a support for teachers to ensure equitable mathematics learning of the highest quality for all students (NCTM, 1991). During the early years, NCTM had two assumptions about teaching mathematics: (1) teachers are key figures in changing the ways in which mathematics is taught and learned in schools, and (2) such changes require teachers to have long-term support and adequate resources (NCTM, 1991, p. 2). In the NCTM (2000) standards, the use of technology is seen as a way to facilitate mathematical problem solving and provide students with opportunities to investigate a variety of mathematical ideas and strategies. "By aligning factual knowledge and procedural proficiency with conceptual knowledge, students can become effective learners" (NCTM, 2000, p. 2).

Middle and high school math teachers who are effectively trained in the use of web-based programs and technology integration perceive that their students experience more success and appear significantly engaged (Kay, Knaack, & Petrarca, 2009).

> With middle school test scores sagging, colleges complaining about remediation rates, parents praying for the Ivy League, and state and national policy makers worrying about job readiness and global competitiveness, academic rigor is in. Eighth grade has become the new 10th grade. (Flannery, 2007, p. 24)

Due to the recent adoption of Common Core State Standards (CCSS) and the Race to the Top (RttT) initiative, meaningful changes to teaching and learning in American schools is crucial. For mathematics instruction, the significant change involves instruction going from subject specific to more authentic integrated mathematics and increased student/teacher engagement.

In North Carolina, effective with the freshman class of 2009-2010, four mathematics units are required for graduation: Algebra I (mandatory state test); Geometry; Algebra II or Math I, II, III; and a fourth course to be aligned with the student's post high school plans (North Carolina Department of Public Instruction [NCDPI], 2010). The Statistical Analysis System Institute, Inc. (SAS, Inc.) in Cary, North Carolina, brought together a group of teachers, administrators, engineers, business leaders, and members from the Educator Value Added Assessment System (EVAAS), to do a study on Algebra I readiness. The group (Algebra Ready) came up with several ways to prepare students for Algebra I and meet CCSS. The goals were (SAS, Inc., 2011, p. 4):

1. Prepare all students for success in Algebra I by ninth grade;
2. Prepare students for college and a globally competitive workforce;

3. Increase high school math achievement;
4. Increase college enrollment; and
5. Improve students' life choices.

To meet the goals, the group concluded that middle school student enrollment in Algebra I must increase (SAS, Inc., 2011). Clifford Adelman (2006), a United States Department of Education researcher, reported the *academic intensity* of a student's high school math courses is a key indicator of college completion. Furthermore, proficient completions of math courses in middle school are prerequisites for student success with a rigorous sequence of math courses in high school (SAS, Inc., 2011).

Although CCSS for mathematics were designed for Grades K-12, adequate preparation for Algebra must begin in the elementary grades. According to the research, elementary teachers may need to alter their instructional delivery to engage and interact with students in new and innovative ways (SAS, Inc., 2011). After the adoption of CCSS, the Algebra Ready Group suggested that middle school math teachers be properly trained and prepared to teach pre-Algebra and Algebra as early as sixth grade (SAS, Inc., 2011). As middle schools increase the number of students taking Algebra, they need to be aware of two things: (1) additional technology is needed and (2) training teachers in how to use the technology effectively to delivery instruction is required (SAS, Inc., 2011).

Students on target for Algebra I in the middle school have a better chance of sustaining positive results with advanced mathematics curriculum and produce higher mathematics performance by the end of high school (Smith, 1996). In a report by Harold Wenglinsky (1998), the sequence of the typical mathematics curriculum suggests that computers are crucial for middle school students. Dr. Jim Goodnight, CEO of the

software giant SAS, challenged the Algebra Ready group by explaining what was at stake. During an interview for *Forbes*, Dr. Goodnight stated,

> In this information age, challenges that require STEM skills – science, technology, engineering and mathematics-will only increase in the years to come. If American students aren't equipped to do the work, there are tens of millions of people in Asia who will step in and take those jobs, and the next generation of American workers will become service workers. (SAS, Inc., 2011, p. 3)

Summary

No two students learn exactly in the same way. Diverse learning styles require differentiation of instruction. Instructional delivery methods vary to meet the needs of students of all abilities. Teachers are able to manipulate the learning environment to address the variety of student abilities, interests, and curricular responsibilities by using a wide array of strategies, methods, research-based programs, and educational tools.

Middle school students possess unique characteristics and behaviors that require more support and encouragement due to involuntary physical and emotional changes as well as societal and education demands. These students are referred to as digital natives because they are growing up in a technology-rich environment. To motivate and engage these students, teachers are using techniques and tools to immerse the students in 21st century concepts and skills.

Increasing demands on STEM success has many schools, programs, and businesses seeking ideas, initiatives, and tools to prepare new learners for future STEM jobs. This may be one of the reasons why one-to-one laptop initiatives are increasing across the country. Ten years ago there were very few school districts using this initiative as a way to increase equity of access to technology. Today, over half the states

in the country have school districts implementing the initiative to not only increase technology equity but also to update teachers' knowledge and skills to improve instruction, increase student engagement, improve student achievement and technology literacy, and increase economic competitiveness (Argueta, Huff, Tingen, & Corn, 2011).

North Carolina was one of the first states to adopt the CCSS (READY, 2012). For mathematics instruction, the changes are significantly more demanding (NCTM, 2011). Students are learning more abstract mathematics earlier and faster. One of the goals of North Carolina's READY Initiative (replaces the ABC's accountability model) is to have all students ready to take Algebra I by ninth grade. This will require more technology integration and shifting mathematics instruction from subject-based learning to a more in-depth authentic learning.

Chapter 3: Methodology

Introduction

The purpose of this study was to evaluate the impact of the one-to-one laptop initiative on teacher perceptions of instructional delivery and student engagement at the middle school level. The study also examined the effectiveness of implementing a one-to-one initiative in rural districts. This chapter is divided into nine sections. These sections include research questions, research design, sample, variables, and limitations and delimitations of the study, data collection, data analysis, and summary.

Research Questions

1. What is the impact of the one-to-one laptop initiative on teacher perceptions of instructional delivery in middle school mathematics?
2. What is the impact of the one-to-one laptop initiative on teacher perceptions of student engagement in middle school mathematics?
3. What do middle school mathematics teachers perceive as the benefits of having a one-to-one laptop initiative?

Research Design

This study used qualitative methods to gather data. The data gathered was from a researcher-designed survey (Appendix B) to determine teachers' perceptions of instructional delivery and student engagement. The types of qualitative data that were analyzed came from multiple choice questions as well as open-ended questions embedded within the survey. These questions solicited feedback from teachers on how the one-to-one initiative had changed instructional delivery, teaching strategies, and student behaviors in the classroom. Other types of data analyzed included teacher gender, grade/subject taught, years of teaching experience, years of using student laptops,

average class size, and average class time in minutes, as well as fixed item responses (e.g., Likert scale items) on the survey.

The 46-question survey was organized into six sections: general information, instructional delivery, student engagement of classroom strategies and assignments, instructional delivery of 21st century concepts and skills, student engagement behaviors, and beliefs. The survey was deployed through the use of SurveyMonkey®, a web-based survey software tool used for creating and publishing surveys. Survey results were available in raw data or graphical form and were filtered, saved, downloaded, and shared.

Sample

Targeted participants for this study were North Carolina middle school mathematics teachers employed in school districts that had implemented a one-to-one laptop initiative (see Table 2), including an additional district that implemented the initiative in the last year. Superintendents, technology staffs, and/or principals were contacted to grant permission for the middle school math teachers to participate in the study. This study examined the teachers' perceptions of instructional delivery and student engagement through the use of a researcher-designed survey. Their perceptions were examined to determine the impact of the one-to-one initiative as well as the benefits, if any, of the initiative.

Variables

The dependent variables in this study were the teachers' perceptions of instructional delivery and student engagement in a one-to-one learning environment. The independent variables were teacher gender, grade/subject taught, years of teaching experience, years of using student laptops, average class size, and average class time in minutes.

Data Collection

The researcher sent a letter (Appendices C, D, and E) to each superintendent in the North Carolina 1:1 LTI explaining the purpose of the survey and requesting permission to survey teachers in their respective LEA. Follow-up was via email and phone calls. An informed consent form was included with the letter and requested the superintendent to indicate whether or not permission was granted for teachers to participate. Once permission was granted, the researcher contacted the technology staff and/or principals of the respective middle schools. After permission was granted at the school level, the researcher sent a follow-up email and/or phone call with a time frame for participants to complete the survey.

Teacher email addresses were obtained from the school's principal and/or school's website in each district where permission was obtained. A letter describing the purpose and significance of the study (Appendix F), as well as assurances of confidentiality, was included in the email that contained the link to the survey. The letter also informed teachers that their completion of the survey was voluntary and that they could withdrawal at any time during the survey. One week after the initial survey invitation, a follow-up email was sent to all prospective participants thanking those who had completed the survey for their participation and reminding those who had not completed the survey of the deadline. An additional reminder (Appendix G) was sent to make sure an ample amount of data was received to provide enough information for validity of the research.

The researcher was notified via email upon completion of each survey. This notification was set up as a function in SurveyMonkey® and allowed the researcher to monitor the activity of the survey link in real time.

Data Analysis

Responses were summarized by examining individual responses and grouping them by commonality to make valid conclusions based on emerging themes of teacher perceptions of instructional delivery and student engagement. Also, descriptive statistics were used to report aggregated results of all items included in the survey instrument. Table 5 contains the data analysis methods that were used for each research question.

