The Impact of Staff Development on Middle School Technology Integration

A Master's Thesis
Presented to

Information Design and Technology

_____

In Partial Fulfillment
Of the Requirements for the

Master of Science Degree

State University of New York
Institute of Technology
Utica, New York

By

Regina Scalisi

May 2005

SUNY IT

Department of Information Design and Technology
Certificate of Approval

Approved and recommended for acceptance as a thesis in partial fulfillment of the
requirements for the degree of Master of Science in Information Design and Technology

_____

 Date

_____

 Russell Kahn, Ph.D.
 Director MS Information Design and Technology

_____

 Mary Nellenback
 Library Media Specialist
 Subject Matter Expert

Abstract

This case study describes the impact of technology staff development in two Central New York Middle Schools. The staff development program was implemented under the federally funded Enhancing Education Through Technology grant. Teachers and students were studied during a seven-month period as they learned to effectively use computers, Internet resources and available software with their curricula and instruction. The conditions of Change Theory were applied to the study as they relate to the adoption of technology integration.

Acknowledgements

I would like to thank my thesis advisor, Dr. Russell L. Kahn for his guidance throughout the course of this study. I learned a great deal from his knowledge and advice. His insight regarding this topic was invaluable. I am also indebted to my subject matter expert, Mrs. Mary Nellenback. She not only offered support during the study, but has also taught me the importance of media literacy and the value of research skills as it applies to the student learning experience.

I owe a debt of gratitude to the Education Technology Integration specialists and the faculty members involved in the study. Their honesty and time commitment made the findings of this study possible.

Table Of Contents

List of Illustrations

Section 1: Entry Vignette

We have two computer labs in each of our Middle Schools, housing almost 30 eMacs in each. At one of the schools, the labs are part of the Media center. Teachers reserve lab time for their classes on a schedule, which is posted on the lab doors. Windows on one side of the front lab look out over the library area. A second lab, to the east is a bit smaller but houses the same number of computers. The library has areas for leisure reading and a section near the rear of the room where ten rectangular tables are set up for individual student use or as an instructional area. There are two mobile laptop carts set up near the tables. When the labs are full, these can be used for class activities and projects. At the center of the library there are four eMacs stationed in full view of the librarian's workstation. These are in use almost every class period by students who are independently working on classroom assignments.

One day as I was walking through the front lab, Lori our lab technician, called me over, with a frustrated look on her face. She told me that Mrs. Roth, one of our Science teachers, was in the back lab creating brochures with her class. I was immediately intrigued by the brochure idea but wondered why Lori seemed frustrated. She told me that I'd understand once I saw how the class was producing the brochures.

When I entered the back lab, the reason for Lori's chagrin became apparent. The first clue that something was awry was the sight of three or four boys grouped around several plastic bottles of Elmer's Glue perched in dangerously close proximity to the LCD projector. At the same time, a young girl walked past me with several black and white images on a piece of paper that she had just retrieved from the printer. I looked at the closest computer and watched a youngster reading some information from a web site and writing with ballpoint pen on a sheet of white paper folded in thirds. The rest of the students were working at their computers, either reading information from the web or writing on folded papers. The teacher was helping one student at his computer.

After asking the group near the glue to move the pasting area to a remote section of the room, I asked one about his project. "We're making a brochure about the planets." he replied. "We read about the planets on the Internet, then write down what we find in the brochure. Then we find pictures about the planet and print them. Later we glue the pictures on the brochure." I was surprised that the class had not been instructed in using word processing techniques, or how to copy and paste images from the web onto a document.

Mrs. Roth walked over to me and we began talking about the science project. This is Mrs. Roth's first year teaching at our school. In late August, first year teachers participate in a full day seminar, which provides training in many of the administrative software that we use, such as the teacher grade book, online attendance procedures, email and the District database information system. Many of our teachers are comfortable using the Windows operating system and Microsoft Word, so part of the seminar prepares them for using the Mac operating system and AppleWorks word processing software. This is a great deal of information to impart to a novice teacher in one day. Teachers are encouraged to contact their building technology staff developer for further help during the year. Mrs. Roth had planned her science project independently, without technical support. I asked her if she knew that students could type directly onto the brochure, as well as place images into the sections and print without the need for glue. "Oh really?" she replied, "I wasn't aware that you could do that. Can you show me?"

