Elementary Teachers’ Perceptions of Technology as a Catalyst for Constructivist Practices in the Classroom: A Case Study

by

Lynne Brown Menard

A dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of Education
Department of Educational Leadership and Policy Studies
College of Education
University of South Florida

Major Professor: Steven Permuth, Ed. D.
Arthur Shapiro, Ph. D.
John Ferron, Ph. D.
Howard Johnston, Ph. D.

Date of Approval:
November 8, 2010

Keywords: leadership, self-regulated learning, technology in education, technology integration, one-to-one laptops

© Copyright 2010, Lynne Brown Menard
Dedication

This research is dedicated to my family. Without their support and encouragement I could not have persevered. For my husband, Vic, to whom I owe the greatest debt. His intellectual and emotional support during this extended project can never be repaid. His support in every aspect of the process is why there is the first completed dissertation in our family. To my daughters, Amy and Michelle, for their energy and excitement about life and learning. They have already accomplished so much in their lives. They encouraged me to pursue my dreams.

To Dr. Arthur Shapiro, and his wife, Sue: Your tireless support and encouragement helped me keep my eye on the prize, a Doctorate in Educational Leadership. You were the bridge across the tumultuous waters of the dissertation process.
Acknowledgements

First, I would like to thank all of the EDGE community in Manatee County. Without the students, teachers, administrators, and district support this research would not have been possible. These dedicated professionals continue to encourage students to learn, dream, and achieve. Special thanks go to the staff and students at Robert E. Willis Elementary. The EDGE and e-Folio classrooms at Willis provided a working model of the dynamic teacher-student relationships that are so prevalent in a technology-infused learning community. I specifically want to thank Principal Bill Stenger for his support of my efforts to complete this project.

Then, thanks go to my dissertation committee who helped me through the process to completion. I owe many thanks to Dr. Arthur Shapiro for his years of constant support, ideas, kindness and discussions about this project. I thank Dr. Steven Permuth for his insightful discussions on the project. His ability to delve deeply to the core of a problem helped me understand the essence of changing teaching and learning. Dr. John Ferron brought clarity to the statistical portion of the project. I thank him for the time he spent examining the methods and data portions of my study. Finally, I would like to thank Dr. Howard Johnston, for sharing his vast knowledge of focus group studies. His suggestions regarding focus group interviews were invaluable in this study.
Table of Contents

List of Tables vi
List of Figures vii
Abstract viii

Chapter One: Introduction 1
  Statement of the Problem 3
  Purpose of the Study 4
  Research Questions 4
  Significance of the Study 5
  Definition of Terms 6
  Assumptions 7
  Limitations of the Study 8
  Summary of Chapter 8

Chapter Two: Review of the Literature 9
  Technology in Education 9
    The Need for Technology Integration in Curriculum Using Constructivism as a Framework 9
  Self-Regulated Learning (SRL) and Technology: Ties to Technology and Curriculum 11
  Review of Manatee County EDGE Laptop Initiative Grant Reference Literature 16
    Background 16
    Grant Reference Literature 17
  Summary of Chapter 22

Chapter Three: Method 23
  Statement of the Problem 23
  Purpose of the Study 24
  Research Questions 25
  Qualitative Research and the Case Study Method 25
  Sample 27
List of Tables

Table 1. Raw Data for Individual Items for Teacher Survey for Attitude 116

Table 2. Raw Data for Individual Items of Teacher Survey for and Comfort 117

Table 3. Data for Attitude, Confidence and Comfort Surveys 118
List of Figures

Figure 1. The Student Learning Model. 101
Figure 2. The Classroom Teaching Model. 102
Figure 3. The Learning Community Model. 103
Figure 4. The Foundations Model. 104
Figure 5. The Round Table. 106
Figure 6. Distribution of Teacher Attitude Scores 108
Figure 7. Distribution of Teacher Confidence and Comfort Scores 110
Figure 8. The Student Learning Model. 136
Figure 9. The Classroom Teaching Model. 139
Figure 10. The Learning Community Model. 141
Figure 11. The Foundations Model. 143
Figure 12. The Round Table. 145
Abstract

This research described and analyzed teachers’ perceptions of technology as a catalyst for stimulating classroom constructivist practices. The teachers were located at multiple schools in one Florida county. The teachers were selected based on participation in the Education through Dynamic Global Experiences (EDGE) program. This One-to-One program provides one laptop for every classroom teacher and student.

The most frequent ideas in the literature fell into three sections. First is the need to integrate technology as part of the curricula and use constructivism as a theoretical framework for technology integration. The second relates to the best practices of incorporating classroom technology driven by constructivist theory and Self-Regulated Learning (SRL). The third describes one county’s EDGE program and related literature.

Two focus groups gathered information from teachers with various levels of classroom and EDGE experience regarding perceptions of a One-to-One classroom. Teachers were surveyed regarding perceptions of processes of using technology as a catalyst for constructivist practices, changing teaching and learning, teaching style, and curriculum content delivery.

Conclusion:

Data collected from teacher surveys and focus groups support the premise that “Elementary teacher’s perceptions of technology as a catalyst for constructivist practices
in the classroom” is valid. This conclusion was demonstrated by evaluating teacher perceptions, patterns of experiences, and the emergence of constructivist instructional practices when technology is infused in the curriculum. The major recurring themes supported a constructivist culture that was: collaborative and independent, receptive to individuals and valued their relationships, replete with opportunities for distributed leadership, interconnected with integrated technology, populated with highly engaged and motivated individuals, self-sustaining, safe and nonjudgmental, vision driven, built on authentic assessment and curriculum, and evolving at the speed of technology.

Implications follow:

1. Technology can be used as a catalyst for classroom constructivist practices
2. Teachers believe that technology supports increasing standardized test scores.
3. Training in constructivism promotes use of technology by teachers and speeds changing teaching pedagogy into constructivist practices.
4. Teachers’ perceptions are important in changing pedagogy toward constructivism.
5. School administration must support classroom technology and constructivist teaching
6. Students and teachers can collaborate in designing, developing, and implementing their learning experiences and students can actually take control of their learning experiences.
Chapter One:

Introduction

Many school districts across the nation are searching for ways to improve their organizations, teaching, and learning, through the increased use of technology. As literature increases on technology use in the educational arena, it seems to indicate that educators are becoming aware of this approach as an aid for meeting their academic and organizational change goals (Nanjappa & Grant, 2003; Phillips, 2000; Shapiro, 2003). The present study examines elementary teachers’ perceptions of using technology as a catalyst for constructivist practices in the classroom. “Constructivism is a learning or meaning-making theory, that offers an explanation of the nature of knowledge and how human beings learn. It maintains that individuals create or construct new understandings through the connection of what they already know and believe, together with new found learning, and draw on their own conclusions” (Brooks & Brooks, 1993, 1999, 2000; Lambert, 2003; Marlowe & Page, 1998; Shapiro, 2000, 2003; Isaacson, 2004). This study also examines the background and steps that evolved throughout the reform process.

Limited research exists on utilizing technology as a school reform model, and on teachers’ perceptions of the development of change strategies resulting from the use of technology. The theoretical basis for this study is Kurt Lewin’s (1947) force field analysis, which is a tool for organizational development. The diametrically opposed
forces, which affect organizations, are the driving forces and the restraining forces. The driving forces move change forward, while the restraining forces hold back changes. The social system known as an organization tends to seek a balance between the driving forces and the restraining forces. This equilibrium results in a status quo period of the organization. Lewin’s idea to move an organization out of this equilibrium or status quo is to break the balance of the opposing force fields. Lewin called this process “unfreezing the organization.” By weakening or strengthening one or more of the forces, unfreezing of an organization can be accomplished. Once that step is completed, the change process can begin. Once the change has been implemented the refreezing process begins. Refreezing involves the process of acceptance. In this way a new equilibrium is reached by the organization. The opposing forces are becoming more balanced and the resulting change has become pervasive and part of the culture of the organization (Chance & Chance, 2002). Systems do not remain stable, though. They will tend to “run down” or slide back to the way things were in the past (Shapiro, Benjamin & Hunt, 1995; Shapiro, 2000). This cycle of entropy describes how organizations lose their focus on the mission. People forget the mission. Attrition and turnover in staff can exacerbate this problem.

Planning must be an integral part of the system that is trying to change. Even when some change has taken place, the leaders must be aware that planning and reinforcement of the mission should be ongoing.

When planning for change, the force field analysis model can be used as a diagnostic or analytical tool. Educational leaders can use this model to identify driving and restraining forces. By using this knowledge, the educational leader will be able to plan and design appropriate strategies to encourage change (Shapiro, 2000).
Statement of the Problem

Children’s learning is facilitated when they are challenged, interested, and engaged in the processes of learning. Students can become more engaged in learning when they have access to technology (Doolittle, 2003). Ubiquitous access to technology facilitates and increases the speed of changes in teaching style (Doolittle, 2003). Technology integration into the classroom can transform the teaching and learning of key content and skills. (Doolittle, 2003). Teachers can change into facilitators in the classroom (Nanjappa & Grant, 2003). As technology becomes more pervasive in the classroom, teachers tend to work more as collaborators with the students on curriculum. When students become more responsible for their own learning, they can explain quarterly activities and learning goals to their parents during student-led conferencing (Benson & Barnett, 1998). Students understand what is required and can explain rubrics to their parents and how well they progressed during the quarter. Therefore, the problem to be studied is whether computers in the classroom can alter pedagogy and help teachers create a constructivist environment in their classroom (Huffman, Goldberg & Michlin, 2003). The use of technology in the complex classroom environment should be viewed as a gradual process of implementation and change. Change should be viewed as a process not an event (Hall & Hord, 2001). It is important to take a long-term view of the process of change when implementing an innovative program. Materials used in the curriculum can follow the social constructivist view of learning (Gergen, 1985; Bruner, 1986; von Glasersfeld, 1995). The school organization adapts itself to the curriculum, style of
teaching, and delivery of curriculum to students as technology is introduced (Nanjappa & Grant, 2003).

Purpose of the Study

The purpose of this case study is to describe and to analyze elementary teachers’ perceptions of the effectiveness of technology as a catalyst for constructivist practices in the classroom. As school leaders and teachers make decisions on the use of technology in schools, and because educational technology continues to evolve so quickly, it is imperative that teachers’ perceptions of technology be examined and monitored over time to determine the efficacy of those decisions. This study comprises 33 elementary teachers in schools in one county in Florida. These teachers completed a survey designed to determine individual attitudes, confidence, and expertise in a One-to-One classroom. From the survey, seven teachers participated in two focus groups separating beginners and experts. The focus group teachers were interviewed to gather information regarding their perceptions of technology as a catalyst for changing pedagogy and implementing constructivist practices.

Research Questions

The author of this study focuses on the practices of elementary school teachers who are implementing the One-to-One technology initiative, what might be learned from them, and how the teachers’ perceptions of the efficacy of technology as a catalyst to implement constructivist practices in the classroom affects the implementation of change. Research Questions:
1. How do novice and expert EDGE teachers perceive that technology changes teaching and learning in the classroom?

2. What patterns of experiences emerge in the classroom when implementing technology?

3. How can one use technology to promote constructivist instructional practices?

4. What are the major barriers that teachers report they experience when implementing technology into the curriculum?

Significance of the Study

The significance of the problem to be studied may be that findings may be used to advance the body of existing knowledge about the impact of technology, in the form of one computer per student and teacher, on elementary teachers’ perceptions of technology as a catalyst for teaching and learning, and implementing a constructivist pedagogy. While there is some authenticated research specifically aimed at these research questions, this study included foundational and philosophical positions surrounding issues of constructivism.

By using the Analysis of Dynamics of Change Model (Shapiro, 2000), the teachers were given a six-step strategy for defining issues. The six steps are Issues/Questions, Summary/Conclusions, Potential Lines of Action/Initiatives, Rationale for Actions, Underlying Themes, and Major Outcomes. In the development of a plan for changing teaching and learning, the teachers’ and students’ experiences help them internalize the constructivist philosophy (Isaacson, 2004). Involving teachers in decision-making on how to solve technology integration issues is constructivist in nature.
Definition of Terms

*Analysis of Dynamics of Change*: a problem solving, decision making process used in a teacher-centered plan to create a constructivist environment (Shapiro, 2003).

*Communities of Practice*: groups of people, whether at work, school, or home who generate collective learning that over time “results in practices that reflect both the pursuit of our goals and the attendant social relations” (Lave & Wenger, 1991). Sometimes we are core members and other times we are on the margins (Lave & Wenger, 1991).

*Constructivism*: a “learning or meaning-making theory, that offers an explanation of the nature of knowledge and how human beings learn. It maintains that individuals create or construct new understandings through the connection of what they already know and believe, together with new found learning, and draw on their own conclusions” (Brooks & Brooks, 1993, 1999, 2000; Lambert, 2003; Marlowe & Page, 1998; Shapiro, 2000, 2003, Isaacson, 2004).

*Efficacy*: “…people’s beliefs in their capabilities to exercise control over their level of functioning and environmental demands. Unless people believe that they can produce desired effects by their actions, they have little incentive to act.” (Bandura, 1993).

*Perception*: Interpretation of events by people as a result of past experiences, current understanding, and the present situation and information. Different situations result in diverse responses from people even when they are confronted with the same information.
“Even with the most objective task, it is nearly impossible to keep our subjective views from altering our perception of what really exists” (Napier & Gershenfeld, 1999, p. 3).

School cultures: “complex webs of tradition and rituals that have been built up over time as teachers, students, parents, and administrators work together and deal with crises and accomplishments” (Deal & Peterson, 1999, p.7).

Self-Efficacy: Self-efficacy states that “beliefs in one’s capabilities to organize and execute the courses of action required to produce given attainments” (Bandura, 1997a, p.3).

Self-Regulated Learning (SRL): “Self-regulation refers to students’ self-generated thoughts, feelings, and actions, which are systematically oriented toward attainment of their goals” (Schunk & Zimmerman, 1994, p. ix).

Traditional education: a teacher-centered, oral and group based style of teaching (Keegan, 1990, p.3).

Assumptions

The assumptions in the study are:

People will respond honestly.

Meanings on the questionnaire will be clear to respondents.
Limitations of the Study

This is a qualitative study conducted in one public school district in Florida. The ability to generalize these findings to any other elementary school teachers becomes unrealistic under these specific circumstances. Even with member checking, coding helpers, and empirical readers, the researcher enters the study with biases. Complete objectivity in any study, including case studies, is all but impossible (Merriam, 1998).

Summary of Chapter

In this chapter the author introduced the research study by discussing the background of improving organizations, teaching, and learning, through the increased use of technology as a catalyst for constructivist practices in the classroom. Some background was given on constructivism. The researcher described the need to understand utilizing technology as a school reform model and of teachers’ perceptions of the development of change strategies resulting from the use of technology. Kurt Lewin’s (1947) force field analysis was discussed. The statement of the problem, purpose of the study, research questions, significance of the study, definition of terms, and limitations were presented.
Chapter Two
Review of the Literature

In this chapter the researcher reviews the existing literature deemed relevant and important to this study. The purpose of this section of the researcher’s study examines literature pertaining to improving educational organizations through the increased use of technology. This review is divided into three sections. The first section is related to the need to integrate technology as part of the curricula and the use of constructivism as a theoretical framework for technology integration. The second section relates to best practices of incorporating technology in the classroom driven by constructivist theory and Self-Regulated Learning (SRL). The third section describes the Manatee County EDGE program and related literature.

Technology in Education
The Need for Technology Integration in Curriculum Using Constructivism as a Framework

The literature concerning technology and change seems to be supporting the use of computers in the classroom. “Computers can be used to help teachers create a constructivist learning environment in the classroom” (Huffman, Goldberg, & Michlin, 2003). Technology in the form of computers can alter the method of teaching and student achievement. The National Council for Social Studies has advocated technology
integration to transform teaching and learning of content and skills (Doolittle & Hicks, 2003). On the other hand, constructivism, even though it is seen as a needed reform (Elkind, 2004), “will succeed only when all three types of readiness are in place: teacher, curricular, and societal” (Elkind, 2004). Constructivism and other reform movement failures can be attributed to the lack of readiness issues alignment. Huffman (2003) states that technological innovation may encourage these types of readiness, but the reform will only be “successful if it incorporates a constructivist philosophy of education” (Huffman, 2003). Constructivists view learning as a “process where students interpret information in light of existing knowledge, and actively construct and reconstruct understandings, rather than receive information from an authoritative source such as a teacher” (Huffman, 2003).

Constructivism is not motivated by political events (such as the curriculum reform movement motivated by the launching of Sputnik) or by social events (such as the Civil Rights Movement). Constructivism is not spurred onward by political agendas (such as the publishing of A Nation At Risk [National Commission on Excellence in Education 1983] and the No Child Left Behind Act). The constructivist movement is pushed forward by pedagogical concerns and motivations (Elkind, 2004).

Other guidelines for interactive media systems have been based on “intuitive beliefs of designers rather than being founded on relevant research and theory” (Deubel, 2003). New opportunities for education are created by technology innovation and require researchers to use a range of theoretical perspectives, including behavioral and cognitive approaches, to optimize the use of technology in teaching and learning (Deubel, 2003).
Self-Regulated Learning (SRL) and Technology: Ties to Technology and Curriculum

Zimmerman (1990) states that the end goal of the educational system is to shift responsibility for learning to the student. Not only does SRL have key processes which help students direct their own learning, it also has implications for teacher interaction and the way schools are organized. This changes the way educators look at student ability and the learning environment.

This ties constructivist views and technology together. Students take more responsibility for their own learning when they have twenty-four hour a day access to technology (Lunenburg, 1998). Different learning styles are accommodated by the many different technologies in the schools and on individual laptop computers. The style of teaching naturally changes from “Sage on the Stage” to “Guide on the Side” when technology is employed. The whole teaching paradigm shifts to focus on student collaboration and student ownership of the projects and learning. Students become the “teacher” as they show newly learned concepts and ideas to their classmates.

Researchers need to address school design, instructional parameters, and curriculum issues that can lead to optimal self-development, motivation, and learning for students with different needs. Just as computers open the doors for students in a nonjudgmental way, each student can feel capable of choosing a product that fits within his knowledge base and comfort level. Students choose the program to display their projects for the teacher.

The instructional design of any curriculum has an impact on the “belief and cognitive systems of learners, knowledge transfer, and efforts to organize and evaluate
classroom activities” (Oberlander, 2004). Problem-based learning is a concept that works hand-in-hand with technology. Teachers pose the problem to the students and the whole class decides on different ways to solve the problems. The students have a supportive atmosphere in which to learn and share results. The self-regulated learners help the emerging SRL students to blossom and grow in their abilities.

Oberlander (2004) states that recent learning systems have undergone a change toward constructivist concepts and practices. This pedagogical shift has happened at the same time that technology has become more prevalent in the schools. Many technology applications that are robust, interactive and self-directed are being used in the classroom. Problem-based learning can be used as a “vehicle for change in which learners become active constructors of knowledge through group based collaborative efforts” (Oberlander, 2004).

Alexiou-Ray, Wilson, et al., (2003) state that attitudes of students, school personnel, and parents are often overlooked when implementing technology integrated curriculum lessons in schools. These attitudes, especially if negative, may surprise and frustrate the teacher. Alexiou-Ray stated that just because technology is available does not mean it will be accepted or used. Surveys were created and used to solicit information from the staff, students, and parents of the high school. Alexiou-Ray collected the data and discovered that the majority of responses were positive toward technology use in the classroom. Initial negative responses from parents and students were attributed to discomfort from the unknown. Individual aspects of technology integration were addressed with the parents such as e-mail communication, Internet access, instructional practice, and collaboration of students, teacher, and parents.
Another factor used to assuage the negative attitudes toward technology integration would be to explain fully how technology will be used in the classroom from the beginning of the class. A different teaching style may provide the students with enjoyable technology tools such as Smart Boards, which provide for a more constructivist approach in the classroom (Britt et al., 1998).

Many kinds of learning are encompassed in constructivist learning. Some of these are inquiry-based, connecting reading and writing using Internet activities, and publishing student work in public forums such as student and school websites (Bass and Rosenzweig, 1999).

Alexiou-Ray (2003) concluded that educational settings include many different components. Comparable results may not be reproducible in every educational setting even when using the same technologies (Tolmie, 2001). The educator’s philosophy and teaching style, attitudes of administration, teachers, students, and parents, subject taught, and the student learning styles must be considered to be successful (Alexiou-Ray, 2003). Alexiou-Ray also suggested the use of reflective evaluation and continued access to current research to refine educational practices.

Beisser (2003) stated that normally the majority of first year education students do not interact regularly with each other. There is very little collaboration among students and some students never learn the names of their classmates due to the lecture structure of the courses. These students completed writing assignments that showed “metacognitive growth from constructivist learning activities, problem solving, collaboration, and reflection” (Beisser, 2003). All of these activities tie into self-regulated learning (SRL). Students who reflect on an activity have time to think about the process
and how to improve it the next time. This is an important consideration for new teachers. Since most first year education students have been taught in a traditional way, this exposure to SRL helps them to start changing their paradigm on teaching and learning (Beisser, 2003). It can be frightening for teachers to release the control of the classroom to the students. The more collaboratively the teacher structures the classroom the more interactive the class will become. Students rise to the challenge of creating their own projects and put more effort into the projects than they would have with pencil and paper type assignments. Beisser (2003) also suggests that people learn by “actively constructing new knowledge,” not by having new knowledge poured into their heads. The students in this study were required to “construct their own understanding and to analyze their own learning based on prior knowledge and experience. Human knowledge is stored in clusters and organized into schemata that people use to interpret familiar situations” (Beisser, 2003). Information taught in isolation is either forgotten or inaccessible (Beisser, 2003).

In Seatter’s (2003) article, *Constructivist Science Teaching: Intellectual and Strategic Teaching Acts*, the author states that the hands-on, “messing about” portion of class can be confusing to students and teachers. The necessary criteria for a successful constructivist classroom must still include planning and direction. A teacher cannot just show up for class and let students engage in experiments without laying a foundation for discovery and allowing time for discussion at the end to pull concepts together (Driver, 1986).

A time for reflection is necessary for proper processing of ideas for students and adults. This coalescing of ideas helps to cement them into memories that are available for
recall when we need them. A self-regulated learner is processing information all of the
time. For all students to move forward toward SRL the teacher needs to teach the
strategies which will help the students reach that goal. A classroom that is chaotic with no
underlying structure will not progress in the same way as a thoughtfully designed
classroom and activities. The structure of the constructivist classroom may not be initially
observable to the untrained eye (Shapiro, 2000).

Sotillo (2002) discusses a group of five master’s level students who used wireless
technology to collaborate during a semester to write their theses. These students
developed a community of practice to collaborate and to edit their work.

This form of authentic communication uses both paper and pencil and wireless
technology. Constructivist teaching brings real life activities to students in the classroom.
The students also used self-regulated learning to plan, write their theses, talk to their
cohorts, and reflect afterwards on the experience. This activity shifts responsibility for
learning onto the student as is suggested by Zimmerman (1990). SRL encompasses key
processes which help students direct their own learning, encourages teacher interaction,
and changes the way schools are organized. Teachers become co-learners along with the
students by using technology in the classroom. Educators look at student ability and the
learning environment differently when they are using self-regulated learning strategies in
their own classrooms and schools.
Review of Manatee County EDGE Laptop Initiative Grant Reference Literature

Background

The Manatee County EDGE (Education through Dynamic Global Experiences) Laptop Initiative Grant was written in October 2002 by the Instructional Technology Department in Manatee County, Florida. In late January 2003 the department was notified that the grant had been approved.

The vision of the Manatee County School District has been to work toward becoming a 21st Century Learning Community for more than a decade. The commitment of the residents of the county is evident in the passing of two sales tax referenda providing funding for technology infrastructure and equipment. Other grants received in the county are the Technology Literacy Challenge Funds (TLCF) and the Enhancing Education Through Technology (EETT) funds which helped the district gather data through practical experiences and action research.