Table 5

Data Analysis

Corresponding Survey Question(s)	Research Questions	Data Analysis Method
8, 9, 10, 11, 12, 21, 22, 23, 24, 25, 26, 27, 28	1. What is the impact of the one-to-one laptop initiative on teacher perceptions of instructional delivery in middle school mathematics?	Qualitative
14, 15, 16, 17, 18, 19, 20, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43	2. What is the impact of the one-to-one laptop initiative on teacher perceptions of student engagement in middle school mathematics?	Qualitative
13, 29, 30, 44, 45, 46	3. What do middle school teachers perceive as the benefits of having a one-to-one laptop initiative?	Qualitative

Qualitative data were provided by Questions 13, 29, 30, 44, 45, and 46. These open-ended items were examined to develop themes through content analysis. Content analysis is a research method used to determine the presence of certain words or phrases within texts and to categorize them by theme. The themes provide understanding into the communication content and allow for analysis of the coded form of the text (Busch et al, 2005). Tallies were recorded for frequency of themes and were presented in frequency tables.

The qualitative data collected from the survey were compared to check for reliability in participant responses. Triangulation involves the crosschecking of consistency of specific data through the use of various methods (Holtzhausen, 2001). This triangulation process helped control biases in the data (Gall, Gall, & Borg, 2003) and provided support for the conclusion in the research (Fitzpatrick, Sanders, & Worthen, 2004).

Limitations

This study did not take into account the technical skills of the teachers or the amount of prior professional development that occurred before deploying the one-to-one initiative. This information may or may not be beneficial provided teachers receive assistance for troubleshooting, assurance of Internet connection availability, and reoccurring professional training after the initial implementation. Also, qualitative data were gathered from six open-ended responses only. If teachers chose not to answer these specific questions, the data may not have provided enough information about perceptions.

Delimitations

Several parameters were established for this study and may have affected its external validity:

1. The study was limited to data collected during the 2012-2013 school year.
2. The sample population was limited to middle school mathematics teachers in three rural North Carolina school districts.
3. Because of the small amount of middle school mathematics teachers available for the sample, all teachers were asked to participate in the study rather than using a random sampling method.
4. School districts were chosen that were in different stages of the

implementation (i.e., number of years in the one-to-one learning environment).

Summary

Chapter 3 reviewed the purpose of the study as well as the research questions. The research design was described, the instrument and sample populations were discussed, and the data collection and analysis procedures were explained. Additional information was included to explain the possible limits to making reasonable inferences about the results of this study.

Chapter 4: Results of Study

The purpose of this study was to evaluate the impact of the one-to-one laptop initiative on teacher perceptions of instructional delivery and student engagement in middle school mathematics. The study subsequently examined the effectiveness of implementing a one-to-one laptop initiative in three rural school districts. The study was conducted in three rural counties in North Carolina. The counties were in different stages of the one-to-one laptop initiative ranging from 1-5 years. This chapter explores the three research questions and the data reported from The Impact of the One-to-One Laptop Initiative on Teacher Perceptions of Instructional Delivery and Student Engagement in Middle School Mathematics Survey. The information provided regarding general information begins the chapter.

General Information

The survey was organized into six sections: (1) general information, (2) instructional delivery, (3) student engagement of classroom assignments and strategies, (4) instructional delivery of 21st century skills, (5) student engagement behaviors, and (6) beliefs. The survey was sent to 33 middle school mathematics teachers via email. Of those 33 teachers, five (15%) were male and 28 (85%) were female. Twenty-three (70%) teachers participated in the survey but only 20 completed the survey. Of those 20 teachers who completed the survey, two (10%) were male and 18 (90%) were female (see Table 5). This resulted in an overall response rate of 60.6%. Only completed surveys were included.

Table 6

General Information (Gender)

"I am a ____."

Answer Choices	Responses	Percent
Female	18	90%
Male	2	10%
Total	20	100%

Tables 7 and 8 indicated nearly half or 50% of teachers taught sixth grade and had been teaching 11-20 years.

Table 7

General Information (Grade)

"I teach _____."

Answer Choices	Responses	Percent
6th Grade Only	9	45%
7th Grade Only	3	15%
8th Grade Only	5	25%
Multiple Grades	3	15%
Total	20	100%

Table 8

General Information (Experience in Years)

"I have ____ years of experience."

Answer Choices	Responses	Percent
Less Than 3	3	15%
4-10	5	25%
11-20	10	50%
21+	2	10%
Total	20	100%

In Table 9, 14 (70%) of the teachers had been using laptops or teaching in a one-to-one environment for at least 3 years.

Table 9

General Information (Number of Years in the 1:1 Environment)

"I have taught using laptops for ____ year(s)."

Answer Choices	Responses	Percent
1 Year	2	10%
2 Years	4	20%
3 Years	8	40%
4 Years	6	30%
Total	20	100%

The teachers were asked to choose what level of math he or she taught. They were allowed to check multiple levels. The results in Table 10 reveal that a majority of the teachers taught standard math or pre-Algebra.

Table 10

General Information (Type of Math Taught)

"I teach mathematics equivalent to _____."

Answer Choices	Responses	Percent
Standard Grade Level	11	55%
Pre-Algebra	10	50%
Algebra I or Common Core Math l	5	25%
Geometry or Common Core Math II	4	20%

When asked to answer the question on class size, 16 of the 20 teachers (80%) taught an average of 25 students per class period (see Table 11).

Table 11

General Information (Class Size)

"I teach on average ____ students per class period."

Answer Choices	Responses	Percent
15 or Less	1	5%
16-20	3	15%
21-25	8	40%
25-30	8	40%
Total	20	100%

Question 7 asked teachers to estimate how many minutes of instructional time they have to teach per class period. As indicated in Table 12, 12 of 20 teachers (60%) responded that they had an average of 60 minutes of instructional time.

Table 12

General Information (Class Period in Minutes)

"I have on average ____ minutes to teach per class period."

Answer Choices	Responses	Percent
80-90 Minutes	4	20%
70-80 Minutes	4	20%
60-70 Minutes	3	15%
50-60 Minutes	9	45%
Total	20	100%

Survey Questions 30 and 31 were also general information questions that asked teachers to indicate how much support was provided to them in the one-to-one learning environment. Of the 20 teachers who responded to survey Question 30, 14 (70%) had access to an instructional facilitator 2 days per week or more (Table 13).

Table 13

General Information (Support)

"I have access to an instructional facilitator."

Answer Choices	Responses	Percent
3+ Days Per Week	13	65%
2 Days Per Week	1	5%
1 Day Per Week	3	15%
Rarely	3	15%
Total	20	100%

Survey Question 31 (Table 14) asked teachers about professional development. All teachers reported at least some opportunity for professional development with most (65%) getting professional development on a quarterly basis.

Table 14

General Information (Professional Development)

"I am provided opportunities for technology professional development."

Answer Choices	Responses	Percent
Monthly	6	30%
Quarterly	13	65%
Yearly	1	5%
Rarely	0	0%
Total	20	100%

Qualitative Data by Research Questions

Research Question 1

What is the impact of the one-to-one laptop initiative on teacher perceptions of instructional delivery in middle school mathematics? To determine the impact of the one-to-one laptop initiative on teacher perceptions of instructional delivery, Survey Questions 8-12 and 21-28 were used. The tables present the data in percentages of

teachers who responded to the questions.

Survey Questions 8-12 (Table 15) asked teachers to indicate how often during laptop use specific instructional delivery methods such as whole and small group instruction, facilitation of student-led instruction, student collaborative pairs, and individualized instruction were used. The responses were recorded via a rating question using number of days per week. Teachers indicated that at least 50% of the instructional methods used were teacher-directed as evidenced by the results of Questions 8, 9, 11 and 12. Survey Question 10 asked teachers to indicate the number of days they facilitated student-led instruction. Nine (45%) of the teachers indicated that he or she rarely facilitated student-led instruction. Again, this response rate indicated lessons were more teacher-directed.

Table 15

Instructional Delivery Methods

Questions	3+ Days	2 Days	1 Day	Rarely	Total
8. During laptop use, I use whole group instruction	12 (60%)	3 (15%)	2 (10%)	3 (15%)	20
9. During laptop use, I use small group instruction	4 (20%)	5 (25%)	6 (30%)	5 (25%)	20
10. During laptop use, I facilitate student-led instruction	3 (15%)	3 (15%)	5 (25%)	9 (45%)	20
11. During laptop use, I use student collaborative pairs	9 (45%)	3 (15%)	5 (25%)	3 (15%)	20
12. During laptop use, I provide individualized instruction	10 (50%)	4 (20%)	3 (15%)	3 (15%)	20

Questions 21-28 asked teachers how often 21st century technology programs, strategies, and tools were used during instructional delivery. A 4-choice Likert response scale (always, often, sometimes, and rarely) was used to record responses. The majority of the responses indicated teachers "often" or "sometimes" used laptops to access online resources, strategies, tools, and technological programs (Table 16). This was an overall rating average of 2.64. The value of the choices to rate the average (av.) is as follows: always = 4, often = 3, sometimes = 2, rarely = 1.

Table 16

Instructional Delivery – 21st Century Programs, Strategies, and Tools

Questions	Always (4)	Often (3)	Sometimes (2)	Rarely (1)	Rating Average
21. I communicate with my students via email, IM, or internet	5 (25%)	8 (40%)	5 (25%)	2 (10%)	2.8
22. I use online math strategies based on research best practices	4 (20%)	10 (50%)	5 (25%)	1 (5%)	2.85
23. I use online math strategies that foster the development of higher-order thinking skills	5 (25%)	8 (40%)	3 (15%)	4 (20%)	2.7
24. During laptop use, I integrate literacy/vocabulary skills into my lessons	2 (10%)	11 (55%)	5 (25%)	2 (10%)	2.65
25. During laptop use, I use problem-based learning	3 (15%)	9 (45%)	5 (25%)	3 (15%)	2.6
26. I use virtual manipulatives and online calculators	4 (20%)	10 (50%)	4 (20%)	2 (10%)	2.8
27. I use online graphs, charts, and tables to enhance instruction	3 (15%)	10 (50%)	6 (30%)	1 (5%)	2.75
28. I use other technological devices (bamboos, iPads, cell phones, etc.) to assess student learning	2 (10%)	6 (30%)	2 (10%)	10 (50%)	2.0

Research Question 2

What is the impact of the one-to-one laptop initiative on teacher perceptions of student engagement in middle school mathematics? To determine the impact of the one-to-one laptop initiative on teacher perceptions of student engagement, survey Questions 14-20 and 32-43 were used. The tables present the data in percentages of how teachers responded to the questions.