I demonstrated the method of copying and pasting images to a word processor, but since her class was nearing the end of their project, we agreed to meet in the future to

share ideas on all the word processing skills that could to be implemented when using technology for classroom activities.

Two weeks after Mrs. Roth's experience with the science project, our faculty learned about additional technology support provided by our area BOCES. We had been granted funding through the No Child Left Behind Act. NCLB is a federal law established in 2001 to improve the performance of America's schools while at the same time ensuring that no child falls behind due to inadequacies in their school. Funding would be distributed through the New York State Enhancing Education through Technology (EETT) program, a technology staff development plan established to improve student academic achievement through the use of technology in elementary and secondary schools. Our district was awarded a three-year grant, which would provide training to any teachers interested in participating. Training would include on-site support, training sessions and a focus on making meaningful connections to instructional techniques and student learning. The Middle School was targeted for the first year of grant; Mrs. Roth was one of the first volunteers.

The need for technology staff development is evident in the anecdote described above. Thirty-one teachers eventually volunteered to be part of the EETT grant cohort. Some of the experiences that the cohort encounters during the program will be described in this case study. What impact will the EETT grant have on technology integration in our Middle Schools? Findings on this question and other sub issue questions will be raised during the study:

- Are teachers more comfortable using technology as a result of the program?
- How do the teachers in the cohort use technology for instructional purposes?
- How has student use of technology changed?

- What are teachers' feelings about how technology benefits students in their learning process?
- What major obstacles and successes did teachers face as they participated in the program?
- How do the lessons learned from this case align with previous studies and literature?

Section 2: Introduction

This case study describes a federally funded Enhancing Education Through Technology grant program and the impact that it has on the ways teachers in Middle School use technology in the classroom. The training program, teacher reactions to the program and differences in technology use offers insight into the impact that staff development has on classroom technology integration. The study will provide the continued dialogue needed as schools search for ways to improve their technology training programs for teachers.

Literature Review

As the 20th Century drew to an end, the country had seen a great increase in the availability of technology in our public schools. By 1999, almost 80% of schools had Internet connections (CEO Forum, 1999). From 1998 to 1999 the number of computers in American schools increased 13 % (p. 6). The progress is encouraging but as the CEO Forum on Education and Technology notes, "the gap between technology presence in schools and its effective use is still too wide" (p. 3). With equipment in place it became apparent that teachers would need to learn not only how to use available technologies, but also how to use it effectively in their classrooms. Since 1997, the Forum has issued an annual assessment of the nation's progress toward integrating technology into America classrooms. Their second report, published in February 1999, is dedicated to the need for improvements in professional development. It notes that although teachers consider technology to be an important part of a child's education, only 20 percent of teachers feel well prepared to integrate education technology into their classroom instruction (p.10). Only two states require teaching candidates to have proof that they can use technology

and three states require technology training as part of license renewal. Just fourteen states require districts to spend a percentage of their technology funds on professional development.