In 2002 the county implemented a pilot program of five classrooms in which every student and teacher received a laptop. This was called the One-to-One Laptop Initiative. It has since been renamed Manatee County Schools EDGE (Education through Dynamic Global Experiences). After the parent information/training meeting, each child was able to take his/her laptop home at night to provide twenty-four hours per day access to technology. Instructional Technology Specialists (ITS) were assigned to approximately three schools each to provide countywide coverage and support for the forty-three schools in the district. The ITS team consists of certified teachers who support integrating the technology each school currently owns into the curriculum.
Grant Reference Literature

The purpose of this section is to review and to discuss the reference materials used in writing the grant. Included in this section will be information on which criteria were used and how other school districts measured improvement during the first three years of their laptop initiative. The primary thrust of the grant is “reading improvement using advanced technology-enhanced instruction.” In this grant is a strong emphasis on “standards-based curriculum, communication, collaboration, and inquiry.” All of these aspects are supported by research conducted before the grant was written. These ideas are included in constructivist theory. In support of the grant, Windschitl’s (2002) article was referenced, since he describes and explains the different models of social and cognitive constructivism. Social constructivism is described as “increasing one’s ability to participate with others in meaningful activity” (Windschitl, 2002). Cognitive constructivism describes how “individuals create more sophisticated mental representations and problem solving abilities by using tools, information resources, and input from other individuals” (Windschitl, 2002). He also describes the dilemmas facing teachers who are trying to implement constructivist ideas into their classroom.

Teachers face a variety of problems whenever they attempt to institute a new instructional paradigm. Windschitl (2002) names the challenges: conceptual, pedagogical, cultural, and political. Within conceptual challenges the teacher faces needs to understand the basic underpinnings of cognitive and social constructivism. Pedagogical dilemmas include the need for the teacher to shift from the deliverer of information to the facilitator (Halpin, 1999). The goal is to help students become more self-reliant and productive. Cultural dilemmas include using to best advantage the
knowledge that students bring with them. Teachers take advantage of the experience of
their own students, language patterns, and local knowledge the students possess. Another
dilemma is the political challenge. The teachers must decide the accountability issues and
garner the support needed to teach for understanding.

Of the recent trends in education, constructivism may be the most significant
affecting how teachers teach and students learn (Marzano, 1992; McClelland, Marsh, and
Podemski, 1994). The foundational underpinning of constructivism is that students
actively construct their own knowledge as opposed to learning ideas told to them by
by experimenting with their surroundings. Children make sense of their world in very
different ways than adults. In the process of trying to “make things happen” children
discover meaning (Lunenburg, 1998). Teachers provide the learning atmosphere that
values critical thinking by students, and encourages cooperative learning. Constructivism
invites students to learn with an interdisciplinary curriculum and facilitates authentic
assessment of student understanding (Lunenburg, 1998).

Applications of constructivism are focused on the processes of creating
curriculum that challenge the students’ understanding and development of the mind
(Srommen and Lincoln, 1992). With the advent of No Child Left Behind and the
improvement in access to the Internet, students have a cooperative classroom that has
enlarged to include the whole world. As students are trained in the cooperative learning
style, they see each other as resources as opposed to competitors. As the teamwork
culture of the classroom grows so does the student learning generated in the classroom
(Schunk and Zimmerman, 1994).
Many of the current movements in content area changes are using constructivism as the basis of the reform. The National Council of Teachers of English (NCTE), The National Council of Teachers of Mathematics (NCTM), the National Committee on Science Education Standards and Assessment (NCSESA), and the National Council of Social Studies (NCSS), are all stressing concept development, problem solving, learner generated inquiry, investigations, hypotheses, and interdisciplinary curricula.

Descriptions of constructivist teacher behaviors include “facilitators of learning” and “empowerers of students to construct their own understandings of content” as opposed to providers of information and managers of behavior (Brooks and Brooks, 1993).

Teachers attempting any new idea in schools today need to do some of the same things they were required to do in the past. Teachers must create and adapt curriculum, manage active classrooms, and concern themselves with accountability issues in regard to student learning (Windschitl, 2002). In the EDGE grant it is stated that according to research, teachers need to be involved in comprehensive training with a focus on Best Practices. The teachers must have ongoing support along with access to the tools necessary to implement what they have learned. The group of teachers that are experiencing this change need to have access to a “collaborative environment where they communicate with others” (Davenport and Prusak, 1998) who are involved in the same situation. This idea is called “communities of practice.” Communities of practice are described in Davenport and Prusak’s (1998) book, Working Knowledge: How Organizations Manage What They Know. Co-workers who share knowledge about different aspects of the same job may form a group. These groups are self-organized to
support common work goals or interests. Communities of practice may benefit from their collaboration effectively establishing a regular exchange of information. By including a mechanism in the grant to begin a community of practice for the teachers experiencing the laptop initiative, the way was opened for the teachers to share information that is critical to the success of their individual enterprises. Each teacher is confronted with similar problems from practical to esoteric.

Research indicated that EDGE students are engaged, responsible, goal-setting learners. There is also a positive impact on student learning when the parents, teachers, and community have good relationships. Students who are involved in their own progress monitoring fare better than those who are not. Electronic portfolios and reflective thinking are ways to contribute to students accomplishments. Achievement was linked to “access and to the ability to work at home and school using 21st century learning tools,” (Lave and Wenger, 1991) in this case, laptop computers.

There is an interdependency of the learner, the activity, the community, and the teacher in learning (Lave and Wenger, 1991). The authors state that “understanding and experience are in constant interaction.” Lave and Wenger (1991) support the idea that when students are involved in new activities, they “perform new tasks and functions, and master new understandings.” By allowing the students in the grant to participate in student-lead conferencing with their parents, produce electronic portfolios, and engage in reflective thinking, the students are becoming critical evaluators of their own work. They decide which projects to show their parents each quarter. The Hispanic students explained their work to their parents in Spanish even though the students had completed
their work in English at school. The students were bridging the gap between home and school and in the process were teaching their parents computer skills.

The children in the grant classrooms have formed a community of practice (Wenger, 1999). They exchange ideas and new learning with each other. They share knowledge and engage in cooperative learning. These children have become film makers, video crew members, script writers and editors, completing every aspect of the film making process. The students become more critical thinkers with each film making experience.

The mass media class at Manatee High School produces video advertisements for products. They have one minute to explain the product and to sell it. The students gain a first-hand knowledge of persuasive advertising while completing this project. Actually doing the project builds collaborative connections for the students. The groups they work with are their communities of practice. Lave & Wenger (1991) discuss this “sustained participation in a community of practice from the entrance as a newcomer through becoming an old-timer with respect to new comers, to a point where those newcomers themselves become old-timers.” This produces a diverse group with many forms of relationships and levels of expertise.

Rockman (1998, 2003) espouses having access at home for students as a means to closing the digital divide. When students have full time access they become more responsible for their learning and more independent.

Stevenson (1999) from the Department of Educational Leadership and Policies at the University of South Carolina produced a three year report for the laptop computer project in the Beaufort County School District. Stevenson (1999) found that in year three,
“both teachers and students continued to respond positively to the impact of the laptop computer project. Students continued to score well on standardized achievement tests.”

The children who were participating in the laptop program continued to keep their test score advantage over students who were not in the program. The classes in which laptops were most likely to be seen were English, history and science. Lesson plans and research were the frequent reasons for teachers to use the laptops. Students who traditionally “have not found success in schools, who participated in the laptop project, continued to perform better than those who did not” (Stevenson, 1999). The laptop students from 1997/98 and 1998/99 who were on free or reduced lunch status “scored approximately the same on standardized achievement tests as students not on free or reduced lunch status who were not laptop participants” (Stevenson, 1999). Of the students participating in the laptop program, females placed as well as males on the tests.

**Summary of Chapter**

In this chapter the review of the literature is presented. The review is divided into three sections. The first section is related to the need to integrate technology as part of the curricula and the use of constructivism as a theoretical framework for technology integration. The second section relates to best practices of incorporating technology in the classroom driven by constructivist theory and Self-Regulated Learning (SRL). The third section describes the Manatee County EDGE program and related literature.
Chapter Three:

Method

A multi-site case study method was chosen to investigate the primary questions of this study. The chapter begins with the statement of the problem, followed by the purpose of the study, and then, a rationale for the use of the case study method. The design of the study is described followed by the procedures used. The chapter ends with an examination of the data collection procedures.

Statement of the Problem

Children’s learning is facilitated when they are challenged, interested, and engaged in the processes of learning. Students can become more engaged in learning when they have access to technology (Doolittle, 2003). Ubiquitous access to technology facilitates and increases the speed of changes in teaching style (Doolittle, 2003). Technology integration into the classroom can transform the teaching and learning of key content and skills. (Doolittle, 2003). Teachers can change into facilitators in the classroom (Nanjappa & Grant, 2003). As technology becomes more pervasive in the classroom, teachers tend to work more as collaborators with the students on curriculum. When students become more responsible for their own learning, they can explain quarterly activities and learning goals to their parents during student-led conferencing.
(Benson & Barnett, 1998). Students understand what is required and can explain rubrics to their parents and how well they progressed during the quarter. Computers in the classroom can alter pedagogy and help teachers create a constructivist environment in their classroom (Huffman, Goldberg, & Michlin, 2003). The use of technology in the complex classroom environment should be viewed as a “gradual process of implementation and change” (Hall & Hord, 2001). Change should be viewed as a process not an event (Hall & Hord, 2001). It is important to take a long-range view of the process of change when beginning an innovative program. Materials used in the curriculum can follow the social constructivist view of learning (Gergen, 1985; Bruner, 1986; von Glasersfeld, 1995, 2000). The school organization adapts itself to the curriculum, style of teaching, and delivery of curriculum to students as technology is introduced (Nanjappa & Grant, 2003).

**Purpose of the Study**

The purpose of this case study is to describe and to analyze elementary teachers’ perceptions of the effectiveness of technology as a catalyst for constructivist practices in the classroom. As school leaders and teachers make decisions on the use of technology in schools, and because educational technology continues to evolve so quickly, it is imperative that teachers’ perceptions of technology be examined and monitored over time to determine the efficacy of those decisions. This study comprises approximately 40 elementary teachers in schools in one county in Florida. These teachers will complete a survey designed to determine individual attitudes, confidence, and expertise in a One-to-One classroom. From the survey, approximately eight to twelve of these teachers will
participate in two focus groups separating beginners and experts. The focus group teachers were interviewed to gather information regarding their perceptions of technology as a catalyst for changing pedagogy and implementing constructivist practices.

Research Questions

1. How do novice and expert EDGE teachers perceive that technology changes teaching and learning in the classroom?
2. What patterns of experiences emerge in the classroom when implementing technology?
3. How can one use technology to promote constructivist instructional practices?
4. What are the major barriers that teachers report they experience when implementing technology into the curriculum?

Qualitative Research and the Case Study Method

The method selected for this research was the case study. A case study is a pragmatic form of research for dealing with problems in which understanding is needed to improve educational practices (Merriam, 1998). Case studies encompass the idea that individuals construct their own realities based on their daily social interactions. Researchers using the case study method are attempting to decipher the meaning that individuals have constructed (Merriam, 1998). The experiences of the participants create meaning for them while the investigator attempts to record, understand, and create meaning from the entire group. The qualitative researcher is attempting to pull things together from many different sources to reach a “depth of understanding” of the situation (Patton, 2002). This research is not conducted to predict future events but to report what
is happening in this particular situation from the participants’ point of view. Case studies are unique in that the person conducting the research is also collecting and analyzing the data. Due to this, techniques of data collection can be modified to be more responsive to the circumstances of the study. Data collected is able to be processed in a timely fashion and summaries can be written as the events unfold (Guba and Lincoln, 1981).

Case studies are usually characterized by “fieldwork.” The qualitative researcher observes the study of interest where it is happening. The researcher visits the site to gather information in its natural setting. Case studies usually describe and interpret a situation in great detail. In this way, the researcher is immersed in the process being studied and has intimate knowledge of the events taking place (Merriam, 1998).

Case study researchers build hypotheses or theories from observations and understanding derived from fieldwork. The researcher uses themes and concepts to move toward a theory. Case studies are often described as “richly descriptive.” These descriptions come from the process, meaning, and understanding the researcher has acquired from observing the situation over time (Merriam, 1998).

Merriam (1998) stated that qualitative researchers are trying to understand the phenomenon, process, or perspectives of the people involved. Analysis of the data is usually grouped by emerging patterns such as themes or categories. The final product is an attempt at a “complete, literal description of the incident or entity being investigated” (p. 30). A limitation of the case study is that results may not be generalizable.
Sample

The target sample in this study consists of 33 elementary public school teachers who are implementing the One-to-One laptop initiative now referred to as Education through Dynamic Global Experiences (EDGE). All 43 elementary teachers included in the One-to-One program were invited to complete the survey. Permission to gain access to the teachers for surveying was addressed through the Supervisor of Measurement for the district and the principals located at the various elementary schools.

Two focus groups of three to four teachers each were used to gather information directly from teachers with various levels of classroom and EDGE experience regarding their perceptions of a One-to-One laptop classroom. Each teacher was selected from a different elementary school within the county. One focus group consisted of three teachers with previous EDGE experience and the other focus group consisted of four teachers new to EDGE. The focus group questions were used to gather perceptions from the teachers. The focus group session lasted approximately one and a half to two hours and was recorded, video-taped, and transcribed for data analysis. The analysis consists of deriving the themes that arise from the conversations of the participants. Once common themes were derived, a comparison of teacher responses is presented. See Appendix 1 for the focus group questions.

This researcher has conducted focus groups in connection with a previous job. As an Instructional Technology Specialist, this researcher was involved in a number of focus group administrations throughout the school district.
Measures

The data collected for this research includes surveys from 33 elementary school teachers. The survey that was used for the teachers in this study is derived from a survey named *Perceptions of Computers & Technology* (Appendix 3). The modified survey (Appendix 1), allows the researcher to collect data from teachers for comparison with survey results from the survey titled *Perceptions of Computers & Technology*. The *Perceptions ...* survey was designed by Ann Barron, from University of South Florida. Barron designed this survey to “gain a better understanding of how educators use technology in the classroom and their level of experience with computers” (Barron, Kemker, Harmes & Kalaydjian, 2003). Barron’s survey includes several sections which cover various aspects of “confidence, skill, support, and uses of computers and technology in teaching” (Barron et al., 2003).

The first page of the Barron instrument collects demographic information about the participant such as gender, race, number of years taught, subject area taught, and level of education attained. This section has twelve questions. The following three pages include the headings: “teacher preparation for computer use (8 items), confidence and comfort using computers (9 items), general school support (7 items), types of software used to complete school related activities (14 items), integration of computers into the classroom (12 items), personal use of computers (5 items), technical support (7 items), and attitudes towards computer use (20 items)” (Barron et al., 2003). The total number of questions on the Barron survey not including personal information is eighty-two. The participants in the Barron survey responded using a 5-point Likert-type scale ranging from 1=strongly disagree to 5=strongly agree. Another type of response included for the
preparation section of the questionnaire, 1=not at all to 5=entirely. Responses to the confidence and comfort section included 1=strongly disagree to 5=strongly agree. For all items related to frequency of use, the option of not applicable (NA) was provided. There were no open ended questions on the survey.

The Perceptions of Computers & Technology survey was validated in a paper titled, Another Look at Technology Use in Classrooms: The Development and Validation of an Instrument to Measure Teachers’ Perceptions by Hogarty, Lang, and Kromrey (2003). Part of this research was supported by the University of South Florida and the Technology Literacy Challenge Fund for 1999-2000. The research was completed in order to understand “how educators and students use technology in the classroom” (Hogarty, et al., 2003). In the study of this survey, the research group was interested in: “…integration; support; preparation, confidence, and comfort; and attitude toward computer use. Once these domains were established, survey items were constructed based on existing validated instruments related to these areas” (Hogarty, et al., 2003).

Factor analyses were conducted separately for each section of the survey by Hogarty, et al. A factor analysis is a type of mathematical procedure that uses many variables or objects and distills these down to a few factors that explain the interrelatedness between the objects or variables (Cody & Smith, 1991). The sample included 2,156 respondents at a 35% overall response rate. This number was reduced to 1,850 after deletion of missing data. The reliability of the factor scores was tested using Cronbach’s Alpha. A web version of the survey was created and administered to a portion of the participants. The return rate for the web version was lower than for the paper version. The lower return rate was postulated as an extra step for the teacher to
receive the web site in the courier and then have to navigate to the survey online. This could have affected the return rate of the respondents. Internal consistency between the web version and the paper version was computed by using Cronbach’s alpha for each of the subscales by mode (Hogarty et al., 2003). Hogarty stated, “The internal reliability estimates ranged from .67 to .90. Reliability estimates for the Confidence and Comfort subscale and the Technological Aversion subscale were the same for each mode (.75 and .90, respectively).”

The research goals for the Barron study included developing a survey to look at technology use in the classroom and validating the comprehensive instrument. The limitations of these results include the fact that “all of the factor analyses were conducted within specific sections of the instrument rather than being based on a correlation matrix of all survey items” (Hogarty et al., 2003).

The survey that was used for this study is a modified version of the Barron survey. For the purposes of this researcher’s study, the Barron survey sections were kept intact even though some of the sections were removed that do not further this study. The sections that remain in the modified survey are Attitudes Towards Computer Use and Confidence and Comfort Using Computers. See Appendix 1 for a copy of the modified survey used in this study. This modified survey was administered one time to the teacher participants. The administration of the survey occurred after approximately six months of the teachers’ experience with the One-to-One Laptop (EDGE) initiative. Individual classrooms in the EDGE schools receive the computers at different times during the school year.
The first page of the modified instrument collects demographic information about the participant such as gender, race, number of years taught, subject area taught, level of education attained and number of months/years the participant has been using computers in the classroom for instruction. This section has twelve questions.

The next section in the modified survey is Attitudes Towards Computer Use. This section has twenty questions answerable with a 5-point Likert scale ranging from 1=strongly disagree to 5=strongly agree. The next area on the modified survey is the Confidence and Comfort section. This section has nine questions answerable with a 5-point Likert scale ranging from 1=strongly disagree to 5=strongly agree. The total number of questions on this survey not including personal information is twenty-nine. There are no open ended questions on the modified survey.

Data collection and data analysis methods

The modified survey was administered one time after the students have had their laptops for approximately six months. The quantitative data from the modified survey was tabulated according to the predetermined categories of Attitude Towards Computer Use and Confidence and Comfort Using Computers. The raw data was organized into two tables included in Chapter Four. The data was analyzed using an overall score for Attitude Toward Computer Use and an overall score for Confidence and Comfort for each participant. The averages of the individual question scores on the Attitude Toward Computer Use scale and the Confidence and Comfort scale were also calculated and reported. For both sections of the modified survey, the internal consistency was
calculated using Cronbach’s Alpha. A confidence interval was used to index the degree of precision of the participant group of thirty-three teachers.

Two focus groups were used to gather qualitative data directly from teachers on their perceptions of experience with technology in the classroom and any changes that occurred in teaching style. Focus group interviews consist of a group of people specifically invited due to their involvement in the topic to be studied (Gall, Gall, & Borg, 2003). The interview is planned and questions are provided to initiate conversation between participants that might not otherwise be stated in an individual interview (Gall, Gall, & Borg, 2003). Focus group characteristics have been identified by Krueger and Casey (2000) as:

“(It is) a carefully planned discussion designed to obtain perceptions on a defined area of interest in a permissive, nonthreatening environment. ... The discussion is relaxed, comfortable, and often enjoyable for participants as they share their ideas and perceptions. Group members influence each other by responding to ideas and comments in the discussion.”

In the researcher’s capacity as an Instructional Technology Specialist, she has conducted focus groups in the past. The previous focus groups were comprised of seven to ten teachers and took approximately sixty to ninety minutes to complete. The sessions were recorded and transcribed. The focus groups began with questions but allowed for conversation between the teachers. Specific questions were asked to generate comments from the teachers in the EDGE program to gather information on positive aspects, concerns, and challenges of the program. The teachers selected for the focus groups were directly involved in the EDGE program. After transcription, themes were derived from
the responses of the participants. See the Appendix 2 for focus group questions used in this study.

Individual interviews do not allow for the interaction among participants as in focus groups. Researchers involved in qualitative studies are using focus groups to collect data on feelings, perceptions and beliefs that participants may not express in individual interviews (Gall, Gall & Borg, 2003). In this study, the focus group interviews follow the format described by Peek & Fothergill (2007) using four to six participants and took approximately one and a half to two hours to complete. One focus group consisted of experienced or “expert” EDGE teachers and the other focus group consisted of all new to EDGE teachers. Questions were posed to the group and the session was recorded, videotaped, and transcribed. Gall, Gall, and Borg (2003) define themes as, “salient, characteristic features of a case.” Thematic analysis begins with transcribing the focus group interview. Strauss and Corbin (1998a) describe making comparisons and asking questions to begin the coding process. As themes became apparent, they were be compiled and discussed. Merriam (1998) encourages using visual devices and trying out themes and ideas on key informants to help advance analysis. Seidman (2006) suggests using transcripts from interviews to organize information into categories. From these categories, the researcher discerns “connecting threads and patterns” to connect other categories. This connection between categories develops themes. The researcher is able to extract and to comment on information from the themes (Seidman, 2006).

As the researcher marks transcripts, words or phrases can be used to describe passages of interest. Classifying is the process of deciding “what is interesting, labeling it, and putting it into appropriate files” (Seidman, 2006). This process is sometimes
referred to as “coding” data. Seidman (2006) states that as a result of the researcher’s study of interview transcripts, the focus of their findings and results may be the presentation of themes.

The Manatee County grant evaluation is presented in this chapter to show how one county responded to the need to evaluate performance in order to continue the program.

Manatee County Evaluation

The Manatee County grant acknowledges, “…the need for an evaluation system to evaluate the progress of the projects. The grant uses formal and summative types of evaluation. Evaluation data gathered is shared with others to extend and to reinforce the conditions for adaptation and adoption. Results of the evaluations are analyzed and used to make decisions.” At the state level, the Florida School Technology and Readiness (STaR) Chart outlines a way for schools to know where they are in the continuum from beginning technology to adoption of integrating technology seamlessly into the curriculum. The STaR chart was used in the construction of the grant format. Since each school in Florida completes a survey at the beginning of each school year for the Department of Education, these responses are entered into a spreadsheet for comparison. From these responses a spreadsheet is created to show on the continuum where each school fits in the technology adoption scheme. At its inception, the chart used merely to count “boxes” meaning the number (and age) of computers at each school. Now the chart is more concerned with the way technology is being integrated into the curriculum. At the
county level, the infrastructure has been built up over the years, and now the greater incentive is on integrating technology into the classroom curriculum. At the county level teachers take a survey (self reporting) on how they feel technology has been used in the classroom during the year. The EDGE classroom teachers take a survey each quarter. The students participating in the EDGE classrooms take a survey at the beginning and end of the school year. Each quarter the teacher data is reviewed to determine if changes need to be made in the program. Research supports the idea that if you incorporate best practices, use modern instructional methods, and progress monitoring in the student environment, that reading achievement will increase.

The teachers involved in the EDGE grant are committed to “changing their teacher practice by providing technology-rich learning experiences which are aligned to the Sunshine State Standards and the National Educational Technology Standards,” (NETS) (http://cnets.iste.org/).

Sunshine State Standards and the International Society for Technology in Education standards and National Educational Technology Standards (ISTE NETS) are included in all lesson plans published on the Instructional Technology department web site and the teacher’s web sites. Information from the ISTE web site was referenced for the writing of the grant. The Florida Center for Instructional Technology (FCIT) at University of South Florida in Tampa collaborated on the filming of sections of the Apple Learning Interchange web site created to showcase the development of the EDGE program.

The Milestones for Improving Learning and Education (MILE) Guide for 21st Century Skills and another publication, Apple’s Achievement for All Children were used
in writing the grant. The MILE Guide states that there are essential conditions that must be in place for adequate yearly progress to occur. The essential conditions that must be in place are “progress monitoring, professional development, and ubiquitous access.

Manatee County Schools EDGE program incorporates these conditions as a three pronged approach for building the 21st century learning community.” The MILE Guide enables school personnel to assess where their schools stand in implementing 21st century skills. These skills include a “combination of information, communication, thinking, problem solving and interpersonal/self direction skills.” The MILE guide is divided into three sections called Early Stage, Transitional Stage and 21st Century. These stages help schools decide where they are on the continuum and to select some specific ways to move forward in their technology development.

In the Manatee County grant, measurement of progress will be determined by the following statements.

“The overall student contribution to this project will be positive attitudes toward learning, improved achievement, collaboration, and productivity demonstrating respect for technology systems, information, and software. Students, through progress monitoring, will be responsible for taking an active role in their own learning. Finally, they will be expected to communicate their learning and experiences with parents, teachers, administrators, and visitors.”