Questions 14-18 (Table 17) surveyed teachers about the frequency of student engagement in specific activities and assessments during laptop use. The responses were recorded via a rating-type scale using number of days per week. The teachers responded that students used laptops 3 or more days for assignments (80%), drill and practice (70%), and online math resources for assessments (50%). Fifteen teachers (75%) indicated that students spent no more than 1 day on developing products or graphics. Eighty percent of teachers (16/20) allowed students to use laptops to take tests or quizzes at least 1 day per week.

Table 17

Student Engagement Activities and Assessments

Questions	3+ Days	2 Days	1 Day	Rarely	Total
14. My students use laptops to access assignments	16 (80%)	1 (5%)	2 (10%)	1 (5%)	20
15. My students use laptops for drill and practice	14 (70%)	4 (20%)	1 (5%)	1 (5%)	20
16. My students use laptops to develop products/ graphics	2 (10%)	3 (15%)	7 (35%)	8 (40%)	20
17. My students use online math resources for assessment	10 (50%)	4 (20%)	3 (15%)	3 (15%)	20
18. My students use laptops to take quizzes and tests	7 (35%)	4 (20%)	5 (25%)	4 (20%)	20

Survey Questions 19 and 20 asked teachers to indicate how he or she encouraged or instructed student use on laptops. Again, a 4-choice Likert response scale (always, often, sometimes, rarely) was used to record responses (Table 18). The value of the choices to rate the average (av.) was based on a 4-point scale as follows: always = 4, often = 3, sometimes = 2, rarely = 1.

The results indicated that 70% of the teachers "always" or "often" (or 3.25 rating average) encouraged students to use laptops to explore and take risks. Another 75% of teachers indicated students "often" or "sometimes" (or 2.6 rating average) used laptops to perform multiple strategies to solve problems.

Table 18

Student Engagement Behaviors

Questions	Always (4)	Often (3)	Sometimes (2)	Rarely (1)	Mean
19. I encourage my students to use laptops to explore and take risks	8 (40%)	6 (30%)	3 (15%)	3 (15%)	3.25
20. My students use laptops to perform multiple strategies to solve problems	2 (10%)	11 (55%)	4 (20%)	3 (15%)	2.6

Survey Questions 32-43 asked teachers to respond to questions about student engagement behaviors during the use of laptops. The responses were recorded via a numeric range scale (75%-100%, 50%-75%, 25%-50%, less than 25%) (Table 19). Overall results show an average of 50% of teachers (Survey Questions 32, 33, and 36) perceived that more than 75% of their students were able to take advantage of peer collaboration, focus on online learning activities with minimum disruptions, and follow

directions with little assistance. Also, an average of 54% of teachers (Survey Questions 34, 35, and 40) perceived that more than 75% of students were capable of developing graphics, videos, webpages, and blogs; using laptop resources; and effectively using peripherals.

Question 37 surveyed teachers about student enthusiasm and/or positive attitudes during laptop use. Ten (50%) of the teachers responded that over 75% of their students displayed enthusiasm and/or positive attitudes. Another eight (40%) of the teachers responded that over 50% of students displayed enthusiasm and/or positive attitudes during laptop use. When asked about students being able to use thoughtful and relevant questions/answers (Survey Question 38) during laptop use, 50% of the teachers perceived that only 50-75% of the students had this capability.

Sixteen (80%) of the teachers responded that over 75% of their students were capable of effectively communicating via email, IM, or Internet (Survey Question 39). For Survey Question 41, only six (30%) teachers perceived that over 75% of their students were capable of facilitating a lesson during laptop use. Another eight (40%) responded that over 50% of students were capable of facilitating a lesson during laptop use.

Questions 42 and 43 surveyed teachers about the percentage of students who had good attendance (no more than 10 days absent for the year) and were performing at or above average. Eleven teachers (55%) responded that over 75% of their students had good attendance. The remaining nine (45%) teachers responded that 50-75% of students had good attendance. Question 43 surveyed teachers about students performing at or above grade level. The majority (53%) of the teachers responded that 50-75% of the students were performing at or above grade level.

Table 19

Student Engagement during Laptop Use

Questions	75%-100%	50%-75%	25%-50%	Less Than 25%	Total Responses
32. During laptop use, about what percentage of students take advantage of peer collaboration	11 (61%)	3 (17%)	4 (22%)	0 (0%)	18
33. About what percentage of students are focused on online learning activities with minimum disruptions?	9 (45%)	4 (20%)	5 (25%)	2 (10%)	20
34. About what percentages of students are capable of developing graphics/videos/webpages/blogs?	10 (50%)	4 (20%)	4 (20%)	2 (10%)	20
35. About what percentage of students are capable of using laptops resources (i.e. IMovie/Keynote/PowerPoint/Activ-engage/Word Processor/IPhoto, Garageband)?	12 (63%)	4 (21%)	2 (11%)	1 (5%)	19
36. During laptop use, about what percentage of students follow directions with little assistance?	8 (44%)	4 (22%)	3 (17%)	3 (17%)	18
37. During laptop use, about what percentages of students display enthusiasm and/or positive attitudes?	10 (50%)	8 (40%)	2 (10%)	0 (0%)	20
38. During laptop use, about what percentage of students use thoughtful and relevant questions/answers	6 (33%)	9 (50%)	2 (11%)	1 (6%)	18
39. About what percentage of students are capable of effectively communicating via email, IM, or internet?	16 (80%)	1 (5%)	1 (5%)	2 (10%)	20
40. During laptop use, about what percentage of students are capable of effectively using peripherals (digital calculators, cameras, probes)?	10 (50%)	8 (40%)	2 (10%)	0 (0%)	20
41. During laptop use, about what percentage of students are capable of facilitating a lesson (student presentation)?	6 (30%)	8 (40%)	4 (20%)	2 (10%)	20
42. About what percentage of students have good attendance (less than 10 days for the year)?	11 (55%)	9 (45%)	0 (0%)	0 (0%)	20
43. About what percentage of students are performing at or above grade level?	7 (37%)	10 (53%)	2 (11%)	0 (0%)	19

Research Question 3

What do middle school mathematics teachers perceive as the benefits of having a one-to-one laptop initiative? Questions 13, 29, 30, 44, 45, and 46, the open response items of the survey instrument, were used to highlight the benefits of a one-to-one laptop initiative. In addition, a 4-choice Likert response scale (agree, somewhat agree, somewhat disagree, and disagree) was used for survey Questions 45 and 46. Positive responses were used to evaluate the benefits of having a one-to-one laptop initiative.

Question 13 surveyed teachers to describe how the use of laptops has changed their instructional delivery. One teacher gave a detailed account of how their 90-minute classroom allowed more time for activities beyond lecture. This teacher's response indicated the ability to increase and monitor PBL, give more individualized instruction, allow for self-paced lessons through online resources, conduct ongoing assessments, show the importance of technology use, foster higher-order thinking skills, and receive immediate feedback on student progress. A teacher with 60-minute class periods responded with similar changes to instructional delivery. They stated, "Having 1:1 laptops has given me the opportunity to use technology for student investigations" and "I like that they have instant feedback." Other responses were shorter, but several (5 or more) gave common changes (themes) to instructional delivery such as decreased lecture time, increased monitoring, more online resources to enhance lessons, having the ability to give and receive immediate feedback, more time for individualized instruction, and more opportunities to assess students. Three teachers specifically stated that there were no changes to their instructional delivery.

Eighteen of 20 teachers responded to this question (Appendix H). A frequency table (Table 20) presents the positive responses.

Table 20

Perceptional Changes to Instructional Delivery in a One-to-One Initiative

Positive Themes	Responses	%
More Online Resources (Student Investigation/Exploration)	10	56%
Immediate or Instant Feedback	6	33%
Increased Individualized or Collaborative Group Instruction	6	33%
Increased Assessment (Practice Skills/Data Collection)	6	33%
Increased Monitoring	5	28%
Decreased Lecturing	5	28%

Survey Question 29 asked the teachers to respond to what teaching strategies they were able to use due to having laptops. Seventy-five percent or 15/20 teachers responded. As with responses from Question 13 (Table 21), the teachers echoed themes such as online resources, individualized instruction, and immediate feedback. Two teachers responded that flipped classrooms and/or lessons were available due to the use of laptops. The actual teacher responses from Question 29 can be found in Appendix I, and Table 21 is a frequency table showing positive themes and the number of teacher responses.

Table 21

Teaching Strategies Due to Laptop Use

Positive Themes	Teacher Responses
Online Programs and Resources (Manipulatives, Graphs, Games, YouTube Videos, Tutorials, etc.)	7
Increased Individualized Instruction	4
Immediate Feedback	3
Flipped Classroom and Lessons	2

Survey Question 30 had two parts. It not only asked the teachers to respond to a general question concerning how much support he or she had available from an instructional facilitator, Part II of the question asked teachers if this is beneficial to explain why. Eight teachers responded. Table 22 shows the actual responses from the teachers. From the responses, the common themes were resource and technical support (Table 23).