Figure 1. CEO Forum STaR Chart 1999
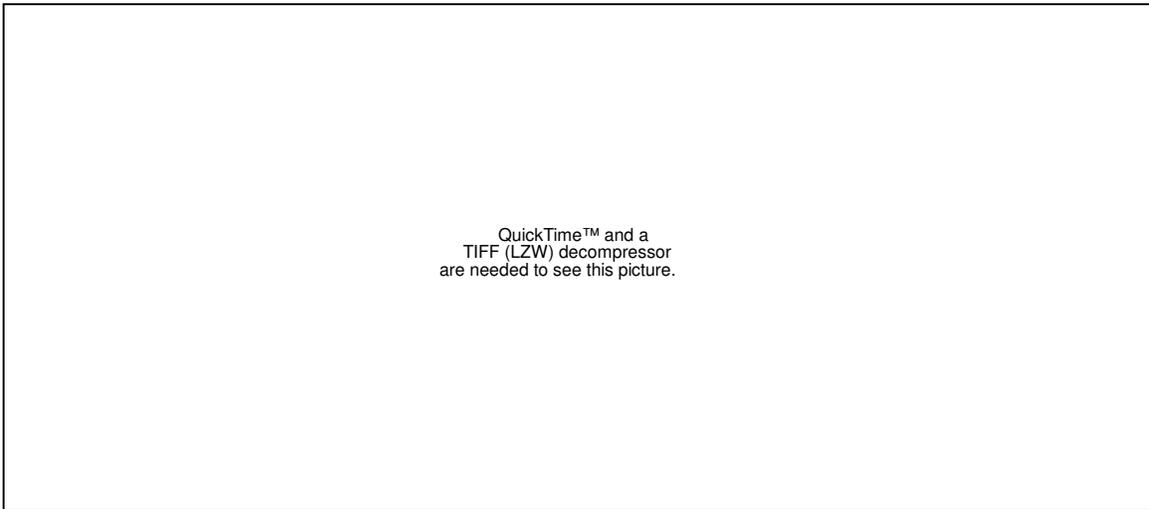
This chart shows the changes in technology integration from 1997 to 1998. The report seeks better data on how schools are using technology and offers several recommendations, among them:

- Schools and districts should establish long- term technology-related professional development plans and proficiency standards for all teachers and administrators by 2000.
- Resources for technology-related professional development should be increased.
- Every state should develop standards for effective continuing education on integrating technology into the curriculum by 2000.

Five years later, the National Education Technology Plan 2004 was published by the US Department of Education. The report continues to find similar shortcomings in teacher preparation across the country. The report states that "teachers have more resources available through technology than ever before, but some have not received

sufficient training in the effective use of technology to enhance learning." (NTEP, 2004, p. 43) Change is a process, and it takes time to implement new practices. As we approach the middle of the first decade in this century, research is expanding from technology resources and access to methods and quality of technology use.

Gregory Wadduops, Nancy Wentworth and Rodney Earle go one step further in their conclusions based on their 2004 case study of technology integration at Brigham Young University. They studied a cohort as they attempted to create technology-enhanced curricula under a federally funded grant. The authors maintain that technologies must be pedagogically sound, and that true technology integration involves supporting and improving sound instructional goals by systemically reforming educational practice. They maintain that " integrating technology is not about technology - it's primarily about content and effective instructional practices. It is defined not by the amount or type of technology used, but by how and why it is used" (Waddoups, et. al, 2004, p. 113). They developed six principles for successful staff development that produces effective technology integration, based on the outcomes of the BYU study (p. 118-119):

1. Key stakeholders needs must be met for successful implementation
2. Change efforts seen as originating from respected colleagues, rather than administrators, were seen as keys.
3. Work teams and alliances should be built on the projects and interests of faculty members.
4. Flexible support structures must be provided. (Rather than a one size fits all approach.)
5. There must be a personal and collective commitment to use technology appropriately to enhance instructional goals.
6. Time for reflection should be provided for teams to share their common goals and discuss the methods they used through the grant.

The Enhancing Education through Technology case study presented here appears to meet all of these principles. Topics pertaining to commitment and time were found to be repeated themes as data was collected and analyzed.

Melissa Pierson conducted a case study that focused on another aspect of technology use in the classroom. She began by observing a group of teachers labeled as "exemplary" and soon found that the group was not homogenous when it came to their abilities in using technology with their students (Pierson 2001). She then studied the interplay of different levels of technology use and teaching abilities. She studied teachers with various levels of technology experience and different teaching styles and years of experience. Pierson concluded that true technology integration happens when there is a correlation or intersection of high quality content knowledge, pedagogical knowledge and technological knowledge (p. 427).

According to Pierson, "our society does not simply need teachers who know how to use computers. We need exemplary teachers who know how to effectively use all the tools at their disposal for the learning benefit of students" (p. 427). Her call is for leaders in education to focus their efforts on programs that lead toward growth in pedagogy as well as in technology use. The EETT program mirrors her findings in their goal to provide a consistent focus on meaningful connections to instructional techniques and student learning.