Student assessment in the EDGE program will be ongoing. Teachers, parents, and students will work together to monitor student achievement through student led conferencing using electronic portfolios.
After reviewing the reference materials used in writing the Manatee County EDGE grant, one can see the criteria selected were carefully chosen. Students, teachers, administrators, community, and parents are included in this laptop initiative study. Some school districts measured improvement with standardized test scores of free and reduced lunch populations compared to non free or reduced lunch status participants. Even though the primary purpose of the grant is reading improvement, other content areas are benefitting from the laptop initiative. In this grant the emphasis is on “standards-based curriculum, communication, collaboration, and inquiry.” All of these aspects are supported by the research included.

Summary of Chapter

In this chapter, the problem, purpose, and method were presented, case study method was discussed, and the population and sample of the teachers were presented. The thirty-three teachers filled out a modified survey titled, *The Perceptions of Computers and Technology Modified Survey*. Validity and reliability were established for the instrument. Data collection and analysis were presented.
Chapter Four:

Results

Reporting the Data

Introduction

The purpose of this multi-site case study is to describe and to analyze elementary teachers’ perceptions of the effectiveness of technology as a catalyst for constructivist practices in the classroom.

The purpose of this chapter is to report the data as they relate to the study questions: (a) How do novice and expert EDGE teachers perceive that technology changes teaching and learning in the classroom? (b) What patterns of experiences emerge in the classroom when implementing technology? (c) How can one use technology to promote constructivist instructional practices? (d) What are the major barriers that teachers report they experience when implementing technology into the curriculum?

Research focused on these collection sources includes: Survey data from elementary teachers in the One-to-One program collected in the summer of 2009; a focus group interview of novice EDGE teachers conducted in the summer of 2009; and a focus group interview of expert EDGE teachers gathered in the summer of 2009. These data
were organized according to the descriptions provided in Chapter Three, and reported later in this chapter.

The research questions provided the structure for the study. The data gathered from the focus groups and survey provided source material for the principal researcher to extract information and draw conclusions. The focus group transcripts were typed word-for-word and provided authenticity for the study.

“The researcher does not search for the exhaustive and mutually exclusive categories of the statistician but, instead, identifies the salient, grounded categories of meaning held by participants in the setting” (Marshall and Rossman, 1999, p.154).

Marshall and Rossman (1999) discuss the “cycle of inquiry” which includes the research questions, personal experiences, and a connection between theory and practice. The principal researcher’s use of focus groups and a survey are consistent with Marshall and Rossman’s (1999) methods for qualitative study.

Teachers’ Survey

The purpose of using surveys as part of the study came from the need to gather information from current elementary EDGE teachers on their confidence and comfort levels using technology and their attitudes regarding computer usage in the classroom. The survey was also used to select participants for the novice and expert focus groups. Information provided by the teachers included the number of years each had participated in the EDGE program. The survey data was used to start the process of inviting teachers
to participate in the focus groups. The statistical analysis of the survey data will be covered at the end of this chapter.

Focus Group Interviews

The next data set came from focus group interviews conducted by the principal researcher. “There is widespread consensus that focus groups are valuable techniques for collecting qualitative data” (Morgan, 1997, p. 71). Based on Morgan’s (1997) research, teacher perceptions data was gathered during the focus group interviews. The focus group questions are found in Appendix 2.

The novice focus group included four EDGE teachers who had participated in the program for one to two years. The expert focus group consisted of three EDGE teachers who participated in the EDGE program for four years or more. The principal researcher chose the participants from data extracted from the survey results. Teachers from different schools were selected and contacted. If the teacher declined, the next teacher on the list was contacted until four had agreed to participate in the focus group. The EDGE program is described in detail in Chapter Two. The size of the focus groups was consistent with the suggestions of Fern (2001).

The comments from these professionals provided individual perceptions of how technology impacted practices in the classroom. The participants freely discussed their insights and shared their expertise as EDGE classroom teachers. Both focus groups were conducted the same way. Participants were invited to attend the group sessions at a predetermined location. The purpose of the focus group was explained at the outset. Teachers had previously signed an informed consent document acknowledging that their
participation was voluntary and that they were not required to participate. Furthermore, teacher evaluations, assessments, or job status would not be affected by participation in the focus group. The tape recording was explained as a way to record accurately the statements of the group. No participant was identified by name. A copy of the questions were provided during the discussion. The purpose of the focus group was reiterated for the teachers at the beginning of each session. They understood the purpose of the session was to hear their perceptions of their participation in the EDGE program. These sessions provided an opportunity to collect data relevant to this study.

Participants were given a copy of the discussion questions prior to the focus group session so they would have time to reflect on the questions before the meeting. The participants were told of the eventual grouping of comments and ideas to create themes from the focus group discussions.

The focus groups were separated to accommodate, and encourage, the different viewpoints of the novice EDGE teachers and the expert EDGE teachers. It was important to collect all data in regards to teacher perceptions. The novice group’s ideas may have been overridden in one large focus group. Another concern was the potential reluctance of the novice teachers to participate with the expert teachers in the same room. It was assumed that the level of expertise would vary according to the length of time the teacher was involved in the EDGE project. For example, teachers who were in the EDGE program for four or more years would have already worked through the simpler implementation issues and would not consider them a problem now, while the novice EDGE teachers may see implementation as a bigger issue because it is the first time they have dealt with it in the classroom.
The sessions were recorded on video and audio tape. After the participants introduced themselves to each other, the session began. Questions were posed and participants took turns responding to the questions. Sometimes the teachers talked over each other on the tape.

After the sessions, the discussion from the focus groups was transcribed verbatim. The audio tapes were transcribed by the principal researcher and a helper, word for word. The redundant video tapes were used as needed to clarify the audio transcription. The principal researcher sorted relevant statements from the focus group interviews into the four study questions. A copy of the distilled transcription was given to the participants and proofread for errors in intent. Stake (1995) recommends member checking to improve correct meaning and intent from the transcription. The distilled transcription excerpts are used in this chapter.

The transcripts were used along with highlighters to underline key words and phrases. The researcher used key words and phrases that were repeated in the discussion to create thematic categories. For example, when teachers repeated statements that related to supporting each other such as “tremendous support from a teacher next door, who assured me daily, hourly, minute by minute that it would all work out, you can do this,” etcetera, those statements later became part of the larger category, “Support.”

Organizing the Data

Organization of data:

1. Transcribed the focus group discussions
2. Identified statements made by the participants that could be grouped under one or more of the study questions
3. Identified patterns from grouped common statements
4. Reviewed the research to determine if other authors used similar expressions or statements in identifying a specific constructivist theme or idea

Analyzing the Data

To begin organizing data for analyzing, Seidman (2006) stated that all interviews and transcripts should be completed. This reduces the inclination to gather meaning from the data individually. Transcribing data is time consuming, approximately two to four hours per interview. This process has benefits in adding to the meaning of the interviews (Seidman, 2006).

After transcribing is completed, the information will be contemplated and distilled into a form that can be shown or discussed. Strauss & Corbin (1998a) name two analytic procedures to code information: making comparisons and asking questions. The result of these procedures is to conceptualize and to categorize data through open coding (Strauss & Corbin, 1998a).

Conceptualizing means to break down or take apart each sentence or paragraph and assign a name to each idea or event. This process codes each phenomenon by asking questions, (Strauss & Corbin, 1998a). Similar events are compared in order to name them in the same way.
Seidman (2006) discusses ways to analyze interview data. By extracting words and phrases from the transcripts, the researcher organizes these bits and pieces into categories. From this collection the researcher searches for patterns and connecting ideas within the categories and overall connections between categories called themes. With the data thematically organized, the researcher may highlight excerpts in the discussion (Seidman, 2006).

Some ways to share data include charts, graphs, and matrices. These can be used to display data and organize excerpts from the transcripts (Miles & Huberman, 1984). Excerpts are then distilled into categories (coding), vignettes or profiles of participant’s experiences (Seidman, 1998).

Excerpts are studied for common themes and patterns to create categories. To categorize categories, one must group concepts that are related to the same phenomenon (Strauss & Corbin, 1990). The researcher finds interesting passages and begins to label them (Seidman, 1998) after considering some questions. The researcher must decide the subject of the passage, look at words and phrases that describe a similar idea, and determine if a single word can become the category for the phrase (Seidman, 1998).

To indicate important dimensions Merriam (1998) suggests Guba and Lincoln’s guidelines for developing categories that are comprehensive and thought provoking. Important categories may be discovered by the number of times something is mentioned or by the number of people who discuss an idea. The audience may have input into the importance of a category. Unique categories will need to be kept in the study, and some categories might add new areas of inquiry (Merriam, 1998).
To validate the categories selected by the researcher, two of the teacher participants from the focus groups were asked to volunteer to look at the data. This action reduces the probability of personal bias in the data.

Graphic Organizer

This researcher created a graphic organizer to place statements under the study questions. Statements made by the teachers were placed under each of the research questions. Graphic organizers in the form of a matrix is suggested by Knodel (1993) and discussed by Fern (2001). “This matrix may be as detailed as the researcher cares to make it” (p. 228). “Once the overview grid is complete the researcher can verify that the same issues were addressed by each group and that the positions taken on these issues are the same across similar groups” (p.229).

The first focus group included the expert EDGE teachers. Four were invited but only three teachers attended the expert group. One teacher had an unexpected personal obligation and was unable to attend. The session was planned to last about one and a half to two hours. Twelve questions were asked during the sessions. The first question for the focus groups allowed the participants to think back to the start of the program and reflect on their feelings at the time. It also allowed the participants to enter the conversation in a non-stressful way. Since teachers were invited from across the county, they did not all know each other.

The focus group questions were designed to elicit responses that could be linked to the four main research questions in the study. Some of the responses could be linked to more than one of the case study questions. The researcher did probe for answers as
necessary depending on the responses of the teachers. This is described in focus group literature by Yin (1994). Excerpts from the focus group interviews were used to help explain the data collected and analyzed.

Focus Group Questions

1. Give three or four adjectives that describe how you felt when you volunteered to become part of the EDGE program.
2. Describe the process of incorporating laptops into your classroom curriculum.
3. What was easiest about the process?
4. Did having constant access to technology change the way you teach students? Describe the changes.
5. What issues/barriers prevented you from doing something you wanted to do in the classroom?
6. What/who helped facilitate your incorporation of laptops into the classroom curriculum?
7. How did you feel about allowing students to be more in control of their own learning?
8. How did your students accept the laptop idea and the curriculum?
9. Do you feel there were fundamental changes in your teaching style during your involvement with the EDGE program?
10. Describe the EDGE learning environment in your classroom.
11a. Veteran EDGE teacher: Has the inclusion of new EDGE teachers changed the EDGE vision, implementation, efficiency, and/or effectiveness?
11b. Novice EDGE teacher: Were you provided opportunities and/or mentoring to better utilize the EDGE tools?

12. How would you approach implementing/changing a One-to-One program in view of what you have learned?

Question two allowed the participants to describe and to discuss the implementation process they used in their classroom and to compare their experiences with other focus group participants.

As participants described the process, similar words and phrases kept emerging. After transcribing the focus group sessions, the principal researcher highlighted the repeated words and phrases. These words and phrases were then grouped into themes. The themes were grouped under the relevant case study questions (Patton, 2002). The following is an excerpt from the expert teacher focus group regarding beginning the process of incorporating technology into the classroom:

Interviewer: Describe the process of incorporating laptops into your classroom curriculum.

Teacher 1: I had to take it in baby steps, a little at a time. It wasn’t just dispersal of laptops and now, you know, do this every day…there was definitely a learning curve involved…as my confidence grew…I could see what the children were doing.

Interviewer: How did that work for you?

Teacher 1: It began to feel more natural. I think I began to feel more confident, as I could help them (the students) and see that, now that they were actually so engaged and so willing to work on whatever project … It motivated me … to learn more, (to) do more.
Teacher 2: …So I talked to her (another teacher) and she suggested…and it really worked out, bringing it in…subject by subject. That way I didn’t feel overwhelmed or that I had to incorporate it across the curriculum.

As noted in chapter one, a limitation of this study is the principal researcher was an Instructional Technology Specialist for four years in this district from 2001-2005. Since that time the principal researcher has been working as an assistant principal in the same district for five years.

Organizational Matrix

The study questions were written at the top of the page on a four section matrix. The researcher sorted the thematic transcript excerpts into relevant subcategories in the four-section matrix (Appendix 4). For example, when a teacher described how she “implemented (technology) with incremental changes” the excerpt was placed under the “Implementation” subcategory on the matrix. Similarly, “written contracts for the students” was placed under the “Acceptable Use Policy” subcategory.

Expert Focus Group Discussions: Question One

The following is a reporting of the expert focus group categories and themes for study question one:

1. How do novice and experienced EDGE teachers perceive that technology changes teaching and learning in the classroom?

The categories included Collaboration, Culture, Implementation of Technology and Curriculum Integration, Motivation, Perceptions, and Support.
The culture of an EDGE classroom is characterized by access to technology twenty-four hours a day. Individual laptops are assigned to the teacher and every classroom student. One theme that became evident was: technology is expected to be available by students and teachers.

Description of Eight EDGE Classrooms at One Elementary School

Each classroom had different seating arrangements. Most students worked independently of the desks as they worked in pairs or small groups. Many students sat on the floor in various areas of the room. Some small groups worked at desks. After the initial instructions, the teachers did not have to intervene in this process. The students were on task in their groups planning their projects and doling out responsibilities to group members. Students were allowed to take home their laptop computers but were expected to have them charged upon returning to school the next day. As students discovered a way to accomplish a task they would share with the other students and the teacher. Many times the teacher learned from the student a shortcut or a new way to insert music or text into a project. This did not seem to bother the teacher or the student. The students were sharing the responsibility of teaching. Teachers created the outline and direction of the lessons in EDGE classrooms. Students were allowed to select from a rubric how to achieve the goals the teacher set. Students could choose to present a slideshow, create a movie, or create a multimedia presentation to show their product. Principals gave power to the teachers to create the lessons in technology format. Teachers still needed to understand the Sunshine State Standards and cover all of the benchmarks during the school year. The teachers were able to weave the requirements into the
projects completed by the students. Teachers in the EDGE team rely on each other for lessons and ideas. They help new teachers become involved in the global perspective of the EDGE classrooms.

Collaboration

One of the recurring categories that emerged in the expert focus group discussion was collaboration. Collaboration was discussed from the viewpoint of student-to-student, student-to-teacher, teacher-to-student, teacher-to-teacher, teacher-to-mentor (teacher or ITS), and mentor-to-teacher. In the EDGE classroom all of these types of learning were happening on a regular basis. Examples of collaboration were given by the way of anecdotes. One teacher commented, “We are piloting a new program right now and the kids have just taken off and they come in every day and show me new things. So you have to be willing to learn from the children because they are this generation. This is how they learn.”

Another recurring theme that encourages collaboration is student competency. Many students arrive with prior software experience and other computer skills. This preexisting student knowledge base helped the teacher to integrate technology quickly in the classroom. When the teacher realized several of her students were already comfortable using computers, she felt a weight had been lifted. She did not have to teach “everything.”

Participants also noted that teacher collaboration reduces isolation. Teachers collaborate to help each other implement technology in the classroom. Sharing ideas reduces stress and speeds up the process of implementation. Teacher collaboration
resulted in closer friendships among some teacher teams. Teachers found they could rely on each other for help. Teacher participants mentioned that computer work reduced isolation among students and themselves. Intuitively it seems that every member of a class having a computer would decrease collaboration but the opposite seems true. Teachers witnessed students gathering in small groups to work on projects. Students selected their own group for project work. The students were in control of assigning parts of the project to the group members. If things were not going well, they consulted with the teacher who asked them to “work it out.” Students went back to the drawing board to decide how the problem could be solved. Surprisingly, a group who had selected a low-performing classmate to be in their group, found out that he was a talented multi-media person. He took his laptop home and each night learned how to integrate drawings and sound to narrate the “State Tour” they were creating. He became a “rock star” in the group and in the classroom as he showed others how to integrate pictures of themselves into background scenes and add waterfall sounds behind the narration. This is one of the scenarios the teachers discussed during the focus group session. There were many other examples discussed. In this example isolation was reduced.

Another concept that was discussed was “snapshot versus video”, referring to the image that many people see of the lone child at a laptop seemingly working alone and isolated. The teacher participants related that a video should be the preferred method of showing an EDGE classroom. In this way the viewer could see the interaction going on between the students and teacher. Even if students are sitting by themselves at their laptop, they are often talking to another student while they are working on the same part of the project.
Culture

Another category that emerged from the expert focus group was culture. Teachers felt that there was an overriding expectation that technology would be pervasive throughout the classroom, and the technology would be used by both the students and themselves. One teacher asked a knowledgeable student, “Show me how to do this...” The student was already familiar with the task having been tutored by an older sibling at home. Now the student was teaching the teacher. This shifting of teaching from teacher to student reveals constructivist methods. Diagrams of the changes in teaching direction are shown in Chapters Four and Five. Encouraging student ownership of teaching is a constructivist marker. This seemed to happen naturally in technology rich classrooms. The culture of the classrooms encouraged collaboration among students and teachers. Teachers indicated that training and support was abundant and readily available. The Instructional Technology Specialists assigned to EDGE schools provided additional insight and assistance to EDGE teachers, increasing the prevailing level of comfort and support. Even though the ITS could not be at their school every day, the teachers knew they still had a knowledgeable resource who was readily available via e-mail. The ITS modeled lessons for the teacher demonstrating how to integrate technology into specific lessons. This infusion of technology into the curriculum was a slow and steady process. One teacher stated that she thought she had been incorporating technology into her lessons all along, but after a few years realized she was just now infusing technology into the curriculum. Her perception of integrating and infusing had changed.

The technology used in EDGE classrooms became indispensable as it was infused into the curriculum. Several teacher participants noted that it was “use it or lose it” as
technology purchases declined due to budget cuts. The reduced availability made administrators rethink how mobile carts would be allocated. Some administrators required classes to demonstrate the teachers’ proficiency before their classrooms were given access to laptops. A few teachers who were reluctant to embrace a technology infused curriculum chose not to take the courses. Their students chose to protest their teacher’s choice. Not all teachers succumbed to this pressure. Parents from technology rich feeder elementary schools joined voices at the receiving middle schools to urge principals to keep a technology enriched curriculum available for their children. The parents felt that access to technology was essential to ensure the continuity of their children’s educational success. One middle school student spoke at the school board meeting to urge school board members to increase the funding for technology at the middle school level.

The participant teachers also discussed school-wide implementation. This creates continuity in the school. The teachers suggested that students who learn the names of the parts of the computer and then use the computers for curriculum-based activities, easily build vocabulary and language skills encompassing both technology and curriculum. The teacher participants observed marked improvement in student comprehension and creative expression after two years exposure to a technology infused curriculum. The teachers also mentioned that a student’s continued exposure to technology created a culture of responsible student use of computers, including copyright, safety and privacy issues.
Implementation of Technology and Curriculum Integration

The expert focus group also explored their experiences with implementation and integration of technology in the curriculum. The teacher participants spoke of implementing technology in their classrooms in incremental steps. One teacher explained how she introduced the laptops by subject. As a new EDGE teacher, she was overwhelmed by the idea of using the student computers for every subject area, all day every day. Instead, she used incremental change to contain the technology-enhanced curriculum to a level with which she was comfortable, since both she and her students were learning together. Another teacher participant agreed, adding, “I talked to (another teacher) and she suggested bringing (the integration of computers) in subject by subject. That way I didn’t feel overwhelmed…that I had to incorporate it across the curriculum (without delay)...”

It was noted that the students often assisted each other and sometimes, they even helped their teachers. Similarly, the teachers regularly helped their students and other teachers. The participant teachers observed that there was, “a lot of reciprocal teaching and learning.” Regarding curriculum integration, one teacher added, “We have to use our reading series as (a required part of) the core curriculum …I can’t do a story a week. I can’t be that regimented. So I pick the best stories and take two weeks and springboard off the Internet.” Another expert teacher participant reflected on her experience integrating technology this way, “…it just unfolds like a flower… the extra things you can do. That’s what I got all excited about.”

An initial concern expressed by teachers regarding implementation was the time required to teach students how to use a particular program so they could complete the
assignment. As it turned out, once the students were shown the basics of a program, they would quickly learn other features on their own. The process of using computer programs became a non-issue. The teachers supplied the rubric for the project and the students created the finished product.

Early efforts utilized computers to deliver “canned” content. The expert teacher participants now include technology as a means to research and to create content. For example, when using presentation software to produce a book report, the students were shown how to create a slide and enter text and images. After that, the students used their own creativity and other digital resources to enhance the slide show. Teachers found that students spent more time on task and evaluated and edited their work more thoroughly with computers. When a finished presentation was shown to the class, the creative spark set off a collaborative wildfire of new student projects. Students enthusiastically exchanged ideas and shared expertise to create better presentations. This further enhanced the cooperative culture in the classroom. The students stretched themselves by creating their own presentations and then by helping others. One of the expert teacher participants commented, “… (The students) worked together, they were like a family. They said if you need help I’ll come over and help you. I didn’t have to say anything (to persuade them to help each other;)” This supports the constructivist tenets of collaborative group work, helping each other, self-directed learning, and family-like atmosphere.

The expert teacher group reported that reaching a level of seamless technology integration took from one to two years. At first, these expert teachers feared the extra time used integrating technology would impact their FCAT preparation time. However, experience with a technology infused curriculum proved significant learning gains were
being realized. The teachers reasoned these gains could be attributed to students accessing research materials on the Internet that were intended for higher grade levels. Since the websites use multimedia to keep student interests high, the student is motivated to read at a more difficult level to follow the research path. This drive for information keeps the student reading for longer periods of time increasing time on task. Teachers repeatedly commented that students exceeded expectations in their work produced. One student created over three hundred slides which he animated to produce an original multimedia movie project. After his classmates watched the finished project, several were inspired to replicate his success. He became a star of the class even though previously he was a quiet, unnoticed student.

One of the expert teacher participants stated that her ESOL (English for Speakers of Other Languages) students improved their reading scores by a significant amount after one year of a technology infused curriculum.

Motivation

Participants in the expert teacher group continually returned to the synergistic effects realized by integrating technology in the classroom. There seems to be spontaneous energy and excitement generated by both teachers and students.

Motivated students bring a wellspring of enthusiasm into the learning equation. The teacher-student relationship is synergistic. Students are generally motivated to do what the teacher requests, and this in turn motivates the teacher to bring more to the learning relationship. Reluctant students who are too frightened to present papers or book reports seem to be more willing to try when the presentation is computer assisted. This
teacher puts it in her own words, “…it does take those kids who are really reluctant to be up in front of the class and to even read out loud. (The students say) Oh…they’re looking at what I did! And they’re so proud of that.”

The laptops also seem to have a positive impact on students who are performing at a lower academic level than their classmates. This teacher explains, “He (the student) presented his solar system slide show in front of the class. He’s still working below grade level but I said (to another teacher), You have to understand where he came from to where he is now.” This student made the extra effort to prepare the slide show and present it in front of others when normally he would not have the courage to present. Having something else for the students to look at during a student presentation seems to help the more timid students pluck up the courage to speak in front of the class.

Teachers who agree to pilot a new program are often forced out of their “comfort zone” and into a “learning mode.” Experienced teachers almost certainly have a better understanding than new teachers of the personal motivation required to implement something “new.” The expert teacher participants indicated they were willing to learn to help their students learn more. This is part of the learning culture at EDGE schools. At one EDGE elementary school, there were sixteen teachers working on their masters degrees at the same time. All of them completed their degrees. This suggests a strong culture of learning.

Perceptions

The expert teacher participants reported that their first impressions of the EDGE program included feelings of nervous uncertainty, intimidation, excitement, invigoration,
and mostly, fear of failure. After overcoming their initial fears, the teachers waited for the student reactions to the program. The teachers were pleased with the student excitement at launch. Some teachers were surprised how much the students already knew about laptops and programs. This pre-existing knowledge base helped carry the new EDGE classroom through those first unsettled weeks. The teacher’s perceptions quickly changed from intimidation and uncertainty to constructive curiosity. The perception of pervasive change was discussed. The global way technology impacted the curriculum and other aspects of the classroom was articulated. Even homework was affected. Larger multi-day and multi-week projects could be assigned for students to work on including student created websites, spreadsheets, presentations, videography, email, and other writing and mathematics projects. These larger projects were realized because the students were allowed to take their laptops home where they could work off school hours. The teacher participants discussed how home use expanded the scope of larger projects. Even though the students could not access the Internet from home on their school owned laptops, they were able to download everything they needed during the school day and then work with the images and text data away from school. The teachers enjoyed the seemingly unlimited access to research information for the students. One teacher participant explained, “…you can’t just sit down and open up the textbook or teacher’s edition and read the objective. That’s just so below everyone now…” Another teacher explained how a student had downloaded a beating heart video to his laptop computer while researching the circulatory system for the human body unit. The finished presentation received numerous accolades on parent night.
One astute perception from an expert teacher participant recalled the perennial static image of students working together in front of a laptop. “I noticed if you take a snapshot of a group of children working on laptops the first impression may be that they are just, you know, isolated, focused on this laptop image. But they are also having conversations. They are sharing ideas. There is a lot going on there. You need to videotape what’s going on, not take a snapshot.”