Table 22

Benefits to Having an Instructional Facilitator

It is helpful when I want to introduce a new skill for the students that I am not familiar or I want them to become familiar with.
Helps with technical issues.
Though we do have technology professional development, we do not have access to a technology facilitator to assist with instruction within our classroom. I would like to have access to PD to help me learn new ways to implement technology specifically within a math classroom. Though I am somewhat comfortable with technology, I still feel that my students know far more than I do.
She is here to help when we run into snags daily.
I answered 1 day per week, but I can have a facilitator whenever I need one. We just have to schedule time. It is extremely beneficial to have an extra person, particularly if you are trying something new.
She helps me with tech issues that arise when having students develop products using the technology. This helps me with the flow of the lesson development because it helps me anticipate technical questions that student might have.
I don't use her often, but she is a good source of ideas and support for innovative implementation of technology.
She takes the goal I have for my students, and helps me break down the different apps and sites that will help my students attain the goal. She will create Google documents, guidelines and rubrics, and just about anything you need, if you are unable to do it yourself. She is a teacher's best resource and support!

Table 23

Benefits to Having an Instructional Facilitator (Themes)

Themes	Teacher Responses
Resource	5
Support	5

Question 44 surveyed teachers to respond to the changes seen in students since the implementation of laptops. Sixteen (80%) teachers responded to this question with three negative responses, six neutral or unsure responses, and seven positive responses. Although a smaller percentage of teachers reported negative responses, the responses described important information that is helpful in understanding the impact. Table 24 shows the positive responses of changes seen in students since implementation of the one-to-one laptop initiative. The common word for the positive responses was "engagement." All 16 responses can be viewed in Appendix J.

Table 24

Positive Changes in Students since Implementation of the One-to-One

Much higher level of engagement-students becoming leaders-students being responsible for their own learning.
Students are more comfortable with technology. They have more experience creating/designing using technology. They also seem to be more organized.
I am amazed at the skills my students have when it comes to computers. They have taught this old lady a lot of things. Also, if I have problems with the computer, they will show me what to do. This gives my students a sense of pride and a can-do attitude.
A greater engagement in learning and a maximize use of time on task. Students are constantly working and as a teacher I can implement more meaningful task within a class period.
At first, I thought the laptops would be a distraction to students because of the readily available access to games or other applications that were not relevant to the instruction or curriculum. However, great progress has been made in how we can monitor students' laptop use at school, and now with LanSchool, I have seen student focus during laptops increase and off-task behavior decrease significantly.
Increased motivation to learn.
More engagement on a daily basis, especially with difficult objectives.

Survey Questions 45 and 46 asked teachers to respond using a 4-choice Likert scale (agree, somewhat agree, somewhat disagree, and disagree). These two questions also had two parts (Likert scale response and open response). The following table (Table 25) shows the actual results from survey Question 45. Eighteen teachers responded to survey Question 45. Sixteen (89%) gave positive responses (50% agree and 39% somewhat agree) to instructional delivery being more effective due to the use of the laptop initiative. The other two (11%) responded as somewhat disagree (Table 26). The values of the choices to rate the mean are as follows: agree = 4, somewhat agree = 3,

somewhat disagree = 2, disagree = 1.

Table 25

Instructional Delivery is More Effective Due to the use of Laptops

Answer Choices		Responses	Percent
Agree (4)		9	50%
Somewhat Agree (3)		7	39%
Somewhat Disagree (2)		2	11%
Disagree (1)		0	0%
Total		18	100%
Mean	3.89		

Part II asked teachers to explain how instructional delivery is more effective due to the laptop initiative. Twelve (67%) of the teachers responded. There were three negative responses, three neutral/unsure responses, and six positive responses. The common theme for Question 45 was "vary, varying or variety of ways to instruct or enhance the lesson." One teacher responded that integrating technology was important because "students find learning using technology is more relevant because the material is presented, manipulated, and enhanced using a medium with which they are comfortable." Table 27 shows the actual positive responses. All 12 responses can be viewed in Appendix K.

Table 26

Effective Instructional Delivery Responses

Teachers are able to provide activities to meet the needs of all learning styles within the same classroom. Teachers are able to easily customize lessons according to individual ability. Teachers are able to implement multiple activities in one lesson to keep the attention of their students.
Instructions can be viewed and reviewed when necessary.
Through Angel, everything is more centralized for the kids. They have access to more instructional resources and faster feedback from assessments. Teachers have a variety of ways to deliver/vary instruction to fit the needs of their students.
I am able to present the material in various ways that enhances all the learning styles in my classroom.
We are progressing forward in a digital society, and in order to better meet the 21st needs of our students, our educational system needs to reflect this progress. Integrating technology into the everyday academic world of students prepares them for the heavily inundated world of technology they will encounter upon graduation and in the workplace. Also, students find that learning using technology is more relevant because the material is presented, manipulated, and enhanced using a medium with which they are comfortable. Lessons can be more engaging when using technology, and research in MUCH easier.
I only need 5-10 minutes of instructional delivery and then use other resources to mix into the lesson that I am teaching. I have more time to actually help the students work on problems; not spend all class talking about the problems. More interaction with students, more discussions, and more one on one time working with students.

Survey Question 46 surveyed teachers about whether student engagement had increased due to the use of the laptop initiative. Twenty teachers responded to the question. Seventeen (85%) responded positively (40% agree and 45% somewhat agree). Two (10%) teachers responded with somewhat disagree and one responded (5%) with disagree (Table 27).

Table 27

Student Engagement has Increased Due to Laptop Use

Answer Choices	Responses	Percent
Agree (4)	8	40%
Somewhat Agree (3)	9	45%
Somewhat Disagree (2)	2	10%
Disagree (1)	1	5%
Total	20	100%
Mean 3.2		

Part II of Survey Question 46 asked teachers to explain how student engagement had increased due to the use of the laptop initiative. Thirteen (65%) of the teachers responded. There were three negative responses, five neutral responses, and five positive responses. The common words used in the positive responses were "engaged" and "focused." Table 28 shows the actual positive responses. All 13 responses can be viewed in Appendix L.

Table 28

Student Engagement has Increased Due to Laptop Use (Responses)

Students are able to take responsibility for their learning through exploring and self - discovery more so now than before the initiative. Students are able to access resources from home when necessary. Students are more engaged in learning. Students reach beyond the classroom.
Students understanding can be assess immediately; therefore, students are having to stay focused and aware of their learning.
I feel my students are more engaged when I use laptops.
Technology is an integral part in to the culture of youth today, and to try to separate teaching and technology is almost a futile effort. With technology, students can be more creative with their presentations and research, can spend a significant amount of time developing higher-order thinking skills through challenging tasks, and students seem more engaged in online assessments because of instantaneous results (click submit and get your score).
Lesson can be tailored to the level each students' needs. No student feels they cannot do the work, or the work is too easy. When curriculum is exactly what they need, the students stay focused; feel good about what they are doing, and work hard every day.

Summary

Research Question 1 addressed the impact of the one-to-one laptop initiative on teacher perceptions of instructional delivery in middle school mathematics. Teachers were asked about instructional delivery methods used in a one-to-one learning environment and how often those methods were used during instruction. The teachers were also asked how often 21st century concepts, skills, and tools were used for instructional purposes in the one-to-one learning environment.

Research Question 2 addressed the impact of the one-to-one laptop initiative on teacher perceptions of student engagement in middle school mathematics. Teachers were asked about how often students were engaged in classroom strategies and assignments

during the use of laptops. They were also asked what percentage of students were engaged in 21st century concepts and skills as well as the percentage of students capable of using 21st century tools during the use of laptops. Student attendance and grade-level performance were also addressed.

Research Question 3 was to determine the benefits of having a one-to-one laptop initiative. Teachers were asked how their instructional delivery had changed due to the use of laptops and what changes were seen in students since the implementation of the one-to-one initiative. They were asked about what teaching strategies were available to them due to having laptops. Teachers were asked about benefits of having support from an instructional facilitator. They were also asked to rate the effectiveness of instructional delivery due to the laptop initiative and explain their responses. Finally, teachers were asked to rate and explain if there was an increase in student engagement due to having the laptop initiative.

Chapter 5: Findings and Conclusions

Introduction

Chapter 5 explores the findings and conclusions of this study. A brief summary of the study begins the chapter. The summary of the findings is discussed in terms of general information and each of the three research questions. Conclusions are based on the data collected. Recommendations are included based on the conclusions. This study was conducted in three rural school districts located in western North Carolina during the 2012-2013 school year.

Summary of the Study

The purpose of this study was to evaluate the impact of the one-to-one laptop initiative on teacher perceptions of instructional delivery and student engagement in middle school mathematics. The participants in this study were middle school mathematics teachers from three rural school districts in western North Carolina. The focus for the literature review was to review instructional delivery methods and strategies, dispositions of teachers and middle school students, 21st century skills, one-to-one laptop initiatives across the states of North Carolina and Maine, and middle school mathematics. The research questions and the researcher-designed survey were derived from the literature review.

The following research questions were the focus and the purpose of this study:

1. What is the impact of the one-to-one laptop initiative on teacher perceptions of instructional delivery in middle school mathematics?

2. What is the impact of the one-to-one laptop initiative on teacher perceptions of student engagement in middle school mathematics?

3. What do middle school mathematics teachers perceive as the benefits of

having a one-to-one laptop initiative?

This study used qualitative methods to gather data. The instrument used to collect data was a researcher-designed survey with a combination of multiple choice and open-ended type questions. The 46-question survey asked the teachers to respond to questions on general information, instructional delivery methods, student engagement activities, instructional delivery of 21st century concepts and skills, student engagement behaviors, and teacher beliefs. Approval to send the survey was granted from district superintendent(s) and/or principals of the intermediate and middle schools. Teachers received the survey at the end of the 2012-2013 school year.

General Findings

The participants were sent the survey electronically via an online survey tool. Thirty-three surveys were sent. Twenty-three surveys were returned but only 20 were fully completed. Only completed surveys were used. This resulted in an overall response rate of 60.6%. Participants could opt out of the survey at any time and anonymity was honored.