The teachers who participated in the EETT case study expressed enthusiasm toward the prospects of using technology as a motivating tool and said they felt that students were more engaged when using technology. In her research, Chrystalla Mouza found that the

teachers in her case study "exhibited enthusiasm for learning new skills and were willing to try out activities" (p. 281). In 2003 Harvey Barnett found that "students demonstrated increased initiative" and "maintained time on task for longer periods" when using technology in their schoolwork (Barnett, 2003, p. 4). According to the CEO Forum StaR Report 4, using technology contributes to improved student achievement as they exhibit increased motivation and engagement. (The CEO Forum on Education and Technology, 2001, p. 6) Reasons for this may be found in a major theme, which emerged, from the 2004 National Education Technology Plan, where student's comments showed that they "feel strongly about the positive value of technology and rely upon technology as an essential and preferred component of every aspect of their lives." Students feel that they are approaching their lives and their daily activities differently because of technology. (p. 21)

As indicated during interviews, teachers in the EETT program began to find that implementing technology integration required time commitments. They expressed a desire to do more in the future with the skills they were learning. Research in the field abounds with recommendations for adequate time to adapt to the changes needed for full implementation. Chrystalla Mouza states; "Findings from this study demonstrate that it would be unrealistic to expect teachers to integrate computers into their classroom in innovative ways in a short period of time." She suggests that future research should study the influence of professional development on teachers who participate for longer periods of time (Mouza, 2003, p. 16). In his research review, Barnett writes that time for using technology and reflections on use "lead, over a period of three to five years, to substantial changes in teacher beliefs about teaching and learning" (Barnett, 2003, p. 4).

Marion, the library media specialist in the EETT cohort sees many students using the computer lab in Middle School. Her participation in this case study provided insight into her own sixth grade class use of technology as well as how other students in the school use the computers in their research. She feels that we should spend more time on how to use resources well, and on what to do with the material once it's been found. "I wish the cohort had spent more time on having students use higher level thinking shills when they use technology. We need more discussion on how students learn." Gregory Waddoups agrees in his 2004 case study of a teacher education program at Brigham Young University. He maintains, "Technologies must be pedagogically sound. They must go beyond information retrieval to problem solving, allowing new instructional and learning experiences not possible without them, promoting deep processing of ideas, increasing student interaction with subject matter, promoting faculty and student enthusiasm for teaching and learning, and freeing up time for quality classroom interaction - in sum, supporting and improving sound instructional goals and systemically reform educational practice" (p. 113).

Technology integration is evident in varying degrees in the EETT study. Some cohort members use LCD projectors daily as an instructional tool in their classroom, while others use it occasionally. Not all teachers provide hands-on computer experience for their students, while others use the computer labs several times a year in project based learning activities. These differences are also found in research done in the field. In 2004, Jerry Woodbridge studied a teaching program at Jacksonville University and concluded that in half of his classroom observations, "active, authentic, constructive, cooperative,

and intentional/reflective learning teaching strategies" were observed (Woodbridge, 2004, p. 7).

Problem Questions

This study will focus on a main research question and several issue sub questions, which provide meaning to the ways in which our teachers are using technology in their instruction.

Main Research Question: What impact does the Enhancing Education Through Technology (EETT) Grant have on teacher and student use of technology at the Middle School level?

Issue Sub questions:

- How are teachers and students using technology as a result of the program?

- What impact has the grant had on student use of technology?

- What are teacher's feelings about how technology benefits students in their learning process?

- What successes and / or obstacles did teachers face as they participated in the program?

- How do the lessons learned from the case align with previous studies and literature?