Support

From its inception, the district has provided support for EDGE schools, teachers, and students. Instructional Technology Specialists (ITS) modeled lessons for teachers and students. Teacher participants spoke of the ITS support and how it reduced fear of the technology and not having enough “hands” to help students. The district’s instructional technology specialists are scheduled at various schools every week to provide continuous technology support for individual EDGE classroom teachers. The expert teacher participants agreed that training was abundant and readily available. Training classes provided by the ITS department have been ongoing since 2003. Training is available to fit most teacher’s schedules, including daytime (with a substitute provided), evenings, weekends, and summer sessions. A variety of online tutorials are now available for teachers to use anytime they choose.

School administrators also provided support for the expert focus group teachers. Administrators provided funds and release time for teachers to attend training classes. Many administrators also attended EDGE courses with their teachers so they would know what to expect from an EDGE classroom.
Support from the Director of Technology and the Supervisor of Technology came in the form of laptop grants for schools. EDGE schools were often included in “buy one, get one” purchase programs for laptop carts, projectors, and digital cameras. EDGE schools also receive additional network and image deployment support from the district.

Expert Focus Group Discussions: Question Two

The following is a reporting of the expert focus group categories and themes for study question two:

2. What patterns of experiences emerge in the classroom when implementing technology?

The major categories determined by the principal researcher included Assessment, Collaboration, Continuous Access, Culture, Goals, Implementation and Integration, Perceptions, Resources, and Support.

Assessment

The teacher participants discussed how students consistently exceed expectations when using technology. Students are fully engaged by multimedia content that accelerates learning and improves comprehension. The students seem to assimilate digital information easily. They evaluate and synthesize their work more often. In Bloom’s revised taxonomy (Pohl, 2000) synthesis and evaluation become evaluating and creating. Student work continues through the cycles of remembering, understanding, applying, analyzing, evaluating and creating results.
Teacher collaboration is common in classrooms implementing technology. Part of this may be moral support, but another aspect is assessing student work. The use of rubrics facilitates the assessment of technology-related lessons and projects. The teachers form teams within the grade level to discuss the best methods for assessing different projects. Student and teacher discussions further clarify what is expected and what will suffice for a final project.

Collaboration

Teacher participants observed that students develop collaborative groups during technology intensive classes. The students work together to determine and to utilize individual strengths. Collaboration includes student-to-student, student-to-teacher, teacher-to-student, teacher-to-teacher, teacher-to-mentor (ITS), and mentor-to-teacher.

As an example, in one EDGE classroom a teacher created an assignment for student groups to work together to create an animated tour of one of the fifty states. The students were given a rubric of items to include in their project and were asked to select their own group members. The next morning one group asked to meet with the teacher. The group members, three girls, were disappointed with their choice for the fourth group member. Originally, they had selected him because they thought no one else would pick him to be in a group, but after further consideration, the girls were regretting their decision. The boy did not want to do any assignment on the rubric. The teacher explained that the group members must go back and discuss the group assignments and come up with a plan for success. After discussion, the group decided that the boy liked to do artwork and he was assigned the illustrator duties. The EDGE classroom had access to
multimedia software that incorporated electronic drawings, pictures, narration, background sounds and music. Each night the boy went home and created one slide for the presentation. Each day the girls were surprised by his progress. As he was complimented on his work he began to create more complex slides and animations. He learned the hidden features of the software and taught other students how to use the program. At the end of the project, the boy was selected to deliver the finished presentation to his peers. No longer an outcast, he was now a star performer and a contributing member of his group.

Collaboration creates a “community” in the class. This community learning environment supports the intensive effort that is an aspect of students and teachers pursuing a common goal. Teachers may recognize a unique method to inspire and to motivate students in their classes. Typically, students respond in an enthusiastic way towards technology. One teacher participant commented, “It doesn’t always have to be my way.” This can change the normal classroom paradigm where the teacher is always right and control flows in one direction. If the teacher is the facilitator in this paradigm, the students are the driving force. Students realize they can be the teacher in some situations. They have the expertise they can share. This classroom “community” began to form on the first day after the state-mandated FCAT test, when the one-to-one laptops were first deployed and the exuberant student outbursts could be heard throughout the school. One teacher reminisced, “The whole school wanted to know, what’s the screaming going on? They (the students) were just jumping up and down and screaming.”
Continuous Access

Students and teachers have access to their computers all day, at school and at home. This 24/7 access changes the learning environment. Teachers are able to assign more ambitious projects that enhance the scope and sequence of the curriculum. One teacher stated that she was unable to assign projects that included multiple parts once the school no longer allowed the students to take their laptops home in the evening and on weekends. She said, “I can see a difference in the in-depth quality of their projects when they took them home as opposed to trying to scramble it together during the day at school.” Part of the school’s concern was the high cost of repairing or replacing laptops that were damaged. All schools have a limited budget for technology. Without grants to maintain and to upgrade their laptops, the schools must make the most of their initial investment while allowing students and teachers as much access as possible. Another favorable outcome for at-home computer access is the protected email software students use to communicate with their teacher. Teachers can send assignments to students at home, and students can email their teachers from home if they have questions about the assignment. This provides an extra level of connectivity and support for the students. The teacher participants added that they set time restrictions for late night and weekend emails from students.

Culture

School culture can be defined as “complex webs of tradition and rituals that have been built up over time as teachers, students, parents, and administrators work together and deal with crises and accomplishments” (Deal & Peterson, 1999, p. 7). While various
curriculum initiatives may define “what” is being taught in the classroom, mission and vision statements define “why” and “how” the classroom community will meet its individual goals. The district mandates the local development of these statements, which builds purpose and responsibility within the learning community.

The teacher participants observed that the culture in an EDGE classroom is shaped by students and teachers, and the collective knowledge and goals they bring to their technology community. Consider a student with prior experience integrating technology. The student expectation changes from how technology will be integrated to anticipation of integrated technology. Students with prior technology experience expect email support at home. Most EDGE students are self-motivated. They create their own projects to submit to the teacher.

“One group of students decided to create a project after reading “Leonardo’s Horse” in the basal reading series. The children were fascinated with the story and began researching Leonardo DaVinci. One website allowed the students to type in their names and then the program rewrote their names mirrored from left to right, like Leonardo wrote. The students made slide show presentations with the letters coming in from left to right. The imagination that emerges (from online research) is amazing.” The teacher continued, “When the story is over in the reading series it’s really not over in a technology-based classroom. The students take it so much further than we possibly would have taken it without technology.”

Copyright lessons have helped to build a generation of good on-line citizens and ethical computer users. A teacher participant remarked, “(I was) trying to find out how they (the students) were doing it (imbedding movies in the slide show presentation) and
where they were finding it (the information). You had to find out about copyright laws and so one thing led to another.”

Current information is abundant and readily available in a technology-rich classroom. A teacher participant explained, “You’re not limited to the media center or an old book from the 1950s …you’re up-to-date, you’re current, and they (the students) get more out of it (the lesson).” She added, “Kids make so many more connections if they have it (technology) at their fingertips…they will take off with it. So whether we’re directing or they’re directing themselves, they will take that foundation and just go with it.” One teacher signed her students up for the online Renzulli Learning program which can be accessed from home. The teacher checks her email account before 8 p.m. to email the students back if they have questions about their project. It is a safe student email account that also preserves the privacy of the teacher’s personal email account.

Goals

An EDGE classroom is a student enterprise. Technology-rich classrooms enable students to work with teachers and administrators (support professionals) to produce the best product possible. Teacher participants state there is more talking, sharing, debating, evaluating, discussing, convincing, promoting, than in a regular classroom. The students embrace their learning. When working on a project, students don’t ask, “How long does it have to be?” The expert teacher participants reported that they rarely heard this question in their technology-rich classrooms. The collaborative community in the EDGE classroom environment is very cohesive and becomes more supportive as the group matures. The culture of the community engenders high-energy, excited learners.
Cooperative learning is commonplace in an EDGE classroom. The teacher participants observed that by building a culture of learning that embraces technology, the capacity to sustain the culture could be carried forward to the next academic year by their students and their teams.

Implementation and Integration

Teacher participants noted that student research and learning regularly exceeded grade level. The initial projects students undertake expand with their research. Since access to online resources is not constrained by grade level, students often read at a higher level to gather information. This does not mean students are allowed to roam free on the Internet. The students still follow the rubric provided by the teacher, but seem to stretch themselves to pursue their interests. Student projects are often formulated at school and worked on at home. One of the expert teachers observed several student groups who produced outstanding finished projects on their own.

Although a percentage of adept EDGE students may consistently exceed expectation, the expectations themselves are reasonable and attainable. Support is provided at every level. Students have support from other students, teachers, the instructional technology specialist, and administrators. The school’s technology person provides technical hardware support. Teachers have a similar support network. Supportive administrators are receptive to different teaching paradigms and styles.

EDGE classrooms are not about the teacher being center stage. Teaching in an EDGE classroom is more facilitative, less “lecture.” Teaching, and learning, is an integral
part of the EDGE community, shared by all members of the community. The teacher-student relationship is rarely unidirectional and increasingly complex.

Perceptions

When asked to recall their initial perceptions of the EDGE program, the expert teacher remarks varied from nervous excitement to indomitable privilege. The teacher participants felt they had stepped “outside of the box” by offering to pilot an EDGE classroom at their school. They believed that the EDGE program was not about the teacher, but about the students and the way “digital natives” learn. Adults are the “digital immigrants” in this situation. The new EDGE teachers marveled at the seemingly limitless online resources for planning. They were also aware that the rest of the staff could have easily misunderstood a detached, one-to-one student, riveted to his multimedia portal. With that singular perception, they would have missed the small group dynamics that happen every day in an EDGE classroom. As the EDGE program matured, and with the arrival of e-Folio, the staff soon realized there could be a culture of learning that embraces technology.

Resources

The expert teacher participants discussed how the district’s proxy server affected Internet research as a student resource. The proxy server is not “exclusive”. Exclusive proxies prohibit specific words or phrases. The district chose an “inclusive” model that compares every online choice the student makes to a library of acceptable choices for K-12 students. The library is updated regularly to keep resources current. While this
model effectively constrains students to material deemed suitable for educational purposes, it does not limit the student’s research to a specific grade level.

Support

While support from the district instructional technology specialists and network administrators was included as part of the EDGE package, an unforeseen support resource was provided by student helpers. One teacher participant observed several fourth grade students training students from another classroom to facilitate and to accelerate technology integration. The older and younger students established an “e-buddies” program. It started with book buddies and evolved over time to include technology. E-buddies can bridge one classroom to another, and may also cross grade levels. As an example, there were several successful e-buddies groups working together from fourth and second grade. The teacher also observed fifth graders helping kindergartners enter their reflections on the classroom web page. The older students also helped younger students with their iPod recordings. Students are encouraged to become an “expert” with a program or device so they can help other students. Student helpers make an extraordinary contribution to the EDGE program.

Expert Focus Group Discussions: Question Three

The following is a reporting of the expert focus group categories and themes for study question three:

3. How can one use technology to promote constructivist instructional practices?
The major categories that were derived from this question included Assessment, Collaboration, Culture, and Curriculum.

Assessment

EDGE teachers utilize digital, or “electronic” portfolios (E-folio) to assess student performance. E-folio is an “authentic” assessment program that was first piloted in the district by EDGE schools, and has now been embraced by the superintendent as part of a district-wide reform strategy. The teacher participants also mentioned the quality and quantity of student work and how it has improved with the arrival of laptops and other technology in the classroom. The creation and use of rubrics was also discussed.

The expert teacher participants noted that hierarchical student roles in EDGE learning environments are the norm. A student who may have been shy in class may find the opportunity to “shine” while using technology. The teacher can then ask that student to help others with a particular activity. The student then has an opening to take the lead.

Collaboration

Teachers also reported a reduction in competition in collaborative EDGE classrooms. Students work primarily in groups. Cooperative learning patterns thrive in EDGE classrooms. Team projects encouraged collaboration among students. Students collaborated by teaching other students, often outside their team.
Culture

The teachers state a different culture emerges in a technology rich classroom. Student teams become synergistic. A student’s individual strengths are recognized and valued. As students present their work to other students, they analyze and evaluate their contribution to the final product. The student “audience” evaluates how individual contributions impact their work as they listen to the presentation. Editing and “polishing” the final product is a routine activity for EDGE students.

Curriculum

EDGE classroom teachers regularly use big concept activities. Incorporating smaller lessons into a large scope project encourages students to work through the fundamentals to get to the “fun part”, and steadily expands their research on the project. The finished project is the amalgamation of many different thoughts and ideas created by the student. Student creativity is further enhanced through collaboration and sharing. Technology provides many ways for students to showcase their work. This also helps students who prefer digital solutions to “paper and pencil”. These kinds of activities are referenced in multiple intelligences studies (Gardner, 2006). The teacher provides a rubric stating the types of acceptable artifacts that may be included in the study. Students select from the rubric whether they want to include a spreadsheet, poetry, audio files, video files, documents, photos, written reflections, drawings, charts, graphs, slideshows, credit page, and any number of other items. Any or all of these artifacts can be posted on the student’s e-folio website. Posting artifacts on the website is a decision made by the student. This gives the student the opportunity to select their best work to post on their
website. Parents and other family members can access the student’s work from the Internet. The teacher participants stated that this access enhanced collaboration among family members and the student, and family members and the school.

Students also gain confidence when presenting to their classmates using technology. Students may use podcasting, voice recordings, slide shows, and multimedia to tell a story when they give a presentation. The expert teacher group discussed how differentiated instruction can be implemented in a technology enriched classroom.

Students choose their work from the rubric provided by the teacher. Rubric choices can also start as ideas from the students. The teacher provides a variety of activities that are acceptable for grading of each chapter or content area. As students demonstrate knowledge gains, the teacher can encourage them to choose more challenging projects from the rubric to expand their knowledge and skills.

One teacher participant recounted a team project which included a tour of the states. The rubric for each state tour included all of the requirements. The student teams had to plan a two-week trip with a five thousand dollar budget. The daily costs for the trip were entered on a spreadsheet. Adherence to the budget was mandatory. Groups of four students formed teams and selected a state to study. Each student member was assigned a task by the team. Individual and joint tasks were considered and assigned. The students may graph the temperature during midday and evening, create a spreadsheet of how much meals for four would cost, rental car prices, gas, snacks, airline tickets, etc. The students must see important places in the state of their choice. This collaboration allows the students to work together, make decisions on their own as a group, and present their final project as a group.
Expert Focus Group Discussions: Question Four

The following is a reporting of the expert focus group categories and themes for study question four:

4. What are the major barriers that teachers report they experience when implementing technology into the curriculum?

Access Issues

Teacher participants reported there is limited access to computer carts in non-EDGE classrooms. Mobile computer carts hold about twenty laptops. Most classrooms have more than twenty students. This lack of access restricted the amount and kind of work the teachers could request from the students. EDGE classrooms have computer access all day, every day and the students can take the laptops home to continue work on their assignments. This encourages a good work ethic and it drives quantity and quality work from students. Some EDGE teachers decried their administration’s decision to discontinue sending laptops home due to replacement issues and repair costs. The teachers felt this restricted the amount of work they could assign and also impacted the quality of work they could expect with access confined to classroom hours. The expert teacher group participants also discussed scheduling issues encountered when grade level team members are required to share a computer cart. Some schools schedule the cart by morning or afternoon. Some teams schedule a full day of use for the cart. Teams also rotate through schedules where one class has access to the cart for several consecutive days so students can complete a project. The teacher participants agreed that mobile carts simply cannot provide the accessibility of one-to-one laptops in an EDGE classroom.
Another barrier brought up by the expert group teachers is the issue of lack of continuity within the school system. Students at EDGE elementary schools often leave their one-to-one laptops behind when they move on to middle school. Similarly, students who move during the school year may move to an elementary school that does not have an EDGE program. The teacher participants agreed that a one-to-one program could not survive without the backing from an administration that is willing to provide the vision and funding necessary for a successful technology program. Continuous support from the administration is equally important. The administrator should attend training classes with his staff to understand how technology is integrated in the classroom.

Changes in Curriculum

With the state pushing accountability and merit pay reform, the expert teacher participants discussed the impact of FCAT on integrating technology in the classroom. The teachers were concerned how implementing technology would affect FCAT scores. Implementation takes time and teachers felt pressured to use that time to prepare their students for FCAT testing in the spring.

The teacher participants agreed that the EDGE program worked best when all of the students in a class took their laptops home. Laptops that need service may spend several weeks in the repair shop. Loaner equipment is typically restricted to classroom use and is not allowed to go home with the student. The type and amount of work teachers could assign changed when one or two students could not take their laptops home. The teacher participants reiterated their concern that 24/7 access to technology was necessary to maintain the quality and quantity of a student’s work.
The expert group also noted that online research is time consuming. It takes time to create technology-rich lesson plans. An EDGE teacher must research each Internet link that they want their students to visit before it can be included in the lesson. Even with the Internet filter provided by the district, EDGE teachers ultimately follow the “trust but verify” rule to ensure their student’s Internet experience will follow the lesson plan.

Financial Issues

Not all laptops go home with students due to the cost of insurance. Some schools provide help for families who cannot afford the annual insurance cost of thirty-five dollars. If the parent chooses not to accept responsibility for the laptop, the student is not allowed to take the laptop home.

Upgrades are another financial concern for EDGE schools. The most common upgrades include operating systems, application software, and “refreshing” the laptop hardware. The district provides some support for software and hardware upgrades. But schools cannot count on help from the district and must have a plan in place to either fund upgrades, or to continue using the equipment “as is” for as many years as the laptops will continue to work. Older laptops are often placed in lab settings to reduce the wear and tear resulting from students carrying them home each day.

Hardware Infrastructure Issues

One-to-one laptops are connected to the school’s Local Area Network (LAN) and the district’s Wide Area Network (WAN). The school’s LAN is hosted by another computer (or a series of computers), called a “server”. When a server quits working
properly a work order must be entered with the district. These work orders may take several weeks to be completed. Support personnel and loaner servers increase the financial burden the district already carries. Teachers must be prepared to present alternative lessons that do not require access to the network until the server is repaired.

Imaging laptops to restore or upgrade the operating system and installed application software requires time, personnel, and equipment. Laptop images are software packages that contain a “snapshot” of a fully functioning laptop. Every year, the EDGE laptops are restored with an updated image. The laptops are wiped clean and imaged with a new operating system and new teacher and student software. This is usually performed over the summer. A large room is set up with tables, switches, servers, and wires to facilitate the image deployment to hundreds of laptops. For larger deployments, the district provides additional support personnel and equipment to help individual schools.

Legal Issues/Ethics

Copyright laws and Digital Rights Management (DRM) have become regular subjects for discussion among teachers and students. Internet research invariably leads to text and image downloading, which triggers discussions on proper usage, credit citation, and plagiarism. Many websites offer free graphics for educators and students if their website is credited. In an EDGE classroom, student presentations include a credit page for resources that are not created by the student. Students were also taught how to write an author to request permission to reproduce their copyrighted material on a presentation or student website. During the Iditarod project conducted by one of the expert teacher
participants, several students wrote to Iditarod mushers to request permission to use the image of the musher on the student websites. Several students received responses from mushers giving them permission to use the Iditarod images. One student posted the letter of permission on her website.

Perception of Quality of Student Work

The expert teachers group strongly endorsed the idea that uninterrupted 24/7 computer access improved the quality of student work. Schools that choose not to allow 24/7 home access are still counting on teachers and students to get similar results in a fraction of the time. Several of the teacher participants commented on the difference in the amount and quality of work submitted when their school changed from uninterrupted access to “in the classroom” access. For students to have time to complete multi-content area projects to the high standards that these teachers required, and were accustomed to, the students needed more access. These “big concept” projects may include student writing, graphing, spreadsheets, voice recordings, videos, and reflections. There are many ways to include a diverse sample of student work in these large projects. The well-rounded student can show his talents in many of the areas of multiple intelligences. The students can also work through his weaknesses by having extra time to complete various sections of the project at home.

Network Issues

Maintaining software updates, extracting malicious code (spam, viruses, etc.), and policing software piracy on thousands of laptop computers is a formidable task for a local
school district. The district looked for a software solution to these software issues, and ended up with an application called FileWave. Properly deployed, FileWave works like a beneficial virus, scanning the computers attached to the district network and repairing them as needed. FileWave can also configure new hardware, update old software, install new software, and enforce software licensing by removing offending applications. With FileWave, one district level person can manage thousands of computers. Of course, with that kind of power, one mistake can effectively take down thousands of computers. After two years of “learning from their mistakes,” the district has a much more realistic understanding of routine maintenance, and EDGE schools have learned to live with FileWave. Antivirus software is one of the software packages routinely deployed by FileWave. The most current version only lasts a few months. When an update is released, the update package is deployed to the school network. Then, when students restart their laptops at school and connect to the network, the latest version is uploaded to their laptop. This stops any other work from being completed on the laptop. A message appears stating the laptop is receiving new software and it cannot be used until the software is installed and the laptop is restarted. Receiving software updates can take up to an hour. The teachers never know ahead of time when software updates will be sent out to schools. This causes a problem when a teacher has a lesson ready to begin when school starts and all of the laptops are busy receiving software. It has been a constant source of frustration for EDGE teachers.

Airport® software and radio receivers have to be upgraded to handle the growing Internet, mail and printer access needs of schools. Airport® routers are the access points
placed throughout the school to provide wireless access for student and teacher laptops and most of the newer desktops.

Server software also needed to be upgraded as newer laptops were connected to the network. The new laptops had newer operating systems than the servers could handle. The district technology personnel created a timeline to upgrade servers at schools as needed.

Support

Support is stretched very thin in the district. Budget constraints hold the district technology support group down to a small number. Even elementary schools that have EDGE classrooms have no allocation for a technology person to help with issues on campus. Allocations for a tech person at every school were started at the high school and middle school level a few years ago. This process was stopped when budget cuts hit the district. The plan to allocate a tech person for every elementary school is still on the table, but may not be implemented for the foreseeable future due to lack of funding.

Teacher Training

The expert teacher participants agreed that offsite “computer” training seemed more important during the initial one-to-one implementation period, but once the technology became seamlessly integrated into their daily workload, persistent training requests were handled in-house by team members and their onsite instructional technology specialist. The training requests also shifted from computer concepts to curriculum integration. This is in part, due to the modern Graphical User Interface (GUI),
which eschews complicated procedures and commands in favor of simple, but powerful, software solutions.

When asked how they felt about training today, the expert teacher participants responded that training was a “non-issue.” They felt there were enough training opportunities for everyone. They also felt that their training needs had been satisfied.

Novice Focus Group Discussions: Question One

The following reports on the novice focus group categories and themes for study question one:

1. How do novice and experienced EDGE teachers perceive that technology changes teaching and learning in the classroom?

The major categories determined by the principal researcher included Assessment, Collaboration, Continuous Access, Culture, Curriculum, Implementation of Technology and Curriculum Integration, and Methods.

Assessment

The novice group participants discussed the creative ways their students find to demonstrate knowledge gains. The students used critical thinking and problem solving to incorporate learning goals into meaningful technology infused products. The use of rubrics allowed the students to choose how they would demonstrate achievement of content area knowledge. There is a give and take between the teacher and the students. Students can “make their case” to a teacher if they want to provide a different type of content assessment project. The teacher participants were impressed by the students’
interaction and creativity determining end-of-unit assessments. Students often had a unique perception of the assessment process which excited the new teachers. The excitement spread to other students who then thought of other ways to provide products related to the unit lessons. Once the students realized they had choices of assessment, they created and planned their own proof of knowledge for the teacher. In the past, students have been trained to expect certain types of assessment at the end of the week or the end of a chapter. Now students were being encouraged to be creative in producing assessment products. Some examples of products created by students were short movies, slide show presentations with music or voice-over narration, multimedia projects, and live web links. Live web links allow students to access for related information from the Internet during a presentation. The students were becoming more interesting and knowledgeable presenters by using a variety of resources.