Eighteen (90%) female teachers and two (10%) male teachers completed the survey. Nearly half or 50% of the participants were sixth-grade teachers who had been teaching between 11-20 years. Eighty percent (80%) of the teachers taught an average of 25 students per class period. Fourteen (70%) of the teachers had been using laptops in a one-to-one environment for at least 3 years, and 13 (65%) teachers had access to an instructional facilitator for 3 days per week or more. The majority of the teachers taught standard mathematics or pre-Algebra and had 60 minutes of instructional time. Six teachers (30%) responded that professional development was provided monthly and another 13 (65%) responded that professional development was provided quarterly.

Research Question 1 Findings and Conclusions

Research Question 1 concerned the impact of the one-to-one laptop initiative on teacher perceptions of instructional delivery in middle school mathematics. This was deemed a moderate impact. At least 45% of teachers indicated their lessons were teacher-directed 3 or more days per week. Also, teachers allowed students to work in collaborative pairs, but student-led instruction was a rare occurrence. However, responses to this question indicated a slightly higher impact with regards to instructional delivery using 21st century skills. At least 47% of teachers indicated they "often" communicate with students via email, IM, or Internet; use online math strategies based on research-based best practices; integrate mathematics and literacy/vocabulary; implement problem-based learning activities; and use virtual manipulatives, online calculators, graphs, charts, and tables. The findings suggest that teachers were making meaningful efforts to infuse 21st century skills into the traditional curriculum. According to the research (Virginia Department of Education, 2010), teachers who use a variety of strategies to deliver knowledge and skills while interacting with students have the potential to enhance student motivation, exploration, and inquiry and provide opportunities for students to engage in higher-order thinking skills. By doing this, mathematics instruction moves from a subject-specific approach to conceptual *authentic* integration (NCTM, 2011).

The overall responses related to this question indicated a moderate impact of the one-to-one laptop initiative on teacher perceptions of instructional delivery in middle school mathematics. Approximately half of the teachers in this study used traditional teaching methods (whole group and lecture) with some technology integration. Also, the teachers reported moderate use of assessments and low-moderate use of other 21st

century tools during instructional delivery. These findings are reflected in research conducted by Silvernail et al. (2011) who found that mathematics teachers use the laptops less frequently than their colleagues in other core disciplines. Silvernail et al. also found in their 8-year study of the Maine Learning Technology Initiative (MLTI) that most of the middle school teachers did not use laptops as frequently for assessments or for teaching 21st century skills. Beaudry (2004) noted from the middle school teachers he surveyed and other similar studies that teachers perceived a positive impact of the one-to-one laptop initiative was lesson presentation or instructional delivery. Researchers (Bebell & O'Dwyer, 2010; Dwyer, 1994; Shapley et al., 2010) believed teacher buy-in, coupled with their perceptions of technology integration, is essential if changes in instructional delivery effectively engage students in higher-order cognitive activities and improve learning outcomes.

Research Question 2 Findings and Conclusions

Research Question 2 addressed the impact of the one-to-one laptop initiative on teacher perceptions of student engagement in middle school mathematics. The results indicate a moderate to slightly high impact on student engagement activities and assessments. Teachers indicated students used laptops at least 3 days per week for drill and practice, online activities, to explore and take risks, and to perform multiple strategies. Teachers were also asked to rate student engagement behaviors during laptop use. Again, the impact was moderate to slightly high. Teachers indicated many students took advantage of peer collaboration, developing graphics, videos, webpages, and blogs. Students were able to effectively communicate via email, IM, or Internet. Students also displayed positive attitudes and enthusiasm. Although teachers indicated that a high percentage of students were capable of using the laptops effectively, when asked about

having students use laptops to develop products/graphics, 40% of teachers indicated that students "rarely" use laptops for these activities.

Research Question 2 responses indicated a moderate to slightly high impact of the one-to-one laptop initiative on teacher perceptions of student engagement in middle school mathematics. In this study, the majority of teachers (55%) were teaching students in standard math classes. This would indicate that many students were categorized as at-risk and not on track to complete Algebra I (or Common Core Math I) by the end of their eighth-grade year. Although this may be the case, teachers in this study indicated that student engagement increased with a high percentage of students being willing and capable of effectively using the laptops. According to the Algebra Ready group (SAS, Inc., 2011), as middle schools increase the number of students taking Algebra, they need to be aware of two needs: (1) additional technology and (2) training teachers how to use technology effectively to deliver instruction. This group also reported that during the elementary years, teachers might need to alter their instructional delivery to engage students in new innovative ways (SAS, Inc., 2011). Silvernail and Lane (2004) collected data on laptop use and reported that teachers believed all types of students were more engaged in their learning and motivated to learn, particularly at-risk and special needs children. Increased student engagement with subject-area concepts and skills is generally associated with higher levels of student learning across all ability levels.

Research Question 2 responses also indicated a high impact when the teachers were asked about student collaboration and students communicating using 21st century concepts and skills. The teachers responded in the following manner: 61% of teachers reported a high percentage of students took advantage of collaboration; 63% of teachers reported a high percentage of students were capable of using laptop resources; and 80%

of teachers indicated that a high percentage of students effectively communicated via email, IM, or internet. Raulston and Wright (2010) believed 21st century learning would require a stronger emphasis on technology, student engagement, and student achievement. McVerry et al. (2009) wrote that student engagement and collaboration is increased when students are instructed using 21st century skills and navigating the Internet appropriately. This is good news for Dr. Goodnight, CEO of SAS, and other futurists who believe American students equipped to use STEM skills and work collaboratively will be able to compete for 21st century jobs (Atomic Learning, 2009; P21, 2010; SAS, Inc., 2011; Wagner, 2008).

Research Question 3 Findings and Conclusions

Research Question 3 addressed what middle school teachers perceived as the benefits of having a one-to-one laptop initiative. The majority of teachers agreed that there were benefits to having the one-to-one laptop initiative. The responses included common themes such as instructional delivery methods and strategies, online resources, instant feedback, individualized instruction, effective monitoring, student engagement, and technical support. Teachers who have a favorable understanding about technology use for student learning continue to learn and seek new ideas, try new technologies, and support technology integration efforts (Shapley et al., 2010).

When the teachers were asked how the use of laptops changed their instructional delivery, 90% responded as follows: (1) 50% of teachers indicated there were more online resources for teaching and learning, (2) 33% agreed that immediate or instant feedback occurred and an increase in individualized instruction, and (3) 28% of teachers perceived that during laptop use they were able to increase monitoring and decrease lecturing. These perceptional changes to instructional delivery in a one-to-one

environment are similar in the study by Bebell and O'Dwyer (2010). Bebell and O'Dwyer used four empirical studies to highlight important themes. The themes were instructional delivery, relevant professional development, supportive school and district leadership, and an increase in student engagement.

Student engagement benefits involved more collaboration, student exploration, and an increase of higher-order thinking activities. These are important because they directly relate to 21st century learning. The findings in this study were also evident in a report by Silvernail and Lane (2004). In the report of the initial phase of the MLTI, teachers reported that students are more engaged in their learning, use the laptops to effectively find and organize information, and produce better quality of work. Using Bloom's taxonomy, coupled with technology integration, teachers are able to engage students in 21st century higher order thinking skills such as analyzing, evaluating, and creating.

Marc Prensky (2001) described today's students as digital natives who are used to having information in real time and networking with peers. He suggested that for effective student engagement to take place, today's teachers must learn to better communicate with students using what the students are familiar with – technology. This is evident by the open responses on The Impact of the One-to-One Laptop Initiative on Teacher Perceptions of Instructional Delivery and Student Engagement in Middle School Mathematics Survey. One particular comment spoke volumes about the importance of technology in today's education:

> Technology is an integral part in the culture of youth today, and to try to separate teaching and technology is almost a futile effort. With technology, students can be more creative with their presentations and research, can spend a significant

amount of time developing higher-order thinking skills through challenging tasks, and students seem more engaged in online assessments because of instantaneous results (click submit and get your score).

Having an instructional facilitator available was also reported as a benefit. The teachers believed having "an extra" person for technical support helped with technology implementation. Facilitators provide resources for 21st century teaching strategies such as virtual manipulatives, online learning games, and student-led instruction using Podcast and videos.

As reported on The Impact of the One-to-One Laptop Initiative on Teacher Perceptions of Instructional Delivery and Student Engagement in Middle School Mathematics Survey, most of the teachers in this study were in year 3 of the implementation and were receiving professional development on a quarterly basis. There were no significant differences regarding the teacher's gender, grade level, class size, or their experience level on how they perceived the impact of the laptop initiative on instructional delivery. Although there is still a need for more research on the impact of instructional delivery in a one-to-one environment, there is enough evidence from the study to indicate a moderate impact on instructional delivery. Eighty-nine percent of teachers "agree" or "somewhat agree" that instructional delivery is more effective due to laptop use.

Given the potential of the one-to-one laptop initiative on instructional delivery and student engagement and the need for student knowledge and progress in the area of mathematics, further research is still needed. Possibly it will take longer for the implementation to reach a "significant level" of impact in the mathematics classroom with a focus on student achievement.

Recommendations

The lack of data on student achievement in middle school mathematics while using laptops leads to the need for research about effective use of 21st century concepts, skills, and programs. Over 3 decades ago, Seymour Papert's (1980) constructivist theory about student learning and the importance of collaboration and exploration, as well as using technology tools to promote higher-order thinking skills and problem-based learning, was a foreshadowing of the 21st century concepts and skills encouraged in today's classrooms. Additional beneficial research on one-to-one learning environments might include administrator and student perceptions of instructional delivery and student engagement, analyzing pre and post results of academic progress to inform educators of effective strategies to help improve student achievement and higher-order thinking skills, and reviewing the number of students successfully completing Algebra during the middle school years to see if progress is being made in preparing students for college and a globally competitive workforce. Also a qualitative study done on a larger scope with other districts in North Carolina and across the country should include interviewing teachers to share their stories to determine in-depth perceptions on best practices to use for technology integration. It would be beneficial to further understand the one-to-one initiative in middle school math classrooms.