The Case Study

In the spring of 2004, the school district being studied in the Upstate New York, received a three-year staff development grant through the Enhancing Education Through Technology (EETT) program. This program is offered through New York State under the

No Child Left Behind Act of 2001 (NCLB). The first year of the study is focused at the Middle School level. The grant provides a technology integration professional development training series to help "teachers design and deliver lessons that integrate technology into regular classroom instruction." (EETT Grant Application, 2004)

Research on staff development at the middle school level will best be served by doing a case study based on qualitative research methods. In researching the impact of an innovation, we will be more concerned about "how" a technology is used, rather than "how often." Qualitative research methods will offer an holistic picture, based on the words and observations of participants in their natural school settings. A case study "explores a bounded system over time through detailed, in-depth data collection involving multiple sources of information rich in context." (Creswell 61) Participants in this study are bounded within a particular small city school district and instructional levels focus on grades six through eight. Staff development began in November of 2004 and continued through May 2005.

Education is the one field where everyone has had some experience. Assertions related to the study should be easily understood by all of us who have an investment in Education. A study of this type will be useful for school administrators as they plan ahead for technology programs and policies. It could be beneficial for faculty members who may not yet be comfortable with using technology and those who wish to learn about the experiences of others during their implementation of technology integration. The study will add to the dialogue promoted by research in the field.

Data Collection

Data was compiled during several interviews with teachers in the cohort. Classes were observed during training work sessions and as teachers and their students worked in the computer lab. Documents prepared by all participants were also reviewed. A data collection matrix is shown below, illustrating the sources of data collection.

Table 1: Data Collection Matrix

Information Source	Interviews	Observations	Documents
Teachers	5	3 & Focus Group	15
ETIS Instructors	--	2	2
EETT Program	--	--	2
Students	--	3	4
Scholarly Journal Articles	--	--	8

Data was collected from a variety of sources, but mostly teachers.

Five teachers from the cohort were interviewed. A sample was selected on these criteria: teaching experience, technical ability, and the type of class they teach. [Some of our cohort members teach in special areas such as Academic Intervention Services and Special Ed]. I chose participants with a varied range of these criteria and their willingness to participate. Each interview was tape-recorded and transcripts were typed for analysis.

Table 2. Teacher Selection

Teacher	Experience	Ability	Area
John	< 10 years	Average	Classroom
Susan	< 5 years	Average	Classroom
Diane	> 15 years	Low	Classroom
Alice	> 15 years	Average	Resource Room
Marion	>15 years	Average	Media Center

Teachers were interviewed based on a variety of factors.

During the year, the Educational Technology Integration Specialists (ETIS) provided four full day work sessions, along with one-on-one instruction and assistance. The author attended an afternoon work session in early February and observed a segment of another in late March. Three of the cohort teachers were also observed as they used technology in the computer lab with their students. Notes were recorded as I observed and typed in detail soon afterward. Six teachers participating in a focus group were observed in May of 2005. They provided additional feedback and reflection on the study.

EETT documentation was reviewed to provide background information on the goals of the program, applications taught and the methods of instruction that were used during the work sessions. Near the end of the program, a short, anonymous questionnaire was sent to the participants who had not been interviewed. Teachers were asked how often they use computers, Internet resources and available software with their curricula and instruction. They were also asked how often their students have used these resources, either in the classroom or in the computer lab. Essays provided by sixth graders at one of the middle schools were also reviewed. The students described the ways in which they

use computers during the school day. They wrote a personal reflection on the ways that using technology helps them in their learning process.

Analysis of Data

After data was collected, observation notes and interview transcripts were re-read and examined to produce categories or shared characteristics in the responses and actions of the participants. Documents that teachers used in with their classes, ETIS work session outlines and questionnaires were compared to interview comments and observations in the computer lab. This method of triangulation, as stated by John W. Creswell, "involves corroborating evidence from different sources to shed light on a theme or perspective." (202) It soon became apparent that teaching experience and the type of class taught, did not determine the impact of the EETT program on technology use. Teachers who had been teaching for more than fifteen years shared some of the same feelings towards using technology, as did newer teachers. Those teaching a regular classroom and those teaching in special areas used technology differently, but still shared some of the same experiences. Technical ability levels among teachers provided some differences in how teachers used technology with their students, but the data was not consistent enough to warrant a meaningful assertion.