Collaboration

As in the expert focus group, the novice focus group participants discussed how the students taught the teachers to use shortcuts in certain programs. When the students had their laptops at home overnight or over the weekend they had time to explore and experiment with the installed applications. Inevitably, a few students became particularly adept with an application or process. These student “power users” would then share their mastery with the rest of the class. Students attached their laptops to the LCD projector to show the entire class a feature or project section they had worked on at home. In this way a culture of collaboration was fostered. During this process of collaboration, the teacher was placed in the role of learner. The relationship between the students and teacher
changes into one of making the journey together. The teacher becomes the facilitator of
student learning and vice versa. Rather than being afraid of not knowing everything about
technology, the teachers seemed intrigued by learning as much as they could from the
students. It was a journey of learning together.

One of the teacher participants observed, “I think by taking their laptops home
where they could share their work on the Internet (with) their parents, (and) their
grandparents… it was a big deal.” The access to student web pages enabled parents to
delve further into their child’s studies and insights. Home laptop access provided a
collaborative environment for parents and children to meet outside of the classroom
where they could share their respective insights, one-to-one.

Students also collaborated with other classrooms of students. Teachers arranged
for same grade level and multi-grade level time on a weekly, bi-weekly, or monthly basis
for their students to become e-buddies with other classes. These e-buddies would share
ideas, learn together, and help each other through projects. Fifth graders would help
kindergartners type in their reflections of a project or subject area. The fifth graders
helped the younger students submit their product to the teacher’s website. Once approved
the teacher posted the students’ work on their website.

Students also collaborated with students from other countries. One of the teacher
participants contacted a teacher from Europe and arranged for their students to become
“digital” pen pals. The students sent pictures of their classroom and their learning
products to each other. The students wrote for a purpose. These kinds of projects create
excitement and renewed student effort to write more than they might have before having
a pen pal.
Continuous Access

The novice EDGE teacher participants explained that continuous access to the laptops expanded the core curriculum. Students used their creativity and curiosity to construct a new, more interesting way to study. Immersed in projects of their own design, the students could also take ownership of the core curriculum underpinning their work. The students were not expected to simply write about the story. Students could write a song, poem, or produce a slide show to show what they had learned to the rest of the class. Continuous access to technology provided the students with many options.

The teacher participants also discussed how technology changed the way they plan their lessons. When students had continuous access to technology, the teachers felt compelled to go online to review the technology part of the lesson. New textbooks provide a technology section in the teacher’s manual for many subject areas including reading. The novice teachers are beginning to use these parts of the teachers’ manual since they have become EDGE teachers. This information helps teachers incorporate technology into their lessons. One class was studying owl pellets during a science lesson. The students were able to go online and watch an actual dissection of an owl pellet. The students were also able to watch an animation of how the pellet travels down a barn owl’s stomach. This kind of online study broadened the learning experience for students.

Culture

The culture in the novice teacher classroom became accepting of students’ role as teachers. On many occasions, students would teach the teachers. The teacher participants felt as many as nine out of ten students were already comfortable with technology when...
they entered the classroom. The teachers did not have to create lessons to encourage their students to use technology. However, the teachers had to be receptive to the challenges of a more open curriculum. The teacher participants stated that technology is an ever present part of their student’s lives. Many of their students already had game systems, cell phones, digital cameras, and Internet access at home. These novice teachers have to make the effort to jump in and learn along with their students in this new paradigm of teaching and learning. Another benefit they observed was the easy way their students were able to stay focused and on task when they were working with their laptops. These teachers found ways to integrate technology into everything in the classroom.

Curriculum

The novice teacher participants discussed the district’s strategic objectives. These objectives include: enthusiasm for learning, democratic process, goal setting, and global outreach. The teachers felt that these were big concepts for elementary children, but with technology in the curriculum, meeting these objectives was easy. Students asked the teachers if they could place an artifact on their website. In response the teacher would ask the student in which category the artifact would be placed. If the student could explain to the teacher which category and why, then the teacher would allow the artifact to be placed on the student’s website. When the students were just beginning to set up their websites, they used a teacher-created template to help them determine how a certain project or artifact could be categorized. Using this model, students were able to post what they were learning and explain why on their website.
The students also wrote reflection pieces to describe their thought processes on a particular project. The students could explain verbally why they were placing their project in a certain category, but it was much harder for them to write it down. At first the students were writing rudimentary sentences like, “I liked it” or “It was fun.” By the end of the year, these same students were including personal insights in their into writing, explaining why they were learning a certain subject.

Over the course of the year, the students expressed a desire to rewrite and to improve their previous reflections. The teacher reminded her students that their websites represented a chronicle of their progress. The students were encouraged not to erase or rewrite their earlier reflections as it would destroy a uniquely personal archive.

A few of the novice group teachers insisted that one-to-one student laptops did not change the way they teach reading. They went on to explain that it did provide another option to support what the students had already been learning and gave them another way to see or hear the lesson. After teaching reading without using the student laptops, one teacher noted that she used a program to track the students’ progress. She stated that there were a lot of good technology based tools she could use to support what she was already teaching in the classroom. Another teacher chose not to include one-to-one student laptops in her guided reading groups. She did state that while she was teaching the small group, the remaining students were in centers that utilized technology.

One of the novice group teachers thought she needed extra practice teaching reading. She was concerned that when students read independently, no one knows if the students are reading correctly. This same teacher explained that one of her students used an iPod to record himself as he read aloud. The teacher connected the iPod to the
student’s computer so he could listen to his saved recordings with headphones. The goal for this student was to improve his fluency in reading. The teacher explained that the technology wasn’t teaching this student to read, but it was supporting what she was trying to do. The technology gave her more options. A student listening to and learning from his own voice recording can be independent of teacher feedback. When the student listens with headphones he is presented with a private audition as opposed to everyone in the class hearing him read aloud. Removing the judgment of others helps some students.

The novice group participants also discussed the ramifications of technology on advanced and gifted students. The teachers felt the EDGE classroom environment provided a real opportunity for differentiated curriculum and learning enrichment, two areas they considered essential for student engagement. With one-to-one laptops in the classroom, teachers could easily extend student learning by differentiating curriculum for students who had mastered a certain skill. The teachers explained that if students had already learned multiplication, they could proceed to division. The teachers also revisited how rubrics provide project options for all students, which further extended the curriculum.

One teacher explained how students were pulled out of class during the special area time (such as Physical Education, Art, Music, Spanish, and Media), to receive the day’s math lesson before the regular class time for math, effectively “front loading” curriculum. Using this method, the students have exposure to the same material twice to facilitate retention.
Implementation of Technology and Curriculum Integration

The teacher participants noted that their students’ prior experiences with technology prompted their quick support of the EDGE program. The students often began sharing their expertise as soon as the laptops were delivered. The teachers were very impressed by the excitement and enthusiasm generated by the arrival of the EDGE laptops.

The novice teachers commented that they themselves perceived no significant changes in their pedagogy but added that some of their strategies had shifted. The first-year EDGE teachers invariably took smaller, incremental steps toward integrating technology since they were uncomfortable with the prospect of infusing technology throughout the curriculum. One teacher explained a change that she made in her strategies to teach grammar. This teacher used the student email software to teach sentence and paragraph structure.

The teacher participants also noted that there were more opportunities for creative learning and differentiating instruction with one-to-one laptops. There were many changes to learning and teaching styles reported by the novice EDGE group teachers, although they seemed reticent to clearly acknowledge these changes.

Methods

The teacher participants discussed the variety of options available for students to show their learning with technology. The teacher rubrics expanded the options available for students using multi-media, slide show and presentation software. Students have the available resources to take ownership of their learning. Some students find creative ways
to demonstrate their knowledge gains. There are more opportunities for creative learning and differentiated instruction. Given time, motivation, and imagination, technology can be integrated into any subject area. One teacher participant is going to record student speeches next year because it worked so well this year. Another teacher added, “…by the time (the students) get to me…they know what to do and that helps with instructional time.”

Novice Focus Group Discussions: Question Two

The following is a reporting of the novice focus group categories and themes for study question two:

2. What patterns of experiences emerge in the classroom when implementing technology?

The major categories determined by the principal researcher included Collaboration, Culture, Curriculum, Continuous Access, Goals, Implementation and Integration, Perceptions, Resources, and Support.

Collaboration

The novice teacher group participants observed students working in groups to advance their knowledge. The teachers also collaborated with each other. A first year EDGE teacher volunteered to become the Peer e-Folio Partner (PEP) for her school. This teacher realized a significant increase in her self-confidence and technical expertise by mentoring new EDGE teachers in her school.
Culture

One of the teacher participants described how her school had hosted an evening EDGE meeting for parents and students. The meeting provided an opportunity for parents to see the inside of an EDGE classroom and approve their child’s participation with continuous access from home. Students and parents signed a contract accepting the district’s policies regulating the use of one-to-one laptops. Although many of the parents already had Internet access at home, more than a few were excited by the prospect of spending evenings and weekends exploring a modern laptop computer loaded with the latest productivity software. With the “signed” approval of their parents, the students would fearlessly click on anything and everything, sometimes finding hidden key commands, but more often finding either they were hopelessly lost or their laptop was suddenly unresponsive. This unfailingly prompted a trip to the teacher’s desk and a flurry of requests for technical support from new EDGE teachers. The district’s instructional technology specialists quickly resolved these common new EDGE teacher requests.

Curriculum

The novice EDGE teachers discussed how one-to-one laptops were used to differentiate the curriculum simultaneously. They described how one group of students could be enriched while another group was remediated during the same lesson. Two of the schools also offered prescriptive assessment in the classroom concurrent with the content area block. Access to technology offered many curriculum options for teachers and students.
Implementation

The teacher participants established acceptable classroom use policies for student laptops immediately following rollout. Proper keyboarding, handling, and other topics were discussed and practiced in the classroom. After the Parent Night EDGE meeting, the students were allowed to take their laptops home. The teachers explained that students used the laptops in the classroom for about one month before they were allowed to take them home. The novice teacher participants seemed to be more mindful of the recommended rollout procedures than their more experienced EDGE team members.

Methods

The novice EDGE teachers considered how technology was incrementally incorporated into their classroom curriculum. The teachers examined their concerns regarding the need for traditional backup plans they could fall back to in the event of a serious laptop or network failure. A second-year teacher added that the newer technology was more robust than the older “legacy” equipment that was part of the school’s inventory. Deploying newer laptops on the EDGE network significantly improved system reliability and teacher confidence. Serviceable legacy units were reassigned to mobile carts that could be reserved for other purposes.

Motivation

The novice teachers agreed that their students were very excited to be part of the EDGE program. The high level of excitement was one of the initial driving forces behind the commitment to integrate technology fully in the classroom. As these new EDGE
teachers became more proficient handling the day-to-day technology tasks, individual specialties emerged. One of the second year teachers commented, “I was so excited when people started calling me and asking me for help. They know I know how (to use technology).”

Perceptions

The first week after roll out was a time of anxious anticipation for the novice EDGE teachers. The teachers’ feelings varied from unsettled anxiety to overwhelming excitement. One of the teachers mentioned her first crisis on roll out day, when she had to plan for all of the logistics of charging a classroom full of laptops with only six electrical outlets in the room and no power strips. The initial perception held by these teachers was that technology would be integrated into everything. The teachers liked the idea of integrating technology into everything but they were not sure they knew how to begin. One of the teachers explained that she wanted technology to be part of the learning environment from day one. As the excitement waned, this overwhelmed first year teacher complained, “I don’t have time for this (technology integration) because it’s instructional time.”

The novice teachers’ confidence was greatly improved by their second year. They felt more comfortable managing a one-to-one classroom and were ready to use additional strategies to integrate technology. They were excited about the upcoming year.
Procedures

The novice EDGE teachers discussed the procedures and policies they followed for the first few weeks after roll out. The teachers followed the district’s Acceptable Use Policy. Several teachers explained the use of a “Purple Book”. The book is a compilation of directions for a variety of programs and activities such as uploading pictures into website software. The students create the step-by-step directions on their laptop, and then print them out to be placed in the Purple Book. When a student has a question about something the class has already learned, the student is directed to the purple book for help.

Support

The novice teacher participants felt that they always had someone to turn to when they needed help with technology related problems. First year EDGE teachers had mentor support from experienced EDGE teachers. EDGE teachers could count on support provided by the district Instructional Technology Specialist assigned to their school. Some schools also had a full time technology person on site. Loaner equipment was usually available when it was needed.

The novice teacher participants did not always attend the EDGE support meetings provided by the ITS. Some of the teachers claimed that they did not receive the notification e-mail from the minutes of the EDGE meetings. The ITS provided weekly training in the form of onsite mini-workshops for the EDGE teachers. One of the novice teachers added, “We had e-folio workshops every Wednesday…and we always had
mentoring. I would say my whole team was my mentor.” A summer institute was also offered for new EDGE teachers.

Teachers In Learning Mode

The first year EDGE teachers discussed their initial concerns regarding their own inability to learn “everything they needed to know” about technology. At this stage, the new EDGE teachers were not trying to learn how to implement technology. They were concerned about staying ahead of their students. Once the teachers recognized that these advanced students were a valuable resource, they were able to provide the necessary direction for instruction and control the pace of implementation and integration.

Novice Focus Group Discussions: Question Three

The following is a reporting of the expert focus group categories and themes for study question three:

3. How can one use technology to promote constructivist instructional practices?

The major categories determined by the principal researcher included Collaboration, Continuous Access, Culture, Goals, Implementation and Integration, Perceptions, Resources, and Support.

Access

The students in an EDGE program have access to learning 24/7. Learning can happen any time of day. The classroom can be any place in the world.
The students at one elementary school emailed the principal to explain the project they had created for the end of the year program. The students chose their own project to showcase their learning. Not only did these students have access to technology, they had access to the principal of the school.

Assessment

During the end of the year open house, student projects were presented online and in videos to parents, administrators and the district’s director of elementary principals. The first year EDGE teachers were very proud of their students’ projects. One of the teachers recalled a particularly memorable meeting, “It was amazing to hear (the director’s) conversation with this eloquent little girl because she was very knowledgeable and her issue was about conservation, conserving energy…you never know what they’re going to say…”

Collaboration

The teacher participants discussed how student experts are recruited to teach other students. The student experts also help students and teachers in other classrooms. At one school, groups of three to five students work together to complete their Primary Years Program project. This school had an International Baccalaureate (IB) focus. The IB program encouraged out-of-the-box thinking for the students’ unbounded exhibition project at the end of their elementary coursework. The curriculum emphasis was on the big concept. The source material was global and personal to the students.
Curriculum

The novice teacher group discussed a pen pal project set up between classrooms in Florida and Virginia. The students emailed each other through a protected software program. They were encouraged to write throughout the school year. At the end of the year, a live video feed was set up between the two classrooms so the students could meet each other face-to-face. One student was heard exclaiming, “I didn’t know you had glasses!” It was a remarkable experience for the students and teachers in both classrooms.

Differentiation

One of the teacher participants described how she used software for comic book creation to reach her Attention Deficit Hyperactivity Disorder (ADHD) students. ADHD students have a difficult time staying “on task.” The teacher explained that her students were able to create interesting comic book stories using the software. The true measure of success for the students using this software was the abundant creative writing they used to tell their illustrated stories. These same students had habitually shunned traditional writing exercises before the introduction of the comic book software.

Independence

The teachers agreed that student learning was more independent of the teacher when technology was integrated into the curriculum. The students were able to complete their research and learning independently. One teacher said she felt like a “human dictionary” before the students had access to their one-to-one laptops. With the dictionary and encyclopedia software loaded on their laptops, the students could spell check and
research the daily vocabulary words. The teacher added that she also had her students use
traditional hardcover dictionaries and encyclopedias so they would know how to use
those resources as well. The teacher’s goal was to make a plethora of resources available
to the students to encourage independent research and confidence in their problem
solving skills.

Another first year EDGE teacher was inspired by the homework submitted by her
students for their school webpages. She kept a running list of ideas for students to use as
starting points for website artifacts. One of her students posted pictures of her home
garden project on her webpage. The student specifically posted the pictures to her “goal
setting” webpage and explained why her garden project belonged on this page in the
accompanying reflection writing. This teacher recognized how her students were
independently pulling from their life experiences and connecting them to the district
strategic objectives.

Motivation

The first year EDGE teachers found that students accepted responsibility for their
own learning. The teachers felt that technology motivated their students by providing a
creative outlet that attached personal meaning to their work. The teachers valued these
uniquely personal connections and the insights they provided into their students’ lives.
They also became more attuned to the nuances underlying student questions, especially
when they were discussing these “big” projects. The students knew that their projects
would be published online where their friends and family could see them. This
encouraged the students to make the necessary revisions and edits so they could show off their best work.

Real Life Experiences

The students published both their school work and outside-of-school work on their web pages. Some students related their goal setting web page to a sport they played after school. One student was a member of a winning ice hockey team. He traveled with his team to Michigan for several weekends of championship play. He used his experiences to write about sportsmanship and goal setting on his web page.

Novice Focus Group Discussions: Question Four

The following is a reporting of the novice focus group categories and themes for study question four:

4. What are the major barriers that teachers report they experience when implementing technology into the curriculum?

The major categories determined by the principal researcher included Access, Assessment, Confidence, Curriculum, State and District Mandates, Parent Involvement, Expectations, and Equipment Support.

Access

One of the first year EDGE teacher participants explained the following situation that occurred at her school. Two of the five fifth grade classrooms were EDGE classrooms with one-to-one laptops. The students in the other three classrooms
complained that they did not have access to technology like the other students in the EDGE classrooms. The students were in three teachers’ classrooms that had participated in EDGE the previous year. These teachers chose not to be included in EDGE for the current year. Their students did not forget that they did not have access to technology like the other EDGE students.

Another issue that was discussed by the novice focus group was an oversight that left teachers and students using different versions of the same software. The teacher laptops were deployed with the latest software, but the students’ laptops were not. One of the teacher participants explained that she had created a slide show lesson using a presentation software application. The lesson was created to show students how they could create their own slide shows. When the students opened their laptops they found their software did not have the same features that their teacher had demonstrated. The teacher was obliged to recreate the lesson using the software that the students had on their laptops.

Assessment

The teacher participants discussed why their students did not take online testing seriously. Several teachers tried to “go paperless” for testing since it was available online for the reading series. The teachers explained that the students knew their parents would not have to sign their test paper, so they did not feel compelled to do their best. When the teachers reverted back to paper testing, the students were more diligent. This observation was partly attributed to the strategies students are taught for FCAT testing. These strategies include highlighting and underlining key words, which the students cannot do
on the electronic versions of the tests. There was also no provision to go back and check previous questions in the online test. One of the teacher participants lamented stated, “I was trying to go paperless and I ended up printing (tests) out anyway to send home the scores (to parents).”

Confidence

The first and second year EDGE teachers were concerned about their level of proficiency with technology. A few were intimidated by “tech talk”. One of the teacher participants commented, “It’s really hard to come to terms with (my lack of knowledge)…it’s not good for your self-esteem…” Another first year teacher added, “The issue is just not relying on it (technology) too much. You still have to teach…”

Curriculum

The teacher participants also discussed the impact on curriculum and classroom culture caused by parents who arbitrarily decided not to allow their child to bring their laptop home. Even one parent can change the paradigm of 24/7 access. One of the teachers had to cut some of the larger projects she had done the year before. The teacher had relied on evenings and weekends for her students to complete their projects. She added that the projects turned in by her students were not as detailed or finished as they were when her students had 24/7 access.
State and District Mandates

The teacher participants explained how the various state and district mandates impacted the technology implementation timeline and eroded their motivation. Florida’s Comprehensive Assessment Test (FCAT) and Adequate Yearly Progress (AYP) scores drive curriculum and learning strategies in most of the district’s schools. Accountability reforms that target “under performing” schools force teachers to devote valuable time to test preparation and practice for FCAT. The teachers also expressed their concerns regarding the district’s unrealistic guidelines for the number of e-folio artifacts that needed to be posted each quarter.

Parent Involvement

The teacher participants noted that some parents never checked the student e-folio work posted on the Internet. This was dispiriting to the students who had worked hard and hoped to share their best work with their family.

Expectations

The first year teachers explained that they entered the EDGE program with idealistic expectations of what they could accomplish with technology. They quickly realized that they did not have the knowledge necessary to implement all of the ideas they had planned. The teachers’ expectations changed as they learned to balance implementation, student learning, and personal training.
Equipment Support

Many of the same equipment failure issues encountered by the expert focus group were also reported by the novice group. The significant difference was how the first and second year teachers responded to technical problems. Relatively simple, but uncorrected problems became decisive obstacles for the uninitiated novice group when one school lost their full time technology support person. Because the novice teachers were dependent on a consistent student experience, they were more likely to revert to traditional teaching methods when confronted with technical interruptions. A variety of part time personnel solutions were investigated, but the majority of the issues were resolved with teacher training and robust equipment upgrades.

Summary of Findings

While compiling the focus group data, the researcher noticed a recurring pattern connecting the categories and underlying threads. The first pattern emerged in the teacher participant’s descriptions of a collaborative student learning model they used to manage large student projects. This student team model was loosely based on Kagan structures (Kagan, 1994). These large projects are used to teach big concepts and to answer essential questions. The big concepts are then used to provide structure for core curriculum delivery. The EDGE teams are usually limited to four students.
The model also uses independent learning to separate the large project into individual tasks. The model is fully connected. Everyone in the group contributes and participates. Each student leads his or her own section. A project leader can be chosen, or the lead position can rotate from one job to the next. The model is effective whether the students operate from their strengths or weaknesses.

The Student Learning Model (Figure 1), encouraged participation at many levels. Students found creative ways to contribute to their projects utilizing their own curiosity, personal experiences, and unique skill sets. This culture of collaboration engages students, provides opportunities for them to demonstrate knowledge gains, and encourages support for individual and collaborative assignments. Students were able to stay focused and on-task, and routinely exceeded expectations. The students also participated in evaluating the finished product and their individual contributions.

The next model demonstrates how the collaborative and independent connections in the Student Learning Model (Figure 1) can be used as a structure for the classroom teaching model.
Figure 2. *The Classroom Teaching Model.*

This model demonstrates the interaction between teachers, student experts, administrators and specialists in an EDGE school. The teaching model symbolizes a typical EDGE team. Everyone is a teacher. Like the student learning model, all of the teachers work collaboratively and independently. The connections may be limited to a specific grade level or part of an extended school-wide network.

The student experts are students who bring unique skills they have acquired either inside or outside of the EDGE classrooms. The teachers were able to utilize the strengths of the student experts to aid in classroom instruction and provide group leadership. This relinquishing of power inspired student ownership.

The school administrators supported the EDGE classrooms by teaching subject areas in which they were proficient. The shared teaching relationship meant that teachers and students were less likely to be intimidated when an administrator entered the classroom. Administrators who attended workshops with teachers had more empathy with team members when resolving issues in an EDGE classroom. The shared teaching model strengthened the trust and respect connecting its members. With trust and respect
in place, a distribution of leadership followed, empowering all team members to solve problems and create new teaching solutions.

The Instructional Technology Specialists worked closely with novice and expert EDGE teachers to support and model classroom lessons. This support was critical to first and second year EDGE teachers. With support from the ITS, novice teachers increased their self-confidence and were able to mentor new EDGE teachers. The ITS met with administrators to facilitate the creation of the schools’ technology plan and the timeline for implementation. The ITS also met with the Peer E-folio Partners and administrators to create a school-wide technology plan.

This networked model sustained a renewable source of mentors. The integrated support system of teachers, student experts, specialists, and administrators provided interconnectedness and interdependence. The interdependence of the team is critical to the success of the EDGE program. The individual contributions from the teams are woven together in a tightly knit fabric in a successful EDGE school.

The next model demonstrates how the learning community is connected.

Figure 3. The Learning Community Model.
The Learning Community Model, Figure 3, reveals the interconnectedness of the students’ home, school and world. The EDGE classroom is not confined to the school.

The EDGE program makes it possible for students to take their laptops home where they can show their parents, grandparents and siblings the projects they are currently working on at school. The students can also retrieve their website products from any computer with Internet access. This access encourages parents to discuss their child’s education and share in the excitement of learning.

Students may use technology to email another student, or communicate with another classroom in the district, state, country, or another continent. Access to global resources and communications is expected by these students. Their thirst for knowledge goes beyond their classroom into other classrooms around the world.

Access to multimedia products on the Internet provides additional opportunities for students to learn from virtual instructors, guides, and experts.

![Diagram of the Foundations Model]

Figure 4. The Foundations Model.