From the research finding that a one-to-one learning environment only moderately impacted instructional delivery, a recommendation would be changes to both teacher content knowledge and pedagogical practices through high quality professional development. Silvernail et al.'s (2011) findings show mathematics teachers who actively participated in a sustained technology-infused professional development program increased their own content knowledge, changed their classroom practices and beliefs

about teaching, increased classroom technology use and made a significant impact on student achievement. After conducting a qualitative study of a middle school in their first 2 years of the laptop initiative, Beaudry (2004) concluded that although he observed positive student/teacher engagement, he believed the effectiveness of the initiative rested on teacher instructional delivery and student achievement.

Silvernail and Lane (2004) reported the greatest obstacles in integrating the laptop technology more into the classroom were lack of technical support, lack of professional development, and lack of time. The obstacles presented in that study were not specifically mentioned as barriers in this study some 10 years later. However, this 2013 study did identify a noticeable obstacle to frequent use of laptops. Approximately 80% of teachers believe students are capable of using technology effectively but teachers themselves are reluctant to have lessons that are student-led or use other technological resources and peripherals to deliver instruction. Research and findings on this reluctant behavior could be another solution to enhancing the impact of the one-to-one laptop initiative on instructional delivery and student engagement in middle school mathematics.

Teacher perceptions, beliefs, and personal commitments are directly tied to their instructional delivery and practices, which is thereby tied to student engagement and student achievement. As teachers continue to learn and work to integrate 21st century skills into their lessons, both students and teachers can benefit from quality educational experiences and positive student/teacher interactions.

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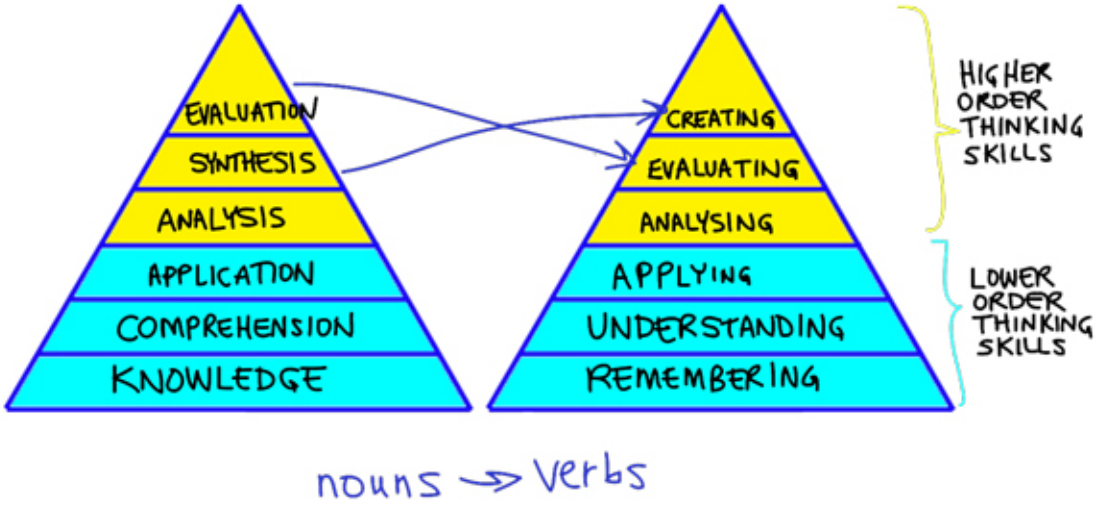
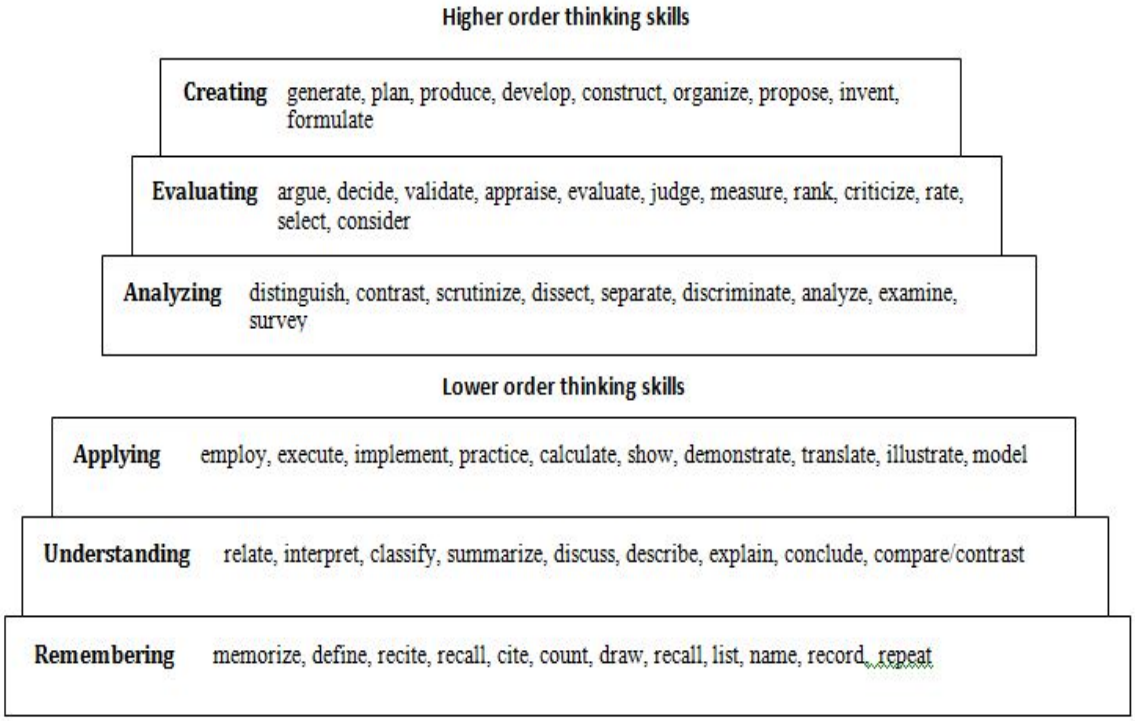
Appendix A

Bloom's Taxonomy Revised

Bloom's Taxonomy – Original and Revised



www.edit302.wordpress.com



www.westminster-blended-learning.wikispaces.com

Appendix B

The Impact of the One-to-One Laptop Initiative on Teacher Perceptions of Instructional Delivery and Student Engagement in Middle School Mathematics Survey

The Impact of the One-to-One Laptop Initiative on Teacher Perceptions of Instructional Delivery and Student Engagement in Middle School Mathematics Survey

General Information

1. I am a
    - Female
    - Male
2. I teach
    - 6th Grade Only
    - 7th Grade Only
    - 8th Grade Only
    - Multiple Grades
3. I have_____ of years of experience
    - Less than 3
    - 4 – 10
    - 11 – 20
    - 21+
4. I have taught using student laptops _____ years.
    - 1 Year
    - 2 Years
    - 3 Years
    - 4+ Years
5. I teach math equivalent to
    - Standard
    - Pre-Algebra
    - Algebra I or Common Core Math I
    - Geometry or Common Core Math II or Higher
6. I teach on average ____ students per class period
    - 15 or less
    - 16 – 20
    - 21 – 25
    - 25 – 30

7. I have on average _____ minutes to teach per class period

    - 80 – 90 minutes
    - 70 – 80 minutes
    - 60 – 70 minutes
    - 50 – 60 minutes

Instructional Delivery – Please answer the following as it pertains to laptop use

8. I use whole group instruction
    - 3+ days per week
    - 2 days per week
    - 1 day a week
    - Rarely

9. I use small group instruction
    - 3+ days per week
    - 2 days per week
    - 1 day per week
    - Rarely

10. I facilitate student –led instruction
    - 3+ days per week
    - 2 days per week
    - 1 day per week
    - Rarely

11. I use student collaborative pairs
    - 3+ days per week
    - 2 days per week
    - 1 day per week
    - Rarely

12. I provide individualized instruction
    - 3+ days per week
    - 2 days per week
    - 1 day per week
    - Rarely

13. The use of laptops has change instructional delivery in the following ways:

Student Engagement (Classroom Strategies and Assignments)

14. My students use laptops to access assignments
    - 3+ days per week
    - 2 days per week
    - 1 day per week
    - Rarely

15. My students use laptops for drill & practice
    - 3+ days per week
    - 2 days per week
    - 1 day per week
    - Rarely

16. My students use laptops to develop products/graphics
    - 3+ days per week
    - 2 days per week
    - 1 day per week
    - Rarely

17. My students use laptops to take quizzes and tests
    - 3+ days per week
    - 2 days per week
    - 1 day per week
    - Rarely

18. My students use online math resources for assessment
    - 3+ days per week
    - 2 days per week
    - 1 day per week
    - Rarely

19. I encourage my students to use laptops to explore and take risks
    - Always
    - Often
    - Sometimes
    - Rarely

20. My students use laptops to perform multiple strategies to solve problems
    - Always
    - Often
    - Sometimes
    - Rarely

21. I communicate with my students via email, IM, or internet
    - Always
    - Often
    - Sometimes
    - Rarely

Instructional Delivery (21st Century Concepts and Skills)

22. I use online math strategies based on research best practices
    - Always
    - Often
    - Sometimes
    - Rarely

23. I use online math strategies that foster the development of higher-order thinking skills
    - Always
    - Often
    - Sometimes
    - Rarely

24. I integrate literacy/vocabulary skills into my lessons
    - Always
    - Often
    - Sometimes
    - Rarely

25. I use problem-based learning during my lessons
    - Always
    - Often
    - Sometimes
    - Rarely

26. I use virtual manipulatives and online calculators
    - Always
    - Often
    - Sometimes
    - Rarely

27. I use online graphs, charts, and tables to enhance instruction
    - Always
    - Often
    - Sometimes
    - Rarely

28. I use other technological devices (bamboos, I-Pads, “Clickers”, Phones) to assess student learning
    - Always
    - Often
    - Sometimes
    - Rarely
29. The teaching strategies that I can use now that we have laptops are:

30. I have access to an instructional facilitator
    - 3+ days per week
    - 2 days per week
    - 1 day per week
    - Rarely

If this is beneficial, explain why:

31. I am provided opportunities for technology professional development
    - Monthly
    - Quarterly
    - Yearly
    - Rarely

If this is beneficial, explain why:

Student Engagement (Behaviors) - Please answer the following as a results of laptop use

32. Percentage of students who take advantage of peer collaboration
    - 75% - 100%
    - 50% - 75%
    - 25%-50%
    - Less than 25%

33. Percentage of students who are focused on online learning activities with minimum disruptions
    - 75% - 100%
    - 50% - 75%
    - 25% - 50%
    - Less than 25%

34. Percentage of students who are capable of developing graphics/videos/webpages/blogs
    - 75% - 100%
    - 50% - 100%
    - 25% - 50%
    - Less than 25%

35. Percentage of students capable of using laptop resources (iMovie, Keynote/Powerpoint/Activengage/Word processor, iPhoto, Garageband)
    - 75% - 100%
    - 50% - 75%
    - 25% - 50%
    - Less than 25%

36. Percentage of students who follow directions with little assistance
    - 75% - 100%
    - 50% - 75%
    - 25% - 50%
    - Less than 25%

37. Percentage of students who display enthusiasm and/or positive attitudes
    - 75% - 100%
    - 50% - 75%
    - 25% - 50%
    - Less than 25%

38. Percentage of students who use thoughtful and relevant questions/answers
    - 75% - 100%
    - 50% - 75%
    - 25% - 75%
    - Less than 25%

39. Percentage of students who are capable of effectively communicating via email, IM, or Internet
    - 75% - 100%
    - 50% - 100%
    - 25% - 50%
    - Less than 25%

40. Percentage of students who are capable of effectively using peripherals (digital calculators, cameras, probes)
    - 75% - 100%
    - 50% - 75%
    - 25% - 50%
    - Less than 25%

41. Percentage of students who are capable of facilitating a lesson (student presentation)
    - 75% - 100%
    - 50% - 75%
    - 25% - 50%
    - Less than 25%

42. Percentage of students with good attendance (less than 10 days for the year)
    - 75% - 100%
    - 50% - 75%
    - 25% - 50%
    - Less than 25%

43. Percentage of students who are performing at or above grade level
    - 75%-100%
    - 50% - 75%
    - 25% - 50%
    - Less than 25%

44. Some of the changes I've seen in my students since we implemented the use of laptops are:

Beliefs

45. Instructional delivery is more effective due to the use of the 1:1 initiative
    - Agree
    - Somewhat Agree
    - Somewhat Disagree
    - Disagree

Please Explain:

46. Student engagement has increased due to the use of the 1:1 initiative
    - Agree
    - Somewhat Agree
    - Somewhat Disagree
    - Disagree

Please Explain:

Appendix C

Permission Letter 1 to Conduct Survey

February 13, 2013

Dr.
Superintendent – School District 1
Main Street

Dear Dr.:

My name is La'Ronda Whiteside and in addition to being principal of XXXXXXXXX in Rutherford County, NC, I am currently a doctoral student at Gardner-Webb University. I am writing to request permission to ask your math teachers in grades 6-8 to complete surveys on their perception of instructional delivery and student engagement in the one-to-one digital learning environment.

Your school district is viewed as a model of digital learning success and I would appreciate the opportunity to conduct surveys to learn more about the impact that a one-to-one digital learning environment has on instruction and student engagement.

My research will be based on a qualitative study using only responses from the surveys and not individual teachers. The data will be reported in aggregated form from three different school districts. I can provide more information or meet with you and/or your technology staffs to further explain my methodology or the focus of my research.

If you grant approval, please sign both copies of this request form and return one to me, keeping the other one for your files.

Thank you for your consideration.

Sincerely,

La'Ronda Whiteside

I (we), _____ grant permission for La'Ronda Whiteside to conduct surveys and use results in published form.

Appendix D

Permission Letter 2 to Conduct Survey

April 23, 2013

Mr.
Superintendent – School District 2
Street
NC

Dear Mr.:

My name is La'Ronda Whiteside and in addition to being principal of XXXXXXXXXXXX in Rutherford County, NC, I am currently a doctoral student at Gardner-Webb University. I am writing to request permission to ask your math teachers in grades 6-8 to complete surveys on their perceptions of instructional delivery and student engagement in the one-to-one digital learning environment.

I would appreciate the opportunity to conduct a survey to learn more about the impact that a one-to-one digital learning environment has on instruction and student engagement for the 2012-2013 school year. The survey will be sent out before the end-of-year testing (mid May). Please see attached letter that will explain the survey.

My research will be based on a qualitative study using only responses from the survey and not individual teachers. The data will be reported in aggregated form from three different school districts. I can provide more information or meet with you and/or your technology staffs to further explain my methodology or the focus of my research.

If you grant approval, please sign both copies of this request form and return one to me, keeping the other one for your files.

Thank you for your consideration.

Sincerely,

La'Ronda Whiteside

I (we), _____ grant permission for La'Ronda Whiteside to conduct surveys and use results in published form.

Appendix E

Permission Letter 3 to Conduct Survey

May 8, 2013

Dr.
Superintendent – School District 3
Street
NC

Dear Dr.:

I am writing to request permission to ask math teachers in grades 6-8 at Middle and Middle to complete a survey on their perception of instructional delivery and student engagement in the one-to-one digital learning environment.

Your school district is viewed as a model of digital learning success as evidenced by the recent recognition from Apple and the success we see each day in the classroom. I would appreciate the opportunity to conduct a survey to learn more about the impact that a one-to-one digital learning environment has on instruction and student engagement.

My research will be based on a qualitative study using only responses from the surveys and not individual teachers. The data will be reported in aggregated form from three different school districts. I can provide more information or meet with you to further explain my methodology or the focus of my research.

If you grant approval, please sign both copies of this request form and return one to me, keeping the other one for your files.

Thank you for your consideration.

Sincerely,

La'Ronda Whiteside

I (we), _____ grant permission for La'Ronda Whiteside to conduct surveys and use results in published form.

Appendix F

Survey Cover Letter

Spring 2013

Dear Mathematics Educator:

My name is La'Ronda Whiteside. I am a middle school principal. I am also a doctoral student at Gardner-Webb University. Please assist the research for my dissertation by completing a 15-minute, online survey that measures the impact of the One-to-One Laptop Initiative on teacher perceptions of instructional delivery and student engagement in middle school mathematics.

Your candid and professional contribution to this study is needed and greatly appreciated. I sincerely thank you in advance for your time and participation. As an educator and doctoral student, it is my goal to pursue research that will provide meaningful information on 21st century mathematics learning in public schools. This survey is designed with that goal in mind.

There are no foreseeable risks to you associated with participating in this survey. The data collected from this survey is confidential and anonymous. The results may be published but your identity will not be known. Participation is voluntary and you may withdraw at any time during the survey. Thanks again for your consideration in assisting me with this important research.

Please select the link below to participate in the survey.

https://www.surveymonkey.com/s/XJJMDXH

Appendix G

Initial Reminder Letter

Good Evening Math Educator:

As the school year comes to a close, I hope you all are having special moments with your students and gaining a boost of energy to administer tests, complete assessments and grading, and plan for next year. If you have a few minutes (15 minutes approximately) could you please complete the survey that I emailed about a week ago? I requested that you assist me with research by completing a survey on the perception of the one-to-one laptop initiative. If you have completed this survey, thank you so much. If not, please take just a few minutes to complete by June 1st. Thank you again for providing your perceptions of this 21st century initiative. I have attached the link below.

Reminder - This survey is optional, anonymous and they're no foreseeable risks to you or your school for participating.

La'Ronda Whiteside

https://www.surveymonkey.com/s/XJJMDXH

Appendix H

Responses to Question 13

Question 13 - The Use of Laptops Has Changed Instructional Delivery in the Following Ways

Grading is much easier.

It serves as good source for the students and they are able to practice the skill but it does not change my instruction.

The students have more resources to gain a better knowledge of the math concept being taught that day. The students are more engaged in their laptop activity and are more willing to try to learn. This only works for students who can focus and not get off task.

I no longer lecture the entire 90 minutes. I always have my core lesson that covers key concepts with examples, but I am now able to provide activities to enhance the lecture. I am able to use online math programs that are aligned with Common Core to allow students to work at their own pace and level of ability. While students are engaged, I am able to circulate and help students individually. I am now able to post notes and assignments for students to review as needed. This is especially helpful when a student is absent. I use videos from sites such as Discovery Education and Teacher Tube to reinforce my lessons. Students and parents are able to view the videos from home when working on homework. I am able to implement more projects in mathematics that foster higher-order thinking skills through research. I can quickly pull examples during lecture when students ask how various concepts will ever be used in "real life." I am also able to clearly convey the importance of technology in the workplace to my students by allowing them to mock skills such as drafting, finance, and statistics into lessons. The laptops have allowed me to customize activities to reach students of all levels and learning styles. The laptops have allowed me to use online journals in math. Students are very creative with their journals and I have seen more participation than with the math notebooks in the past. Their journals can be accessed to add notes and vocabulary words as needed. This serves as a notebook that can be reviewed next year if necessary. Threads on Angel allow me to make quick assessments. I usually post a question that is to be answered at the end of class. Students enjoy reading through the threads and are able to access them at any time for review. I was worried about implementing collaborative groups, but this has not been an issue.

I do not use laptops very much in my classroom; therefore my instructional delivery has not changed very much.

They are able to work in small groups on projects, online math games in which they compete with other classes and schools, and research. I give specific roles within each group to keep students on task and have noticed that they take the initiative to use available online resources to explore and discover solutions on their own without relying on the teacher as much as the past. Before the 1:1 initiative, the same lessons took me hours to plan each day. Parent communication has improved due to their ability to access grades and assignments for home.