When the school district set about to create its own mission and vision statements, the community was invited to participate. The committee included 190 community
leaders and school district employees. The product of this committee was EdVantage, the
district’s strategic plan for curriculum, community partnerships, leadership, national and
state mandates, trust, and technology. The strategic objectives are: Demonstrate
enthusiasm for the self-directed pursuit of knowledge; Articulate goals and create plans to
achieve; Participate in the Democratic Process; and Actively engage in Global Outreach.

EdVantage was set in motion several years after EDGE, and embraced the EDGE
program by creating e-Folio. The e-Folio program provides the structure for authentic
assessment. The district also instituted curriculum maps as part of their reform package.
Curriculum maps outline a scope and sequence for the year in core subject areas. The
essential questions in the curriculum maps provide the scope and sequence necessary for
teachers to incorporate the core curriculum.

Schools were challenged to create their own mission and vision statements that
would follow the district’s strategic plan. EDGE teachers and students have shown that
global interconnections enhance the learning experience.

The district has supported the EDGE and e-Folio programs with funding for
planning, implementing, equipment, and support.

These foundations are an integral part of the EDGE program.
In The Round Table the four models are connected. All of the other models are included in this final “Round Table.” This shows the interconnectedness of all of the systems that are in place in this study. The models take us from student learning to teaching to community to the foundations that make EDGE and e-Folio possible. Equally important is the realization that the many connections are not unidirectional. Learning, teaching, leadership roles, and vision are shared responsibilities.

Survey

Survey data are described in this chapter as they relate to the study questions. As introduced at the beginning of this chapter the Perceptions of Computer Technology Modified Survey was used along with a questionnaire to determine individual teacher skills and experience levels. Surveys were distributed to all elementary EDGE teachers in the county. The sample group consisted of 43 EDGE teachers. Many of these teachers were hand picked at their schools for their technology skills. EDGE teachers are generally considered by their administrators to be high achievers. Thirty-three of the
forty-three teachers in the sample group successfully completed the survey, which represents a 77% return rate. The statistical analysis results reveal high scores on both the Attitudes Towards Computer Use section and the Confidence and Comfort section of the survey. Individual teacher responses can be referenced in Tables 1 and 2. Simple bar graphs created to illustrate the distribution of scores for each section can be referenced in Figures 6 and 7. The survey data was also subjected to a SAS univariate procedure to analyze means and standard deviation and basic statistical measures. The statistical results follow.

The survey can be found in Appendix 1. Question 12 on the survey informs the first study question, “How do novice and experienced EDGE teachers perceive that technology changes teaching and learning?.” Questions 2, 3, 4, 5, 8, 9, 10, and 11 address the second study question, “What patterns of experiences emerge in the classroom when implementing technology?” Question 13 speaks to the third study question, “Can one use technology to promote constructivist instructional practices? Survey questions 12 and 13 speak to the fourth study question, “What are the major barriers that teachers report they experience when implementing technology into the curriculum?

The Attitudes Toward Computer Use section of the survey has twenty questions. Table 1 includes the raw data for individual teacher answers on each survey question. Teacher respondents are designated by T1, T2… through T33 down the left column. Questions are designated by Q1, Q2… through Q20 across the top row. Teacher responses are numbered one through five for each question. A number one indicates “strongly disagree,” number two indicates “disagree,” number three indicates “neutral,” number four designates “agree,” and number five equals “strongly agree.” The sum of all
teacher responses is indicated in the far right column labeled “Sum.” In the bottom row the mean score for the teacher responses is indicated for each question. In the bottom right corner the mean score for the Attitude portion of the survey for all teachers is indicated. For example, Teacher One (T1) answered question one (Q1) with a five for “strongly agree.” Teacher One (T1) had a total score of 86 for all answers on the Attitudes Toward Computer Use section of the survey. Question One (Q1) had a mean of 5.0 indicating that all teachers strongly agreed they would like every student in their class to have access to a computer. The mean score for the sum of all teacher responses was 85.2. This mean score would suggest that the teacher respondents had a positive attitude towards computer use.

Figure 6. Distribution of Teacher Attitude Scores

Figure 6 displays a bar graph of the Distribution of Teacher Attitude Scores. The number of teacher respondents is indicated by the vertical axis. The vertical axis is
divided into increments of two. The Score Range from 20 -100 is shown on the horizontal axis. The horizontal axis is divided in increments of five. The graph shows one teacher responded with a total score of 51, one teacher with 63, two teachers with 74 or 75, four teachers with scores between 76 and 80, five teachers with scores between 81 and 85, eleven teachers between 86 and 90, six teachers between 91 and 95, and three teachers between 96 and 100. All teacher responses are between 51 and 100 on the bar graph.

Table 2 displays the Raw Data for Individual Items of the Teacher Survey for Confidence and Comfort chart. The Confidence and Comfort section of the survey has nine questions. This chart designates the teacher respondents in the left column as T1, T2, through T33. Questions for the Confidence and Comfort section are designated as Q21, Q22, through Q29 across the top row. Teacher responses are numbered one through five for each question. A number one indicates “strongly disagree,” number two indicates “disagree,” number three indicates “neutral,” number four designates “agree,” and number five equals “strongly agree.” The sum of all teacher responses is indicated in the column labeled “Sum.” In the bottom row the mean for the teacher responses is indicated for each question. At the bottom of the Sum column, the mean score for the Confidence and Comfort portion of the survey of all teachers is indicated. For example, Teacher One (T1) answered question one (Q21) with a four for “agree.” Teacher One (T1) had a total score of 39 for all answers on the Confidence and Comfort section of the survey. Question One (Q21) had a mean of 3.9. This mean score would suggest that the teachers agreed they had adequate training in using computers. The mean score for the total of all teacher responses was 40.2. The number of years each teacher has participated in the EDGE program is displayed in a column next to the sum column. The far right column
identifies which teachers participated in the focus groups. Expert focus group participants are identified by an “E” in this column. Novice focus group participants are identified by an “N.”

Figure 7. Distribution of Teacher Confidence and Comfort Scores

Figure 7 displays a bar graph of the Distribution of Teacher Confidence and Comfort Scores. The number of teacher respondents is indicated by the vertical axis. The vertical axis is divided into increments of one. The Score Range from 9 - 45 is shown on the horizontal axis. The horizontal axis is divided in increments of two. The graph shows three teachers responded with a total score of 33, two teachers with 34 or 35, four teachers with 36 or 37, four teachers with scores of 38 or 39, six teachers with scores with 40 or 41, five teachers with 42 or 43, and nine teachers with 44 or 45. All teacher responses are between 33 and 45 on the bar graph.
Table 3 presents the statistical data derived from the Attitudes Toward Computer Use and Confidence and Comfort Using Computers surveys. Cronbach’s Alpha was run on this data to determine internal reliability for attitudes toward computer use. Internal reliability for this section was 0.85, a score that is moderately high. This indicated that the likelihood is moderately high that the teachers taking the survey would answer another question similarly on the attitude portion of the survey. Gall, Gall, and Borg (2003) state the correlation coefficient should be above 0.70 for internal reliability. Since the Attitude Toward Computer Use Cronbach’s Alpha was 0.85 one can determine that internal reliability is moderately high. This indicates that teachers would likely answer similar items the same way in the survey.

Cronbach’s Alpha was also run on this data to determine internal reliability for confidence and comfort. Internal reliability for this section was 0.89, a score that is moderately high. This indicated that the likelihood is moderately high that the teachers taking the survey would answer another question similarly on the confidence and comfort portion of the survey.

This chart also displays the skewness, kurtosis, and standard deviation for the Attitude and Comfort sections of the survey. Skewness for Attitude is -1.76 and Comfort was -0.40. The negative numbers for skewness indicates a strong shift to the right on the graph in Figures 6 and 7. The tail is pointed to the left side of the graph. Kurtosis for Attitude is 4.48 and Comfort was -1.13. Kurtosis looks at the peakedness of the distribution. Positive numbers indicate more peaked data whereas negative numbers suggest a flatter distribution. Kurtosis also looks at the shoulders of the data. In Figure 6 there are shoulders, in Figure 7 the graph simply goes up on the right with no shoulder.
Standard deviation was also calculated. This is the measure of dispersion or variation in a set of data. In other words, if data is dispersed far from the mean the number will be higher. Data charts that show dispersion closer to the mean have lower numbers for standard deviation. Standard deviation for Attitude was 9.55 and Comfort was 4.07.

Research Question One

1. How do novice and experienced EDGE teachers perceive that technology changes teaching and learning in the classroom?

Question 12 (Q1 – Q20 in the survey data), the Attitudes Toward Computer Use section of the survey can be used to inform the first research question. This section includes twenty questions that relate to teachers’ attitudes toward technology use. Table 3 displays data for the Attitudes Toward Computer Use survey. Cronbach’s Alpha was run on this data to determine internal reliability for attitudes toward computer use. Internal reliability for this section was 0.85, a score that is moderately high. This indicated that the likelihood is moderately high that the teachers taking the survey would answer another item similarly on the attitude portion of the survey. Gall, Gall, and Borg (2003) state the correlation coefficient should be above 0.70 for internal reliability. Since the Attitude Toward Computer Use Cronbach’s Alpha was 0.85 one can determine that internal reliability is moderately high.

Teachers answering this section agreed they would like every student in their class to have access to a computer. This concept is supported by the Raw Data for Individual Items for Teacher Survey for Attitude chart in Table 1. All responses under question one were answered “strongly agree” by the teacher participants. Teachers
reiterated this same idea in both focus groups with discussions of continuous access expanding and enhancing the scope and sequence of the core curriculum and providing options for the students. The teachers felt that computer skills are essential to their students. This response is supported by Table 1 which shows every teacher responded “agree” or “strongly agree” They would like their students to be able to use computers more. These teachers liked to use computers to solve complex problems. These teachers did not want more training in the use of computers. They felt that computers made their job easier and should be incorporated into the classroom curriculum. The teachers felt that computer access helped close the gap among students along economic lines. The teachers believed computers helped them as professionals. The teachers felt the computers changed their role as a teacher. They felt they could help others solve computer problems. They also felt computers enhanced classroom instruction.

The supported themes in the Attitudes Towards Computer Use section of the survey included access, curriculum, barriers, change, and professional development. The impact on teacher’s technology perceptions should be considered given the sample group’s high attitude scores.

Research Question Two

2. What patterns of experiences emerge in the classroom when implementing technology?

Survey questions 2, 3, 4, 5, 8, 9, 10, and 11 were determined by the researcher to address the second study question. Even though all teachers in Manatee County are required to have completed a bachelors degree to teach, higher degrees are held by many
of the EDGE teachers. The number of teachers who attained masters degrees were 23, and there were no specialist degrees among the group surveyed. All of the EDGE teachers surveyed taught elementary content. The number of years taught ranged from one year to 35. The grade levels taught by the EDGE teachers were third, fourth and fifth. Eighteen teachers taught fifth grade, ten taught fourth grade, three taught a four-five looping class, and two teachers taught third grade. Years using one-to-one technology in the classrooms ranged from one year to seven years. Additional technology experience outside the classroom included: newsletters, online research, genealogy, banking, word processing, spreadsheet, DVD creation, iTunes, iPhoto, games, accounting software, real estate appraising, yearbook, journalism, page design, blogging, presentations, and systems software.

The supported themes on the cover page of the survey included teaching experience, and pre-existing knowledge. The impact on teacher’s technology experiences should be considered given the sample group’s survey responses.

Research Question Three

3. How can one use technology to promote constructivist instructional practices?

Question thirteen (Q21 – Q29 in the survey data), the Confidence and Comfort Using Computers portion of the survey is used to inform this question. The confidence and comfort section includes nine questions. The teachers answered this section of the survey indicating they felt they had received adequate training in using computers and that they use computers effectively in the classroom. The teacher participants felt comfortable giving computer assignments to their students. They felt the computer
enhanced their teaching. The teachers felt comfortable using computers during classroom instruction. They felt their computer use enhanced student performance. The teachers felt incorporating multi-media into lessons enhanced their teaching. These teachers were comfortable with computer terminology and they were developing expertise in the uses of technology in the classroom.

The supported themes in the Confidence and Comfort Using Computers section of the survey included curriculum, change, and professional development. The impact of technology on constructivist practices should be considered given the sample group’s high confidence and comfort scores.

Research Question Four

4. What are the major barriers that teachers report they experience when implementing technology into the curriculum?

The survey section, Attitudes Towards Computer Use (mean score 4.3), specifically questions 3, 4, 6, 7, 8, 9, 11, 12, 15, and 17 (mean score 4.2 for the questions within the section) and Confidence and Comfort Using Computers (mean score 4.5), determine how teachers respond to barriers. The barriers included confidence and comfort, teacher perceptions, potential impact across socio-economic lines, and personal time investment. High scores on both survey sections indicate the sample group should be capable and resourceful when confronted by the major barriers associated with implementing technology into the curriculum.
### Table 1. Raw Data for Individual Items for Teacher Survey for Attitude

<table>
<thead>
<tr>
<th>Q1</th>
<th>Q2</th>
<th>Q3</th>
<th>Q4</th>
<th>Q5</th>
<th>Q6</th>
<th>Q7</th>
<th>Q8</th>
<th>Q9</th>
<th>Q10</th>
<th>Q11</th>
<th>Q12</th>
<th>Q13</th>
<th>Q14</th>
<th>Q15</th>
<th>Q16</th>
<th>Q17</th>
<th>Q18</th>
<th>Q19</th>
<th>Q20</th>
<th>SUM</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>3</td>
<td>5</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>3</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>1</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>92</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>4</td>
<td>80</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>5</td>
<td>3</td>
<td>2</td>
<td>5</td>
<td>95</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>4</td>
<td>5</td>
<td>4</td>
<td>2</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>3</td>
<td>2</td>
<td>4</td>
<td>4</td>
<td>2</td>
<td>4</td>
<td>5</td>
<td>1</td>
<td>5</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>4</td>
<td>5</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>97</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>97</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>91</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>5</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>5</td>
<td>4</td>
<td>4</td>
<td>5</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>63</td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>95</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td>5</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>2</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>86</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>4</td>
<td>3</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>80</td>
</tr>
<tr>
<td>5</td>
<td>4</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>3</td>
<td>3</td>
<td>4</td>
<td>81</td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>3</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>2</td>
<td>5</td>
<td>2</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>89</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>96</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>4</td>
<td>4</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>51</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td>5</td>
<td>3</td>
<td>3</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>1</td>
<td>5</td>
<td>3</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>3</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>3</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>96</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>3</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>2</td>
<td>4</td>
<td>5</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>88</td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td>4</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>3</td>
<td>3</td>
<td>4</td>
<td>85</td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td>3</td>
<td>3</td>
<td>4</td>
<td>3</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>82</td>
</tr>
<tr>
<td>5</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>3</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>75</td>
</tr>
<tr>
<td>5</td>
<td>4</td>
<td>3</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>2</td>
<td>4</td>
<td>3</td>
<td>3</td>
<td>4</td>
<td>74</td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>3</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>89</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>4</td>
<td>1</td>
<td>4</td>
<td>3</td>
<td>4</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>80</td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>2</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>87</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>3</td>
<td>5</td>
<td>3</td>
<td>3</td>
<td>5</td>
<td>3</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>84</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>2</td>
<td>5</td>
<td>5</td>
<td>2</td>
<td>5</td>
<td>3</td>
<td>5</td>
<td>86</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td>3</td>
<td>2</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>1</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>88</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td>5</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>88</td>
<td></td>
</tr>
</tbody>
</table>

| Mean | 5.0 | 4.8 | 4.3 | 3.9 | 3.8 | 4.6 | 4.6 | 4.0 | 4.7 | 4.1 | 3.6 | 4.3 | 4.0 | 3.9 | 3.7 | 4.7 | 3.1 | 3.8 | 4.1 | 4.8 | 83.2 |
Table 2. Raw Data for Individual Items of Teacher Survey for Confidence and Comfort

<table>
<thead>
<tr>
<th></th>
<th>Q21</th>
<th>Q22</th>
<th>Q23</th>
<th>Q24</th>
<th>Q25</th>
<th>Q26</th>
<th>Q27</th>
<th>Q28</th>
<th>Q29</th>
<th>Sum</th>
<th>EDGE</th>
<th>Yrs</th>
<th>Focus Grp</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1</td>
<td>4</td>
<td>4</td>
<td>5</td>
<td>4</td>
<td>4</td>
<td>5</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>39</td>
<td>2</td>
<td></td>
<td>N</td>
</tr>
<tr>
<td>T2</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>45</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T3</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>35</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T4</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>45</td>
<td>6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T5</td>
<td>2</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>5</td>
<td>4</td>
<td>4</td>
<td>36</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T6</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>41</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T7</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>4</td>
<td>43</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T8</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>40</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T9</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>44</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T10</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>36</td>
<td>1</td>
<td></td>
<td>N</td>
</tr>
<tr>
<td>T11</td>
<td>4</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>42</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T12</td>
<td>4</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>40</td>
<td>6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T13</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>45</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T14</td>
<td>2</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>33</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T15</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>33</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T16</td>
<td>2</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>34</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T17</td>
<td>4</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>43</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T18</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>41</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T19</td>
<td>4</td>
<td>4</td>
<td>5</td>
<td>4</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>4</td>
<td>39</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T20</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>3</td>
<td>43</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T21</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>45</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T22</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>5</td>
<td>4</td>
<td>4</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>38</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T23</td>
<td>4</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>41</td>
<td>4</td>
<td></td>
<td>E</td>
</tr>
<tr>
<td>T24</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>3</td>
<td>5</td>
<td>4</td>
<td>4</td>
<td>36</td>
<td>2</td>
<td></td>
<td>N</td>
</tr>
<tr>
<td>T25</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>3</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>33</td>
<td>2</td>
<td></td>
<td>N</td>
</tr>
<tr>
<td>T26</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>45</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T27</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>45</td>
<td>6</td>
<td></td>
<td>E</td>
</tr>
<tr>
<td>T28</td>
<td>2</td>
<td>4</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>4</td>
<td>3</td>
<td>36</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T29</td>
<td>4</td>
<td>4</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>4</td>
<td>4</td>
<td>5</td>
<td>4</td>
<td>40</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T30</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>45</td>
<td>7</td>
<td></td>
<td>E</td>
</tr>
<tr>
<td>T31</td>
<td>4</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>43</td>
<td>6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T32</td>
<td>2</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>3</td>
<td>38</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T33</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>44</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>3.9</td>
<td>4.3</td>
<td>4.6</td>
<td>4.7</td>
<td>4.7</td>
<td>4.5</td>
<td>4.7</td>
<td>4.5</td>
<td>4.3</td>
<td>40.2</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 3. *Data for Attitude, Confidence and Comfort Surveys*

<table>
<thead>
<tr>
<th>Section</th>
<th>Attitude</th>
<th>Confidence and Comfort</th>
</tr>
</thead>
<tbody>
<tr>
<td>Items</td>
<td>20</td>
<td>9</td>
</tr>
<tr>
<td>Mean</td>
<td>85.18</td>
<td>40.18</td>
</tr>
<tr>
<td>Median</td>
<td>87</td>
<td>41</td>
</tr>
<tr>
<td>Mode</td>
<td>88</td>
<td>45</td>
</tr>
<tr>
<td>SD</td>
<td>9.55</td>
<td>4.07</td>
</tr>
<tr>
<td>Skewness</td>
<td>-1.76</td>
<td>-0.40</td>
</tr>
<tr>
<td>Kurtosis</td>
<td>4.48</td>
<td>-1.13</td>
</tr>
<tr>
<td>Cronbach’s Alpha</td>
<td>0.85</td>
<td>0.89</td>
</tr>
</tbody>
</table>

**Teacher Survey**

N=33
Summary of Chapter

This chapter reported the data collected from the expert and novice focus groups and the Perceptions of Computers and Technology Modified Survey as related to the research questions. The data were reported by each of the four questions.

Responses from the teachers in the focus groups confirmed that their students were actively engaged independent learners. The students used technology as a tool to collect and to disseminate information. Network connections ensured that the latest resources would be available to students, ready to be researched anytime, anywhere. The students were reported to know how to work independently and collaboratively, solve problems, and build on prior knowledge. The students accepted responsibility for their own learning. They were comfortable working in small groups and on their own projects. Students were able to think critically, construct their own knowledge, and form new ideas based on past experiences.

The teachers expanded their capacity to accept expert student support as a valuable classroom asset. Through the numerous connections provided by technology, the teachers developed new resources and insights that were subsequently integrated into the curriculum. Their classrooms became learning communities.

The survey data was summarized and reported in Tables 1 through 3. Including the personal data from the cover sheet, the survey data revealed a homogenous sample group dominated by white, female, high achievers with a variety of technology skills and experiences.
Chapter Five:

Summary, Conclusions, Implications, and Recommendations for Further Research

The focus of this chapter is to summarize the data, make conclusions based on these data, discuss implications of this study, and make recommendations for further studies. Many of the items found in the earlier chapters are revisited in this chapter. A review of the problem examined in this study begins the chapter, followed by the statement of purpose, research questions, significance of the study and a brief statement of constructivism. The summary of literature is next, followed by the method and the summary of findings with a discussion of an analysis of the data collected. The researcher then explains conclusions based on the findings. Limitations are followed by implications of the study and the writer’s recommendations for future studies.

Statement of the Problem

Children’s learning is facilitated when they are challenged, interested, and engaged in the processes of learning. Students can become more engaged in learning when they have access to technology (Doolittle, 2003). Ubiquitous access to technology facilitates and increases the speed of changes in teaching style (Doolittle, 2003). Technology integration into the classroom can transform the teaching and learning of key content and skills. (Doolittle, 2003). Teachers can change into facilitators in the
classroom (Nanjappa & Grant, 2003). As technology becomes more pervasive in the classroom, teachers tend to work more as collaborators with the students on curriculum. When students become more responsible for their own learning, they can explain quarterly activities and learning goals to their parents during student-led conferencing (Benson & Barnett, 1998). Students understand what is required and can explain rubrics to their parents and how well they progressed during the quarter. Therefore, the problem to be studied is whether computers in the classroom can alter pedagogy and help teachers create a constructivist environment in their classroom (Huffman, Goldberg, & Michlin, 2003). The use of technology in the complex classroom environment should be viewed as a “gradual process of implementation and change” (Huffman et al., 2003). Change should be viewed as a process not an event (Hall & Hord, 2001). It is important to take a long-term view of the process of change when implementing an innovative program. Materials used in the curriculum can follow the social constructivist view of learning (Gergen, 1985; Bruner, 1986; von Glasersfeld, 1995, 2000). The school organization adapts itself to the curriculum, style of teaching, and delivery of curriculum to students as technology is introduced (Nanjappa & Grant, 2003).

Purpose of the Study

The purpose of this case study is to describe and to analyze elementary teachers’ perceptions of the effectiveness of technology as a catalyst for constructivist practices in the classroom. As school leaders and teachers make decisions on the use of technology in schools, and because educational technology continues to evolve so quickly, it is imperative that teachers’ perceptions of technology be examined and monitored over time.
to determine the efficacy of those decisions. This study comprises 33 elementary teachers in schools in one county in Florida. These teachers completed a survey designed to determine individual attitudes, confidence, and expertise in a One-to-One classroom. From the survey, seven teachers participated in two focus groups separating beginners and experts. The focus group teachers were interviewed to gather information regarding their perceptions of technology as a catalyst for changing pedagogy and implementing constructivist practices.

Research Questions

The author of this study focused on the practices of elementary school teachers who are implementing a One-to-One technology initiative, what might be learned from them, and how the teachers' perceptions of the efficacy of technology as a catalyst to implement constructivist practices in the classroom affects the implementation of change.

Research Questions:

1. How do novice and expert EDGE teachers perceive that technology changes teaching and learning in the classroom?
2. What patterns of experiences emerge in the classroom when implementing technology?
3. How can one use technology to promote constructivist instructional practices?
4. What are the major barriers that teachers report they experience when implementing technology into the curriculum?
Significance of the Study

The significance of the problem studied may be that findings may be used to advance the body of existing knowledge about the impact of technology, in the form of one computer per student and teacher, on elementary teachers' perceptions of technology as a catalyst for teaching and learning, and implementing a constructivist pedagogy. While there is some authenticated research specifically aimed at these research questions, this study included foundational and philosophical positions surrounding issues of constructivism.

By using the Analysis of Dynamics of Change Model (Shapiro, 2000), the teachers were given a six-step strategy for defining issues. The six steps are Issues/Questions, Summary/Conclusions, Potential Lines of Action/Initiatives, Rationale for Actions, Underlying Themes, and Major Outcomes. In the development of a plan for changing teaching and learning, the teachers' and students' experiences helped them internalize the constructivist philosophy (Isaacson, 2004). Involving teachers in decision making on how to solve technology integration issues is constructivist in nature.

Constructivist Philosophy

A review of the literature described how researchers view constructivist philosophy and how it relates to student learning in an elementary school. The descriptions of constructivist beliefs were used to identify relevant parts of the teachers’ descriptions in the focus groups of student and teacher interactions. Blase & Blase (1998) report that constructivist learning occurs in a variety of ways. In a constructivist environment, the learners need to be actively engaged, know how to work independently,
build upon prior knowledge, work collaboratively, make connections, and think critically. These learners are engaged in an active experience, can solve problems, form new ideas based on past experiences, and construct their own knowledge (Blase & Blase, 1998; Brooks & Brooks, 1993, 2000; Lambert, Collay, Dietz, Richert, & Richert, 1997; Marlowe & Page, 1998; Shapiro, 2000, 2003).

The constructivist culture promotes democratic processes and also includes a safe, risk-free place in which to learn. The process of learning and infusing technology in the classroom occurred in an environment that promoted reflective practices, small group instruction, project-based learning, a democratic process, self-assessment, and goal setting (Apple & Beane, 1999).

Huffman (2003) discusses the view of constructivists to show learning as a "process where students interpret information in light of existing knowledge, and actively construct and reconstruct understandings, rather than receive information from an authoritative source such as a teacher" (Huffman, 2003).

Summary of Literature

In chapter two the review of the literature was presented. The review was divided into three sections. The first section is related to the need to integrate technology as part of the curricula and the use of constructivism as a theoretical framework for technology integration. The second section relates to best practices of incorporating technology in the classroom driven by constructivist theory and Self-Regulated Learning (SRL). The third section describes the Manatee County EDGE program and related literature.

Constructivists view learning as a “process where students interpret information
in light of existing knowledge, and actively construct and reconstruct understandings, rather than receive information from an authoritative source such as a teacher” (Huffman, 2003). Students take more responsibility for their own learning when they have twenty-four hour a day access to technology (Lunenburg, 1998). Different learning styles are accommodated by the many different technologies in the schools and on individual laptop computers. The instructional design of any curriculum has an impact on the “…belief and cognitive systems of learners, knowledge transfer, and efforts to organize and evaluate classroom activities” (Oberlander, 2004). Many kinds of learning are encompassed in constructivist learning. Some of these are inquiry-based, connecting reading and writing through on-line interaction, and publishing student work in public forums such as student and school websites (Bass and Rosenzweig, 1999). Alexiou-Ray (2003) also suggested the use of reflective evaluation and continued access to current research to refine educational practices.

Method

Qualitative Research and the Case Study Method

The method selected for this research was the case study. A case study is a pragmatic form of research for dealing with problems in which understanding is needed to improve educational practices (Merriam, 1998). Case studies encompass the idea that individuals construct their own realities based on their daily social interactions. Researchers using the case study method are attempting to decipher the meaning that individuals have constructed (Merriam, 1998). The experiences of the participants creates meaning for them while the investigator attempts to record, understand, and create
meaning from the entire group. The qualitative researcher is attempting to pull things together from many different sources to reach a "depth of understanding" of the situation (Patton, 2002). This research is not conducted to predict future events but to report what is happening in this particular situation from the participants' point of view. Case studies are unique in that the person conducting the research is also collecting and analyzing the data. Due to this, techniques of data collection can be modified to be more responsive to the circumstances of the study. Data collected is able to be processed in a timely fashion and summaries can be written as the events unfold (Guba and Lincoln, 1981).

Case studies are usually characterized by "fieldwork." The qualitative researcher observes the study of interest where it is happening. The researcher visits the site to gather information in its natural setting. Case studies usually describe and interpret a situation in great detail. In this way, the researcher is immersed in the process being studied and has intimate knowledge of the events taking place (Merriam, 1998).

Case study researchers build hypotheses or theories from observations and understanding derived from fieldwork. The researcher uses themes and concepts to move toward a theory. Case studies are often described as "richly descriptive." These descriptions come from the process, meaning, and understanding the researcher has acquired from observing the situation over time (Merriam, 1998).

Merriam (1998) stated that qualitative researchers are trying to understand the phenomenon, process, or perspectives of the people involved. Analysis of the data is usually grouped by emerging patterns such as themes or categories. The final product is an attempt at a "complete, literal description of the incident or entity being investigated." (p. 30). A limitation of the case study is that results may not be generalizable.
Sample

The target sample in this study consists of 33 elementary public school teachers who are implementing the One-to-One laptop initiative now referred to as Education through Dynamic Global Experiences (EDGE). All elementary teachers included in the One-to-One program were invited to complete the survey. Permission to gain access to the teachers for surveying was addressed through the Supervisor of Measurement for the district and the principals located at the various elementary schools.

Two focus groups of three to four teachers each were used to gather information directly from teachers with various levels of classroom and EDGE experience regarding their perceptions of a One-to-One classroom. Each teacher was selected from a different elementary school within the county. One focus group consisted of three teachers with previous EDGE experience and the other focus group consisted of four teachers new to EDGE. The focus group questions were used to gather perceptions from the teachers. The focus group session lasted approximately one and a half to two hours and was recorded, video-taped, and transcribed for data analysis. The analysis consisted of deriving the themes that arise from the conversations of the participants. Once common themes were derived, a comparison of teacher responses were presented. See Appendix 2 for focus group questions.

This researcher has conducted focus groups in connection with a previous job. As an Instructional Technology Specialist, this researcher was involved in a number of focus group administrations throughout the school district.
Measures

The data collected for this research includes surveys from 33 elementary school teachers. The survey that was used for the teachers in this study is derived from a survey named *Perceptions of Computers & Technology* (Appendix 3). The modified survey (Appendix 1), allows the researcher to collect data from teachers for comparison with survey results from the survey titled *Perceptions of Computers & Technology*. The *Perceptions ...* survey was designed by Ann Barron, from University of South Florida. Barron designed this survey to “gain a better understanding of how educators use technology in the classroom and their level of experience with computers” (Barron, Kemker, Harmes & Kalaydjian, 2003). Barron’s survey includes several sections which cover various aspects of, “…confidence, skill, support, and uses of computers and technology in teaching” (Barron et al., 2003).

The first page of the Barron instrument collects demographic information about the participant such as gender, race, number of years taught, subject area taught, and level of education attained. This section has twelve questions. The following three pages include the headings: “teacher preparation for computer use (8 items), confidence and comfort using computers (9 items), general school support (7 items), types of software used to complete school related activities (14 items), integration of computers into the classroom (12 items), personal use of computers (5 items), technical support (7 items), and attitudes towards computer use (20 items)” (Barron et al., 2003). The total number of questions on the Barron survey not including personal information is eighty-two. The participants in the Barron survey responded using a 5-point Likert-type scale ranging from 1=strongly disagree to 5=strongly agree. Another type of response included for the
preparation section of the questionnaire, 1=not at all to 5=entirely. Responses to the confidence and comfort section included 1=strongly disagree to 5=strongly agree. For all items related to frequency of use, the option of not applicable (NA) was provided. There were no open ended questions on the survey.

The *Perceptions of Computers & Technology* survey was validated in a paper titled, *Another Look at Technology Use in Classrooms: The Development and Validation of an Instrument to Measure Teachers’ Perceptions* by Hogarty, Lang, and Kromrey (2003). Part of this research was supported by the University of South Florida and the Technology Literacy Challenge Fund for 1999-2000. The research was completed in order to understand “how educators and students use technology in the classroom” (Hogarty, et al., 2003). In the study of this survey, the research group was interested in: “…integration; support; preparation, confidence, and comfort; and attitude toward computer use. Once these domains were established, survey items were constructed based on existing validated instruments related to these areas” (Hogarty, et al., 2003).

Factor analyses were conducted separately for each section of the survey by Hogarty, et al. A factor analysis is a type of mathematical procedure that uses many variables or objects and distills these down to a few factors that explain the interrelatedness between the objects or variables (Cody & Smith, 1991). The sample included 2,156 respondents at a 35% overall response rate. This number was reduced to 1,850 after deletion of missing data. The reliability of the factor scores was tested using Cronbach’s Alpha. A web version of the survey was created and administered to a portion of the participants. The return rate for the web version was lower than for the paper version. The lower return rate was postulated as an extra step for the teacher to
receive the web site in the courier and then have to navigate to the survey online. This could have affected the return rate of the respondents. Internal consistency between the web version and the paper version was computed by using Cronbach’s alpha for each of the subscales by mode (Hogarty et al., 2003). Hogarty stated, “The internal reliability estimates ranged from .67 to .90. Reliability estimates for the Confidence and Comfort subscale and the Technological Aversion subscale were the same for each mode (.75 and .90, respectively).”

The research goals for the Barron study included developing a survey to look at technology use in the classroom and validating the comprehensive instrument. The limitations of these results include the fact that “all of the factor analyses were conducted within specific sections of the instrument rather than being based on a correlation matrix of all survey items” (Hogarty et al., 2003).

The survey used for this study is a modified version of the Barron survey. For the purposes of this researcher’s study, the Barron survey sections were kept intact even though some of the sections were removed that do not further this study. The sections that remained in the modified survey were Attitudes Towards Computer Use and Confidence and Comfort Using Computers. See Appendix 1 for a copy of the modified survey used in this study. This modified survey was administered one time to the teacher participants. The administration of the survey occurred after approximately six months of the teachers’ experience with the One-to-One Laptop (EDGE) initiative. Individual classrooms in the EDGE schools receive the computers at different times during the school year.

The first page of the modified instrument collects demographic information about the participant such as gender, race, number of years taught, subject area taught, level of
education attained and number of months/years the participant has been using computers in the classroom for instruction. This section has twelve questions.

The next section in the modified survey is Attitudes Towards Computer Use. This section has twenty questions answerable with a 5-point Likert scale ranging from 1=strongly disagree to 5=strongly agree. The next area on the modified survey is the Confidence and Comfort section. This section has nine questions answerable with a 5-point Likert scale ranging from 1=strongly disagree to 5=strongly agree. The total number of questions on this survey not including personal information is twenty-nine. There are no open ended questions on the modified survey.

Data Collection and Data Analysis Methods

The modified survey was administered one time after the students had their laptops for approximately six months. The quantitative data from the modified survey was tabulated according to the predetermined categories of Attitude Towards Computer Use and Confidence and Comfort Using Computers. The raw data was organized into two tables included in Chapter Four. The data was analyzed using an overall score for Attitude Toward Computer Use and an overall score for Confidence and Comfort for each participant. The averages of the individual question scores on the Attitude Toward Computer Use scale and the Confidence and Comfort scale were also calculated and reported. For both sections of the modified survey, the internal consistency was calculated using Cronbach's Alpha. A confidence interval was used to index the degree of precision of the participant group of thirty-three teachers.
Two focus groups were used to gather qualitative data directly from teachers on their perceptions of experience with technology in the classroom and any changes that occurred in teaching style. Focus group interviews consisted of a group of people specifically invited due to their involvement in the topic to be studied (Gall, Gall, & Borg, 2003). The interview was planned and questions were provided to initiate conversation between participants that might not otherwise be stated in an individual interview (Gall, Gall, & Borg, 2003). Focus group characteristics have been identified by Krueger and Casey (2000) as:

"(It is) a carefully planned discussion designed to obtain perceptions on a defined area of interest in a permissive, nonthreatening environment. ...The discussion is relaxed, comfortable, and often enjoyable for participants as they share their ideas and perceptions. Group members influence each other by responding to ideas and comments in the discussion."

In the researcher's capacity as an Instructional Technology Specialist, she has conducted focus groups in the past. The previous focus groups were comprised of seven to ten teachers and took approximately sixty to ninety minutes to complete. The sessions were recorded and transcribed. The focus groups began with questions but allowed for conversation between the teachers. Specific questions were asked to generate comments from the teachers in the EDGE program to gather information on positive aspects, concerns, and challenges of the program. The teachers selected for the focus groups were directly involved in the EDGE program. After transcription, themes were derived from the responses of the participants. See Appendix 2 for the focus group questions used in this study.
Individual interviews do not allow for the interaction among participants as in focus groups. Researchers involved in qualitative studies are using focus groups to collect data on feelings, perceptions and beliefs that participants may not express in individual interviews (Gall, Gall & Borg, 2003). In this study, the focus group interviews followed the format described by Peek & Fothergill (2007) using three to four participants and took approximately one and a half to two hours to complete. One focus group consisted of experienced or "expert" EDGE teachers and the other focus group consisted of all new to EDGE teachers. Questions were posed to the group and the sessions were recorded, videotaped, and transcribed. Gall, Gall, and Borg (2003) define themes as, "salient, characteristic features of a case." Thematic analysis begins with transcribing the focus group interview. Strauss and Corbin (1990) describe making comparisons and asking questions to begin the coding process. As themes became apparent, they were compiled and discussed. Merriam (1998) encourages using visual devices and trying out themes and ideas on key informants to help advance analysis. Seidman (2006) suggests using transcripts from interviews to organize information into categories. From these categories, the researcher discerns "connecting threads and patterns" to connect other categories. This connection between categories develops themes. The researcher is able to extract and to comment on information from the themes (Seidman, 2006).

As the researcher marks transcripts, words or phrases can be used to describe passages of interest. Classifying is the process of deciding "what is interesting, labeling it, and putting it into appropriate files" (Seidman, 2006). This process is sometimes referred to as "coding" data. Seidman (2006) states that as a result of the researcher's
study of interview transcripts, the focus of their findings and results may be the presentation of themes.

Summary of Findings

The researcher concluded that the expert and novice focus group participants supported constructivist concepts in their classrooms even though they were unaware of the term “constructivism.” Students and teachers were learning in a variety of ways. They learned to work independently, build upon prior knowledge, make connections, work collaboratively, and think critically. The students and teachers were constructing their own knowledge, using past experiences to form new ideas and solve problems. The teachers supported student learning with constructivist teaching methods.

The Distribution of Teacher Attitude Scores bar graph depicts a bell curve that is skewed toward the upper end of the scale. This indicates that the teacher attitudes toward computer use were comfortable. All teachers scored between 51 and 100.

Since the Attitude Toward Computer Use Cronbach’s Alpha was 0.85 one can determine that internal reliability is moderately high. This indicates that teachers would likely answer similar items the same way in the survey.

Research Question One

1. How do novice and expert EDGE teachers perceive that technology changes teaching and learning in the classroom?
From the focus group data collected, the responses from both groups clearly demonstrate the perception that technology does change teaching and learning in the classroom. The differences in their perceptions were interesting.

The expert teachers explained that technology had evolved from basic content delivery to more global creative processes. They described technology as an integrated part of the curriculum. They readily accepted the challenges incumbent on all EDGE teachers. They clearly recognized the advantages an EDGE classroom provided for the learning community.

At first, the novice EDGE teachers were protective of their traditional teaching skills and fearful of change. They initially denied any significant changes to teaching and learning in the classroom and were uncertain of potential benefits. They cautiously admitted smaller, systemic changes. They were comfortable using technology for content delivery, research, and some creative solutions. In this sample group, novice EDGE teachers generally became expert EDGE teachers after three or four years in an EDGE classroom. The novice teachers became more skilled at integrating technology in the classroom but did not truly infuse technology in their teaching for several years. One of the expert teachers stated she did not think she had truly infused technology in her curriculum until after four or five years.

The high survey scores achieved by both the expert and novice groups demonstrated a predisposition to utilize basic technology skills successfully. How this predisposition might have affected teacher perceptions is difficult to determine from the data collected.
Research Question Two

2. What patterns of experiences emerge in the classroom when implementing technology?

The patterns of experiences that emerged in the classroom when implementing technology include many recurring constructivist themes derived from the focus group discussions. The teacher’s experiences are examined and categorized in chapter four. The recurrent categories and the discussion threads were used to generate a visual model demonstrating connectivity between significant ideas and subsequent models.

One of the recurrent categories was “collaboration.” An interesting model emerged from the student collaboration discussion. The teachers described a student team model that was loosely based on Kagan structures (Kagan, 1994). The learning pattern described in this model is significant because it is recurrent.

![Student Learning Model](image)

Figure 8. The Student Learning Model.

The model uses collaborative learning to manage large student projects. These large projects are used to teach big concepts and to answer essential questions. The big concepts are then used to provide structure for core curriculum delivery.
The model also uses independent learning to separate the large project into individual tasks. The model is fully connected. Everyone in the group contributes and participates. Each student leads his or her own section. A project leader can be chosen, or the lead position can rotate from one job to the next. The model is effective whether the students operate from their strengths or weaknesses.

The Student Learning Model (Figure 8), encouraged participation at many levels. Students found creative ways to contribute to their projects utilizing their own curiosity, personal experiences, and unique skill sets. This culture of collaboration engages students, provides opportunities for them to demonstrate knowledge gains, and encourages support for individual and collaborative assignments. Students were able to stay focused and on-task, and routinely exceeded expectations. The students also participated in evaluating the finished product and their individual contributions.

Some of the emergent themes that embrace constructivism in the Student Learning Model included:

- Students used collaborative learning strategies
- Students used independent learning strategies
- Students were highly motivated
- Students used their creativity and curiosity to study
- Students were actively engaged in their project/learning
- Choosing a student project topic was a democratic process
- Choosing a student’s contribution to a project was a democratic process
- The model provided leadership opportunities for the students
- Students accepted ownership of their project/learning
• Students set project goals
• Students connected their contributions to the team project
• Students used critical thinking
• The learning environment was nonjudgmental and safe
• Students used existing knowledge and life experiences
• Students explored and experimented within their area of expertise
• Students evaluated their own work
• Students used reflective practices
• Students constructed and reconstructed their knowledge as they learned
• Student teams became part of a larger learning community
• Students chose how their project would be presented to the community
• Students accepted responsibility for their own learning
• The model inspired a culture of learning
• Time on task improved dramatically
• Students routinely exceeded expectation
• Student/team autonomy
• Small teams and independent learning strategies provided a venue for differentiated curriculum and learning enrichment
• Students had a sense of efficacy
The next model demonstrates how the collaborative and independent connections in the *Student Learning Model* (Figure 8) can be used as a structure for the classroom teaching model (Figure 9).

![Diagram](image.png)

**Teacher**           **Student Experts**

**Specialists**       **Administrators**

**Figure 9. The Classroom Teaching Model.**

This model demonstrates the interaction between teachers, student experts, administrators and specialists in an EDGE school. The teaching model symbolizes a typical EDGE team. Everyone is a teacher. Like the student learning model, all of the teachers work collaboratively and independently. The connections may be limited to a specific grade level or part of an extended school-wide network.

The student experts are students who bring unique skills they have acquired either inside or outside of the EDGE classrooms. The teachers were able to utilize the strengths of the student experts to aid in classroom instruction and provide group leadership. This relinquishing of power is also part of constructivism.

The school administrators supported the EDGE classrooms by teaching subject areas in which they were proficient. The shared teaching relationship meant that teachers
and students were less likely to be intimidated when an administrator entered the classroom. Administrators who attended workshops with teachers had more empathy with team members when resolving issues in an EDGE classroom. The shared teaching model strengthened the trust and respect connecting its members. With trust and respect in place, a redistribution of leadership followed, empowering all team members to solve problems and create new teaching solutions.

The Instructional Technology Specialists worked closely with novice and expert EDGE teachers to support and to model classroom lessons. This support was critical to first and second year EDGE teachers. With support from the ITS, novice teachers increased their self-confidence and were able to mentor new EDGE teachers. The ITS met with administrators to facilitate the creation of the schools’ technology plan and the timeline for implementation. The ITS also met with the Peer e-Folio Partners and administrators to create a school-wide technology plan.

This networked model sustained a renewable source of mentors. The integrated support system of teachers, student experts, specialists, and administrators provided interconnectedness and interdependence. The interdependence of the team is critical to the success of the EDGE program. The individual contributions from the teams were woven together in a tightly knit fabric in a successful EDGE school.

Some of the emergent themes that embrace constructivism in the Classroom Teaching Model included:

- Teachers used collaborative teaching strategies
- Teachers embraced other teaching resources
- Teachers were highly motivated
The model promoted a culture of learning for all participants
• The model improved teacher confidence
• Teacher/student roles changed, teachers relinquished power
• Student “experts” became valuable support/teaching resources
• Teacher perceptions of learning and teaching evolved
• New rubrics embraced authentic assessment and curriculum maps
• Teacher/administrator roles changed, administrators relinquished power
• The model provided leadership opportunities for the teacher
• The model increased trust and respect between its members
• The model sustained a renewable source of mentors
• Teachers had a sense of efficacy

The next model demonstrates how the learning community is connected.

Figure 10. The Learning Community Model.
The Learning Community Model (Figure 10), reveals the interconnectedness of the students’ home, school and world. The EDGE classroom is not confined to the school.

The EDGE program makes it possible for students to take their laptops home where they can show their parents, grandparents and siblings the projects they are currently working on at school. The students can also retrieve their website products from any computer with Internet access. This access encourages parents to discuss their child’s education and share in the excitement of learning.

Students may use technology to email another student, or communicate with another classroom in the district, state, country, or another continent. Access to global resources and communications is expected by these students. Their thirst for knowledge goes beyond their classroom into other classrooms around the world.

Access to multimedia products on the Internet provides additional opportunities for students to learn from virtual instructors, guides, and experts.

Some of the emergent themes that embrace constructivism in the Learning Community Model included:

- Collaborative support was shared by the community members
- The school was committed to integrating technology in their mission statement
- Students expected access to technology and the internet in the classroom
- Most students already had technology and internet access at home
- The connections improved parent involvement
• The model connected teachers, students and parents to other teachers, students and parents next door and around the world
• The connections are spontaneous and immediate
• The connections provided learning opportunities across grade levels
• The connections provided learning opportunities across continents
• The connections provided seemingly limitless research capabilities
• Students had continuous access to these resources anywhere, anytime

![Diagram of Foundations Model]

Figure 11. The Foundations Model.

When the school district set about to create its own mission and vision statements, the community was invited to participate. The committee included 190 community leaders and school district employees. The product of this committee was EdVantage, the district’s strategic plan for curriculum, community partnerships, leadership, national and state mandates, trust, and technology. The strategic objectives are: Demonstrate enthusiasm for the self-directed pursuit of knowledge; Articulate goals and create plans to achieve; Participate in the Democratic Process; and Actively engage in Global Outreach.
EdVantage was set in motion several years after EDGE, and embraced the EDGE program by creating e-Folio. The e-Folio program provides the structure for authentic assessment. The district also instituted curriculum maps as part of their reform package. The essential questions in the curriculum maps provide the scope and sequence necessary for teachers to incorporate the core curriculum.

Schools were challenged to create their own mission and vision statements that would follow the district’s strategic plan. EDGE teachers and students have shown that global interconnections enhance the learning experience.

The district has supported the EDGE and e-Folio programs with funding for planning, implementing, equipment, and support.

These foundations are an integral part of the EDGE program.

Some of the emergent themes that embrace constructivism in the Foundations Model (Figure 11), included:

- A culture of collaboration
- The vision process (EDGE and the One-to-One initiative)
- Acceptable use policies promote student (and teacher) responsibility
- A safe internet experience
- Mission statement (EdVantage and the strategic objectives)
- Authentic assessment (e-Folio)
- “Essential” questions (curriculum maps)
In The Round Table (Figure 12), the four models are connected. All of the other models are included in this final “Round Table.” This shows the interconnectedness of all of the systems that are in place in this study. The models take us from student learning to teaching to community to the foundations that make EDGE and e-Folio possible. Equally important is the realization that the many connections are not unidirectional. Learning, teaching, leadership roles, and vision are shared responsibilities.

All of the models supported a constructivist culture that was:

- Collaborative and independent
- Receptive to individuals and valued their relationships
- Replete with opportunities for distributed leadership
- Interconnected with integrated technology
- Populated with highly engaged and motivated individuals
- Self-sustaining
- Safe and nonjudgmental
- Vision driven
• Built on authentic assessment and curriculum
• Evolving at the speed of technology

Research Question Three

3. How can one use technology to promote constructivist instructional practices?

Many constructivist tenets emerge in the patterns described in question two. As an observer moves from the Student Learning Model to the Classroom Teaching Model to the Learning Community Model and finally on to the Foundations Model there is a visible constructivist correlation. But is there cause? The answer lies in the realization that the interconnectedness is not unidirectional.

The EDGE program was designed from its foundations upward through the community, the teachers, and the student’s learning environment. Those foundations were further refined with the arrival of e-Folio. The vision process defined how technology would ultimately be integrated into every aspect of teaching and learning, blurring traditional lines along the way. Given the chronological implementation of the EDGE program and e-Folio, the vision process for the district’s technology implementation and strategic objectives ensured the emergent culture would be constructivist in nature.