More use of current informational textual reading and real world applications awareness for my students.

There are days when I am solely one-to-one as the student work on various assignments based on their levels.

I am no longer in front of the room teaching while students watch. I am able to monitor students more closely and address individual needs. I allow students more freedom and control.

A wider variety of materials, information, etc.

I try to make things more interactive for the kids. And they have access to my notes and flipcharts. The laptops have changed how quickly I can give feedback to the kids and have helped them become more responsible for their grades and completing assignments.

Students have a can do attitude. They are more intent on getting the correct answer. The students have instant feedback on their answers. Students also are more independent. I can also watch how the students as a class are doing. Also, I can individually help students as needed.

Not so much in my instruction but allows the students to reinforce the concepts with various programs.

All test and homework assignments are online. Instruction and classwork is on paper. My day users may switch order.

Assessments, Note-taking, Discovery led teaching, Web quests, Yearlong online reviewed.

Having 1:1 laptops has given me the opportunity to use technology for student investigations or practice for portions of class periods (perhaps a 5-15 minutes part of a 60 minute class) in a way that I probably wouldn't have used the tech resources if I'd had to go to a computer lab for students to have access. Previously, I might have just done a
demonstration on the projector, but now students (individually or in pairs) can do their own investigation. I also have used it for students' individual skills and practice. I like they have instant feedback on the correctness of their answers, so they don't spend a large chunk of time doing things the wrong way.

I use the laptop to deliver instructional materials to students. Students use it to explore concepts they do not understand. For example, find videos and websites that explain. Use it for students to practice concepts through games or other web delivered practice such as IXL.

The one-to-one laptop initiative has allowed me to completely change the way I deliver lessons. Instead of face-to-face instruction with me in front of the classroom, students "learn" the material at home through videos instead of my standing in front of the classroom teaching on a daily basis.

Tracking growth of each student is available through different programs. Identifying individuals' gaps can be found quickly using data. Data collection and assessment scores are available immediately. Allows for more precise planning of lessons.

Appendix I

Responses to Question 29

Question 29 - Teaching Strategies That I Can Use Now That We Have Laptops Are

Manipulatives and better graphs

Incorporate graphs and data from online resources

Question #21: Student communication takes place on Angel through discussion threads and email if a student has a question from home. I do not allow my students to IM or to contact me outside of Angel or school email. Collaborative Grouping Peer Pairs Online Math Journals Online Discussion Threads (on Angel) Ticket Out the Door (submit answer in drop-box) Interactive Games Student-led instruction (Podcast, videos, presentations, etc.) Real Life Simulations

Individualizing instruction

I am not sure how to answer this question

Students can search for information themselves; this makes it more meaningful that just being told.

Active Engage, assessments on Angel that provide immediate feedback, online learning games, etc.

Drill and practice – my students do not act as if it is such a chore to practice math skills on the computer

YouTube video presentations, and skill based exercises

Flipping lessons – I don't particularly like this method of teaching math (it tends to be lecture/practice approach rather than an investigative, student-centered approach), but it has been helpful for students (whether they were absent or they've just forgotten how to do something) to be able to refer back to video tutorials I've made on my I-Pad. I also make video answer keys showing step-by-step how to work out a problem. This is an improvement over giving students answer keys, or even answer keys with work shown, because I can "talk" students through the solutions.

Immediate feedback

Activengage, Numbers, Keynote Google Sites

I'm moving toward more problem-based learning

Student-made instructional videos, research and collaboration on cross-curricular projects, the flipped classroom, online "modules" for individually-paced learning needs, IXL and ClassScape as assessment and enrichment tools…

Virtual manipulatives, tutorial videos, immediate feedback for correction

Appendix J

Responses to Question 44

Question 44 – Some of the changes I've seen in students since we implemented the use of laptops

They do not know how to focus their attention. They have become too distracted by the laptop. They can easily get off task.

More involvement for some students but others it was more of a temptation to be off task.

Some are more motivated, some are more distracted by the laptops

Students are more engaged in class when they are provided hands-on activities to practice. Students are going beyond the basic content and are seeing how concepts are related to real-life situations. The laptops can be a distraction for some, so close monitoring is necessary (we use Lan School). One drawback is that students spend time on the laptops on things that are not school related. I have seen time dedicated to homework and studying decline. Students report staying up late playing on the laptops, so they are often tired in class. Just as with a personal home computer, parent monitoring could alleviate this issue.

To be honest, those who want to do well do, and those who don't, don't.

Much higher level of engagement - students becoming leaders - students being responsible for their own learning

Increased motivation to learn

Students are more comfortable with technology. They have more experience creating/designing using technology. They also seem to be more organized.

I am amazed at the skills my students have when it comes to computers. They have taught this old lady a lot of things. Also, if I have problems with the computer, they will show me what to do. This gives my students a sense of pride and a can-do attitude.

What awful things they do with them during down time.

Lack of motivation

A greater engagement in learning and a maximize use of time on task. Students are constantly working and as a teacher I can implement more meaningful task within a class period.

Some are more engaged with laptop use; others are much happier when they are able to do things on paper rather than on laptops. I try to find a balance, just as with any other learning style/preference. I do find that they are more easily distracted, and often think they can get away with of-task behavior because the teacher can't always see what's on their screen.

My first year teaching with laptops-unsure

At first, I thought the laptops would be a distraction to students because of the readily available access to games or other applications that were not relevant to the instruction or curriculum. However, great progress has been made in how we can monitor students' laptop use at school, and now with LanSchool, I have seen student focus during laptops increase and off-task behavior decrease significantly.

More engagement on a daily basis, especially with difficult objectives

Appendix K

Responses to Question 45

Question 45 – Instructional delivery is more effective due to the use of the laptop initiative. Please explain.

The laptops are a tool. My delivery is dependent on my style. I believe that makes my instruction effective not the laptops.

Some teachers are using it effectively; others are still struggling with it.

Teachers are able to provide activities to meet the needs of all learning styles within the same classroom. Teachers are able to easily customize lessons according to individual ability. Teachers are able to implement multiple activities in one lesson to keep the attention of their students.

Instructions can be viewed and reviewed when necessary.

Through Angel, everything is more centralized for the kids. They have access to more instructional resources and faster feedback from assessments. Teachers have a variety of ways to deliver/vary instruction to fit the needs of their students.

The kids often do not use appropriate sites for research and get off task.

I am able to present the material in various ways that enhances all the learning styles in my classroom.

I think our administrators feel that use of technology means a lesson is better than the same lesson without the use of technology, and this isn't always the case. For every lesson I teach, I evaluate several options to determine the best way to teach a concept. I choose the best one, regardless of whether it uses the laptops or not. Often, this ends up being a combination of paper-and-pencil work and laptop work -- but I think my approach is perceived as being inferior to those who use the laptops more consistently in their classrooms. And I never assess using online assessments. I would argue that I know a lot more about my students' math skills because I can analyze their step-by-step work to pinpoint misconceptions and incomplete understandings.

My first year teaching with laptops-unsure. Overall the technology initiative has improved instructional delivery- promethean boards, etc.

We are progressing forward in a digital society, and in order to better meet the 21st needs of our students, our educational system needs to reflect this progress. Integrating technology into the everyday academic world of students' prepares them for the heavily inundated world of technology they will encounter upon graduation and in the workplace. Also, students find that learning using technology is more relevant because the material is presented, manipulated, and enhanced using a medium with which they are comfortable. Lessons can be more engaging when using technology, and research is MUCH easier.

I only need 5-10 minutes of instructional delivery and then use other resources to mix into the lesson that I am teaching. I have more time to actually help the students work on problems, not spend all class talking about the problems. More interaction with students, more discussions, and more one on one time working with students.

Students misuse computer, therefore have to be made a restricted user/day user therefore alternative assignments are made.

Appendix L

Responses to Question 46

Question 46 – Student engagement has increased due to the use of the laptop initiative.

Student engagement should be happening with or without the laptop. My students are engaged but depending on the activity depends on whether they are more or less involved when using the laptop.

Student engagement has increased; a myriad of student behavior problems has also increased because of the access to technology and social media.

Students are able to take responsibility for their learning through exploring and self discovery more so now than before the initiative. Students are able to access resources from home when necessary. Students are more engaged in learning. Students reach beyond the classroom.

To be honest, those who want to do well do, and those who don't, don't.

The laptops engage the students more, particularly with online games/activities and collaborative projects. However, student distraction has also increased due to the laptops. Many of them try to multi-task when they need to focus their full attention on the lesson. I have to frequently monitor my classroom to check for off-task students, so most of the time I now teach from the back of the room using the active slate.

Sometimes we have students that are not exactly were they are suppose to be on the computer.

They are so engrossed in games and skype and do not spend time on homework and also do not sleep enough at night because they stay up on their computers.

Students understanding can be assess immediately; therefore, students are having to say focused and aware of their learning.

It really depends on the individual student's preferences. And I think our students are so accustomed to having the laptops now that it's just there as a tool, not a novelty. With such a long list of content we have to teach in 6th grade math it's hard to justify the class time to use laptops for project -based learning or in other innovative ways that are more common in the reading or social studies classrooms.

I feel my students are more engaged when I use laptops.

Students are even more off task. The computer is more of a “toy” than an educational tool to students.

Technology is an integral part in to the culture of youth today, and to try to separate teaching and technology is almost a futile effort. With technology, students can be more creative with their presentations and research, can spend a significant amount of time developing higher-order thinking skills through challenging tasks, and students seem more engaged in online assessments because of instantaneous results (click submit and get your score).

Lesson can be tailored to the level each student’s needs. No student feels they cannot do the work, or the work is too easy. When curriculum is exactly what they need, the students stay focused, feel good about what they are doing, and work hard every day.