The recurrent themes that accompanied the patterns described in question two were manifold. The interdependence of the patterns supported some similarities, but the independence of the teams and the way they interacted with technology guaranteed there would be differences, too. Collaboration moved up from the “Foundations Model” through every aspect of technology integration. Throughout the models there is
interconnectedness and opportunity. The district’s first strategic objective was to “demonstrate enthusiasm for the self-directed pursuit of knowledge.” These tenets touch every aspect of “The Round Table.”

Research Question Four

4. What are the major barriers that teachers report they experience when implementing technology into the curriculum?

The survey and focus group data revealed that this sample group of teachers was confident with their technology experiences and expectations. Although there were numerous reports of equipment failures and other implementation difficulties, most of these issues were resolved when the teacher was diligent. But the potential impact of high stakes testing and district mandates was more difficult to predict. The sample group agreed that training was a “non” issue. Each new hardware version is more robust, new software versions are more intuitive. Technology development is evolving at a rapid pace with new product being introduced every six to eighteen months. Future EDGE programs will likely find implementation and integration to be much less challenging.

Conclusions

Research question one asked how novice and expert EDGE teachers perceive that technology changes teaching and learning in the classroom. The focus group data from both groups clearly demonstrated that the teacher participants’ perception was technology does change teaching and learning in the classroom. The differences in their perceptions were interesting.
The expert teachers described technology as an integrated part of the curriculum. They readily accepted the challenges incumbent on all EDGE teachers and recognized the advantages provided by an EDGE classroom.

The novice EDGE teachers were initially protective of their traditional teaching skills and fearful of change. They cautiously admitted smaller, systemic changes. They were comfortable using technology for content delivery, research, and some creative solutions. In this sample group, novice EDGE teachers generally became expert EDGE teachers after three or four years in an EDGE classroom.

The high survey scores achieved by both the expert and novice groups demonstrated a predisposition to utilize basic technology skills successfully. How this predisposition might have affected teacher perceptions is difficult to determine from the data collected.

Research question two asked what patterns of experiences emerged in the classroom when implementing technology. Careful attention was given to the method used to elicit the focus group teacher responses. During the discussion, the researcher avoided any reference to constructivism that might influence a teacher’s response. Using Seidman’s (2006) approach to coding the data, the discussion responses were separated into categories relevant to the research questions. These recurring categories and their underlying themes were then connected into patterns that were also recurring.

The patterns demonstrated working models of student learning, classroom teaching, the learning community, and foundations. Within these models there were numerous supporting constructivist tenets.
Research question three asked how one could use technology to promote constructivist instructional practices. By reading the patterns chronologically from the inception of the program, “The Foundations Model” (Figure 11), through “The Learning Community Model” (Figure 10), “The Classroom Teaching Model” (Figure 9), and “The Student Learning Model” (Figure 8), cause is readily discernible, indicating that the technology program piloted in this district promoted constructivist instructional practices.

Research question four asked teachers to describe the major barriers they experienced when implementing technology into the curriculum. These ran the gamut from the fear of a student’s superior expertise with a technology resource to a system-wide network failure that was completely out of the teacher’s control. The teachers discussed the barriers they encountered including high-stakes testing, district mandates, network failures, overcoming the fear of student expertise, and entry-level technophobia. Most of the barriers could be attributed to a teacher’s lack of experience or obsolete technology. Both of these barriers should be resolved with continuous mentoring and modern, robust technology solutions.

In summary, the data collected from the teacher surveys and focus groups support the premise that elementary teachers’ perceptions of technology are a catalyst for constructivist practices in the classroom.

Limitations of the Study

This is a qualitative study conducted in one public school district in Florida. The ability to generalize these findings to any other elementary school teachers becomes unrealistic under these specific circumstances. Even with member checking, coding
helpers, and empirical readers, the researcher enters the study with biases. Complete objectivity in any study, including case studies, is all but impossible (Merriam, 1998).

Implications of the Study

1. Technology can be used as a catalyst for constructivist practices in the classroom.
2. Teachers believe that the use of technology supports improved student learning.
3. To facilitate technology integration, training should include a primer on constructivist practice.
4. Teachers' perceptions are an important part of the equation in changing pedagogy toward constructivism.
5. The school administration must support technology and constructivist teaching in the classroom.

Recommendations for Further Research

1. A case study where teachers learn constructivist practices before technology is introduced in the form of an EDGE classroom.
2. A follow-up study of the Manatee County EDGE program to determine its continued viability and other evolutionary outcomes.
3. A comparative study of other One-to-One models across the country with an emphasis on emergent patterns affecting pedagogy and the future of long-term technology integration.
4. A meta-analysis could leverage the vast amount of data being generated by One-to-One studies worldwide to create a statistically robust survey sample for future inquiries into the efficacy of the model.

Summary of Chapter

This case study examines elementary teachers’ perceptions of technology as a catalyst for constructivist practices in the classroom. Constructivism is a learning theory that provides a framework where individuals create, or construct, new understandings through the connection of pre-existing knowledge and beliefs with new found learning, and draw their own conclusions (Brooks & Brooks, 1993, 1999, 2000; Lambert, 2003; Marlowe & Page, 1998; Shapiro, 2000, 2003).

The significance of the study is that the findings may be used to advance the body of existing knowledge about the impact of technology, in the form of one computer per student and teacher, on the teachers’ perceptions of technology as a catalyst for constructivist teaching and learning.

The study surveyed 33 elementary teachers who were participating in a One-to-One initiative that was part of a comprehensive district program to bring technology into the classroom. The One-to-One initiative provided individual laptop computers to students and teachers. The program also provided essential software solutions, wireless connectivity to the Internet and local network servers, and instructional support personnel. From the survey, seven teachers were chosen to participate in two focus groups separating beginners and experts.

Supporting literature was divided into three sections. The first section was related
to the need to integrate technology as part of the curricula and the use of constructivism as a theoretical framework for technology integration. The second section related to best practices of incorporating technology in the classroom driven by constructivist theory and Self-Regulated Learning (SRL). The third section described the district technology program and grant related literature.

The research questions in this study were used to investigate the culture of these One-to-One classrooms, delving into changes in pedagogy, developing organizational patterns, emergent constructivist themes and practices, and the barriers encountered when integrating technology into the curriculum.

The research method utilized a survey to determine the teacher’s demographic background, technology experience, and general attitude and confidence using technology. The survey also provided the preliminary data needed to select the focus group participants. Because the survey data regarding attitude and confidence was homogenous and high, the focus group participants were differentiated by their years of experience with the One-to-One initiative. The “expert” group had four or more years experience and the “novice” group had one or two years. The focus group discussions were transcribed verbatim. These documents were later categorized and coded by the researcher (Seidman, 2006).

The summary of findings included the survey and coded focus group results. The survey score distribution for attitude and confidence was homogenous and high, with high statistical scores for reliability. With regard to the research questions, the survey data demonstrated a probable correlation between high performing technology teachers and their adaptability to change, their willingness to embrace constructivist ideas, and
their determination when confronted with obstacles. Additionally, the coded focus group data revealed recurring constructivist frameworks for student learning, classroom teaching, the learning community, and foundations. Together, these four frameworks formed an interconnected system built on constructivist tenets. These recurring tenets supported a constructivist culture that was collaborative and independent, receptive to individuals and valued their relationships, replete with opportunities for distributed leadership, interconnected with integrated technology, populated with highly engaged and motivated individuals, self sustaining, safe and nonjudgmental, vision driven, built on authentic assessment and curriculum, and evolving at the speed of technology.

Barriers to these outcomes included high-stakes testing, district mandates, network failures, overcoming the fear of student expertise, and entry-level technophobia.

To conclude, teachers perceived technology implementation as a means for content delivery and research, and technology integration as a catalyst for holistic change to both teaching and learning. Integrating technology in the classroom precipitated numerous patterns of experiences that revealed underlying systems that affected every aspect of teaching and learning. Finally, vision, knowledge, and integration are necessary to promote constructivist instructional practices in a One-to-One classroom.

The major implications of the study included the roles teachers and administrators play when integrating technology in a constructivist culture. Recommendations for further research included the introduction of a constructivist practices primer for new One-to-One teachers and a meta-analysis leveraging the data being generated by One-to-One studies worldwide to create a statistically robust survey sample for inquiries into the efficacy of the model.
“We are piloting a new program right now and the kids have just taken off…they come in everyday and show me things (on the laptop). So you have to be willing to learn from the children, because they are this generation. This is how they learn.”

5th Grade EDGE teacher
References


Beisser, S.R. & Gillespie, C.W. (2003). Kindergarteners can do it-so can you: A case study of a constructionist technology-rich first-year seminar for undergraduate


http://ejite.isu.edu/Volume2No1/nanjappa.pdf


http://www.allacademic.com/meta/p183125_index.html


Appendix 1: Perceptions of Computers & Technology (Modified Survey)

Perceptions of Computers & Technology (Modified Survey)

Purpose: This survey is designed to gain a better understanding of how educators use technology in the classroom and their level of experience with computers. The survey includes sections addressing attitudes toward computer use and level of confidence using computers and technology in teaching. Responses will be kept strictly confidential and individual responses will not be identified or reported. Your participation is voluntary.

Thank you for your time and interest.

Please tell us about yourself:

Name: ________________________________

Name of your school: ________________________________

Gender: Male: _____ Female: _____

1. Race/Ethnicity:
   __ Native American / American Indian
   __ African American
   __ White / Non-Hispanic
   __ Asian/Pacific Islander
   __ Hispanic
   __ Other, please specify ________________________________

2. Highest degree earned:
   __ Bachelors
   __ Masters
   __ Specialist (Ed.S)
   __ Doctorate
   __ Other, please specify ________________________________

3. What subject area(s) do you teach? (Check all that apply)
   __ Elementary classroom subjects: Reading, Math, Science, Social Studies
   __ Art / Music
   __ Media / Technology specialist
   __ Special Education
   __ English
   __ Other, please specify ________________________________

4. Total teaching experience in years: __________________
5. What grade level(s) do you currently teach? ________________
6. Average number of students per class: __________________
7. Number of computers in your classroom used for instruction: ______
8. How many years have you been using One-to-One technology in your EDGE classroom for instruction? ______
9. How many years have you been using technology in your classroom for instruction (including but not limited to EDGE)? ______
10. If you are new to EDGE, how many months have you been using One-to-One computers in your classroom for instruction? __________
11. List additional technology experience outside of the classroom (i.e.: newsletter - page layout, banking – spreadsheet, legal – word processing, genealogy – online research, etc.). Use back of page if necessary: ____________________________

164
12. ATTITUDES TOWARDS COMPUTER USE

**Directions:** The following statements address general attitudes towards computer use. Please circle the one answer that best reflects your level of agreement.

<table>
<thead>
<tr>
<th>Statement</th>
<th>1= strongly disagree</th>
<th>2= disagree</th>
<th>3= neutral</th>
<th>4= agree</th>
<th>5= strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>I would like every student in my class to have access to a computer.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Computer skills are essential to my students.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I feel tense when people start talking about computers.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I feel pressure from others to integrate the computer more into my classroom.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I would like my students to be able to use the computer more.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Computers are dehumanizing.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I avoid the computer whenever possible.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Computer instruction is just another fad.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>The use of computers should be confined to computer courses.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I like using the computer to solve complex problems.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>More training would increase my use of the computer in the classroom.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Computers diminish my role as a teacher.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Computers should be incorporated into the classroom curriculum.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Computers make my job easier.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Computers further the gap between students along socio-economic lines.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Computer skills will help me as a professional.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Learning computers make high demands on my professional time.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Computers change my role as a teacher.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I can help others solve computer problems.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Computers enhance classroom instruction.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

13. CONFIDENCE AND COMFORT USING COMPUTERS

**Directions:** Please read the following statements and circle the one response that best reflects your level of agreement.

<table>
<thead>
<tr>
<th>Statement</th>
<th>1= strongly disagree</th>
<th>2= disagree</th>
<th>3= neutral</th>
<th>4= agree</th>
<th>5= strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>I have had adequate training in using computers.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I use computers effectively in my classroom.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I am comfortable giving computer assignments to my students.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>The computer enhances my teaching.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I am comfortable using computers during classroom instruction.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>My use of computer technology enhances student performance.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Incorporating multi-media into lessons enhances teaching.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I am comfortable with computer terminology.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I am developing expertise in the uses of technology in the classroom.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>
Appendix 2: Teachers’ Questions for the Focus Group Interviews

Questions for Focus Group
Teacher’s Copy

Introductions, Grade level, School, years in EDGE

1. Give three or four adjectives that describe how you felt when you volunteered to become part of the EDGE program.

2. Describe the process of incorporating laptops into your classroom curriculum?

3. What was easiest about the process?

4. Did having constant access to technology change the way you teach students? Describe the changes.

5. What issues/barriers prevented you from doing something you wanted to do in the classroom?

6. What/who helped facilitate your incorporation of laptops into the classroom curriculum?

7. How did you feel about allowing students to be more in control of their own learning?

8. How did your students accept the laptop idea and the curriculum?

9. Do you feel there were fundamental changes in your teaching style during your involvement with the EDGE program?

10. Describe the EDGE learning environment in your classroom.

11a. Veteran EDGE teacher: Has the inclusion of new EDGE teachers changed the EDGE vision, implementation, efficiency, and/or effectiveness?

11b: New EDGE Teacher: Were you provided opportunities and/or mentoring to better utilize the EDGE tools?

12. How would you approach implementing/changing a One-to-One program in view of what you’ve learned?
Appendix 3: Perceptions of Computers & Technology (Barron Survey)

PERCEPTIONS of COMPUTERS & TECHNOLOGY

**Purpose:** This survey is designed to gain a better understanding of how educators use technology in the classroom and their level of experience with computers. The survey includes sections addressing level of confidence, skill, support, and uses of computers and technology in teaching. Responses will be kept strictly confidential and individual responses will not be identified or reported. Your participation is voluntary.

*Thank you for your time and interest.*

**Please tell us about yourself:**

Name of your school: ____________________________.

Gender: Male______ Female______

Race/Ethnicity:

___ Native American /American Indian ___ Asian/Pacific islander
___ African American ___ Hispanic
___ White/ non-Hispanic ___ Other, please specify _________________.

Highest degree earned:

___ Bachelors ___ Masters
___ Specialist (Ed.S) ___ Doctorate
___ Other, please specify _________________.

What subject area(s) do you teach? (Check all that apply)

___ English ___ Art / Music
___ Math ___ Media / Technology specialist
___ Physical Education ___ Special Education
___ Science ___ Vocational Education
___ Social Studies ___ Reading
___ Other, please specify ____________________.

Total teaching experience in years: ______________

What grade level(s) do you currently teach? ______________

Average number of students per class: ______________

Number of computers in your classroom used for instruction: ______________

How many years have you been using computers in your classroom for instruction? ______________.

Do you have access to a computer lab? ______ Yes _____ No

If yes, how many hours each week do your students use the lab? ______________
Appendix 3 (continued): Perceptions of Computers & Technology (Barron Survey)

**TEACHER PREPARATION FOR COMPUTER USE**

**Directions:** For the following items please circle the one response that best reflects the extent to which you’ve acquired computer skills from the following sources.

<table>
<thead>
<tr>
<th>Source</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>As part of your undergraduate coursework</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Inservice courses / workshops</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Independent learning (e.g., online tutorials or books)</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Interaction with other faculty / staff</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Distance Learning courses</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

**To what extent do you think the following types of computer education would be beneficial to you?**

<table>
<thead>
<tr>
<th>Type</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introductory computer skills</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Specific applications (e.g., spreadsheet, desktop publishing)</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Specialized training on integrating the computer into the classroom</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

**CONFIDENCE AND COMFORT USING COMPUTERS**

**Directions:** Please read the following statements and circle the one response that best reflects your level of agreement.

<table>
<thead>
<tr>
<th>Statement</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>I have had adequate training in using computers.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I use computers effectively in my classroom.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I am comfortable giving computer assignments to my students.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>The computer enhances my teaching.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I am comfortable using computers during classroom instruction.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>My use of computer technology enhances student performance.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Incorporating multi-media into lessons enhances teaching.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I am comfortable with computer terminology.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I am developing expertise in the uses of technology in the classroom.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

**GENERAL SCHOOL SUPPORT**

**Directions:** Please read the following items and circle the one response that best represents your level of agreement.

<table>
<thead>
<tr>
<th>Statement</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>I have adequate time to learn computer skills.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I have sufficient access to computers at my school.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I receive a sufficient level of computer related support at my school.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Faculty members encourage the use of computers.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>The administration supports computer related training.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>The administration actively encourages the use of computers in the classroom.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>The administration actively encourages the use of computers outside the classroom.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>
Appendix 3 (continued): Perceptions of Computers & Technology (Barron Survey)

### TYPES OF SOFTWARE USED TO COMPLETE SCHOOL RELATED ACTIVITIES

<table>
<thead>
<tr>
<th>My Use</th>
<th>My Students' Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>1  2  3  4  5  NA</td>
<td>1  2  3  4  5  NA</td>
</tr>
<tr>
<td>Word processors (e.g., AppleWorks, MS Word, ClarisWorks)</td>
<td></td>
</tr>
<tr>
<td>1  2  3  4  5  NA</td>
<td>1  2  3  4  5  NA</td>
</tr>
<tr>
<td>Spreadsheets (e.g., Excel, Lotus)</td>
<td></td>
</tr>
<tr>
<td>1  2  3  4  5  NA</td>
<td>1  2  3  4  5  NA</td>
</tr>
<tr>
<td>Databases (e.g., FileMaker Pro, Access)</td>
<td></td>
</tr>
<tr>
<td>1  2  3  4  5  NA</td>
<td>1  2  3  4  5  NA</td>
</tr>
<tr>
<td>Desktop publishing programs (e.g., Pagemaker, Microsoft Publisher, Printshop)</td>
<td></td>
</tr>
<tr>
<td>1  2  3  4  5  NA</td>
<td>1  2  3  4  5  NA</td>
</tr>
<tr>
<td>Presentation software (e.g., PowerPoint, Persuasion, Hyperstudio)</td>
<td></td>
</tr>
<tr>
<td>1  2  3  4  5  NA</td>
<td>1  2  3  4  5  NA</td>
</tr>
<tr>
<td>Web publishing programs (e.g., FrontPage, PageMill, Dream Weaver, Claris Homepage)</td>
<td></td>
</tr>
<tr>
<td>1  2  3  4  5  NA</td>
<td>1  2  3  4  5  NA</td>
</tr>
<tr>
<td>Graphics programs (e.g., Draw &amp; paint programs, PhotoShop, FreeHand, Illustrator)</td>
<td></td>
</tr>
<tr>
<td>1  2  3  4  5  NA</td>
<td>1  2  3  4  5  NA</td>
</tr>
<tr>
<td>Drill and practice</td>
<td></td>
</tr>
<tr>
<td>1  2  3  4  5  NA</td>
<td>1  2  3  4  5  NA</td>
</tr>
<tr>
<td>Games</td>
<td></td>
</tr>
<tr>
<td>1  2  3  4  5  NA</td>
<td>1  2  3  4  5  NA</td>
</tr>
<tr>
<td>Simulations</td>
<td></td>
</tr>
<tr>
<td>1  2  3  4  5  NA</td>
<td>1  2  3  4  5  NA</td>
</tr>
<tr>
<td>Tutorials</td>
<td></td>
</tr>
<tr>
<td>1  2  3  4  5  NA</td>
<td>1  2  3  4  5  NA</td>
</tr>
<tr>
<td>Integrated Learning Systems (e.g., Josten, CCC)</td>
<td></td>
</tr>
<tr>
<td>1  2  3  4  5  NA</td>
<td>1  2  3  4  5  NA</td>
</tr>
<tr>
<td>Web browsers (e.g., Netscape Communicator, Internet Explorer)</td>
<td></td>
</tr>
<tr>
<td>1  2  3  4  5  NA</td>
<td>1  2  3  4  5  NA</td>
</tr>
<tr>
<td>Programming / authoring tools (e.g., Authorware, Java, Visual Basic)</td>
<td></td>
</tr>
<tr>
<td>1  2  3  4  5  NA</td>
<td>1  2  3  4  5  NA</td>
</tr>
</tbody>
</table>

### INTEGRATION OF COMPUTERS INTO THE CLASSROOM

**Directions:** Listed below are teaching modes in which computers may be used. Indicate how often you use computers in each teaching mode. If you feel an item does not apply then circle (NA).

<table>
<thead>
<tr>
<th>My Use</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1  2  3  4  5  NA</td>
<td></td>
</tr>
<tr>
<td>Small group instruction</td>
<td>1  2  3  4  5  NA</td>
</tr>
<tr>
<td>Individual instruction</td>
<td>1  2  3  4  5  NA</td>
</tr>
<tr>
<td>Cooperative groups</td>
<td>1  2  3  4  5  NA</td>
</tr>
<tr>
<td>As a reward</td>
<td>1  2  3  4  5  NA</td>
</tr>
<tr>
<td>Independent learning</td>
<td>1  2  3  4  5  NA</td>
</tr>
<tr>
<td>To tutor</td>
<td>1  2  3  4  5  NA</td>
</tr>
<tr>
<td>To promote student centered learning</td>
<td>1  2  3  4  5  NA</td>
</tr>
<tr>
<td>As a research tool for students</td>
<td>1  2  3  4  5  NA</td>
</tr>
<tr>
<td>As a problem solving/decision making tool</td>
<td>1  2  3  4  5  NA</td>
</tr>
<tr>
<td>As a productivity tool (to create charts, reports or other products)</td>
<td>1  2  3  4  5  NA</td>
</tr>
<tr>
<td>As a classroom presentation tool</td>
<td>1  2  3  4  5  NA</td>
</tr>
<tr>
<td>As a communication tool (e.g., email, electronic discussion)</td>
<td>1  2  3  4  5  NA</td>
</tr>
</tbody>
</table>
Appendix 4: Research Questions Matrix

<table>
<thead>
<tr>
<th>Theme</th>
<th>Answered by Teacher’s Questions for the Expert Focus Group Interview Sorted by Question Number</th>
<th>Answered by “Perceptions of Computers and Technology”, (Modified Survey) Sorted by Question Number</th>
<th>Answered by Teacher’s Questions for the Novice Focus Group Interview Sorted by Question Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technology Changes Teaching and Learning</td>
<td>2, 3, 4, 6, 8, 9, 10, 11a, 12</td>
<td>12 (Attitudes)</td>
<td>2, 3, 4, 6, 8, 9, 10, 11b, 12</td>
</tr>
<tr>
<td>Patterns of Experiences Theme Development</td>
<td>1, 3, 4, 6, 8, 9, 10, 11a</td>
<td>2, 3, 4, 5, 8, 9, 10, 11 (Personal Experience)</td>
<td>1, 3, 4, 6, 8, 9, 10, 11b</td>
</tr>
<tr>
<td>Technology Promotes Constructivist Practices</td>
<td>3, 7, 8, 9, 11a</td>
<td>13 (Confidence)</td>
<td>3, 7, 8, 9, 11b</td>
</tr>
<tr>
<td>Barriers</td>
<td>2, 5, 8, 11a</td>
<td>12, 13 (Attitudes &amp; Confidence)</td>
<td>2, 5, 8, 11b</td>
</tr>
</tbody>
</table>
About the Author

Lynne Menard holds a Bachelor of Arts (1992) in Elementary Education and a Masters in Education (1996) in Educational Leadership, both from the University of South Florida. Mrs. Menard taught elementary school grades K-4 for seven years. She then accepted a position as an Instructional Technology Specialist for the Manatee County School District for four years. She has been a school administrator for six years. She currently holds a position as a school administrator for the School District of Manatee County, Florida. As an administrator, she has had the privilege to open two new schools.

Mrs. Menard is a native Floridian. She lives with her husband, Vic, in Bradenton, Florida. Mr. Menard is a small business owner and the author of a technical treatise on Newtonian collimation. Their two grown children live in Tallahassee, Florida. Amy Menard is the Assistant Principal Violist at the Northwest Florida Symphony Orchestra, and violist for Georgia’s Albany Symphony Orchestra and the Valdosta Symphony Orchestra. Amy is the Music Director at the Unitarian Universalist Church of Tallahassee. Mrs. Menard’s other daughter, Michelle Menard Hudson, is the orchestra director and guitar teacher at Montford Middle School, and Director of the Tallahassee Youth Orchestra Philharmonia. During the summers, Michelle is the Assistant Coordinator of the Sarasota Music Festival.