Through repeated readings and additional interviews, potential themes were noted; thoughts and actions were coded to establish patterns that could be grouped into related categories. This eventually led to a collection of themes or lessons learned during the study.

Development of Themes

Before discussion can proceed, a clear understanding of the concept of technology and technology integration needs to be established. Instructional technologies include using hardware, software applications and Internet resources. Hardware may include computers, LCD projectors, digital cameras and camcorders. Software applications range from desktop publishing tools including graphics, web publishing and presentation software, to specific instructional programs. Web-based instruction and the use of digital document sharing are examples of some Internet resources that might be used in the classroom. Does using instructional technology ensure that teachers are integrating technology in the work that they do with their students? What does it mean to integrate technology in the classroom? Rodney S. Earle, a Professor of Teacher Education at Brigham Young University and a contributing editor to Educational Technology Magazine, defines integration as a "sense of completeness or wholeness and incorporates the need to overcome artificial separations by bringing together all essential elements in the teaching and learning process—including technology (as *one* of the elements, not the sole element)." (Earle, 2002, p. 15)

Earle reports that teachers move through at least three levels when adapting to changes in teaching. These levels are confidence, competence, and creativity. "It is a process of gradualness as they progress from learner to adopter to leader. At first they utilize existing practices, then adapt to their own needs, and finally design their own integrated experiences." (p. 16) These three levels were reached in varying degrees as the EETT cohort continued throughout the 2004 - 2005 school year. Themes developed

during the study parallel these levels in adapting to technology integration. Analysis of data indicated significance in the following areas:

1. Students were motivated and felt ownership in their work.

2. Teachers experienced an increase in technology integration.

3. Teachers expressed uncertainty.

4. Teachers expressed the desire to extend skills to the next level.

5. Teachers expressed the need for more time to practice the skills learned and plan for integration with their curriculum.

As learners gaining confidence in using new technologies, teachers in the cohort saw benefits to their efforts. They recognized the power of using computers, software applications and web-based instruction as a motivational tool for their students. Students demonstrated pride in their work and felt ownership in the work they produced. A sixth grade student who uses word processing and presentation tools, along with web resources, wrote that she likes using "technology in our school, because I have so much more possibilities for learning and doing my work." As these gains became apparent, teachers continued to adapt and become more competent in using the skills and lessons that they had learned in the work sessions and follow-up meetings with instructors. As evidence of increased technology integration there was an average increase of 27% in computer lab reservations at the two middle schools.

Cohort members began to develop goals as their technical confidence increased. To some extent, teachers felt that they still experienced some degree of uncertainty in using software and web resources to their full potential. They expressed a desire to extend the skills they had learned. They also realized that time commitments were

necessary to fulfill these goals and began to see how they could continue to integrate

technology in the future. For some, this process advanced to a level of creativity as

teachers continued to see their students engaged in their work. They began to use desktop

publishing tools to engage students in project-based learning experiences. Some teachers

developed Web quests to guide students in their research. WebPages were designed to

communicate with students and parents. Presentation software was increasingly used as a

method of delivering content. Cohort members continued to expand their knowledge

base and make the time and commitment to use technology as a tool to deliver content

and implement better instructional practices with focus on curriculum and learning.

(Waddoups, 2004)

These themes occur in a cyclic process. Learners see the gains that occur and set

goals to continue learning new skills. They continue to see benefits and this prompts

greater confidence, competence and creativity. Figure 2 demonstrates this flow of

learning levels and the themes that developed during the study.

John's experiences set an example for this cycle. When he joined the cohort, he

used a web quest for his students learn about election issues during the 2004 Presidential

Election. As he saw how students became engaged in learning about the candidates, his

confidence in using technology increased. He became more competent through available

staff development and created new ways in which he began to integrate technology. He

now used digital images and short movie clips during his lessons. With time and

commitment to technology, he worked with the eighth grade teams in creating an

interdisciplinary oral history project.

Figure 2. Integration Process

QuickTime™ and a
TIFF (Uncompressed) decompressor
are needed to see this picture.
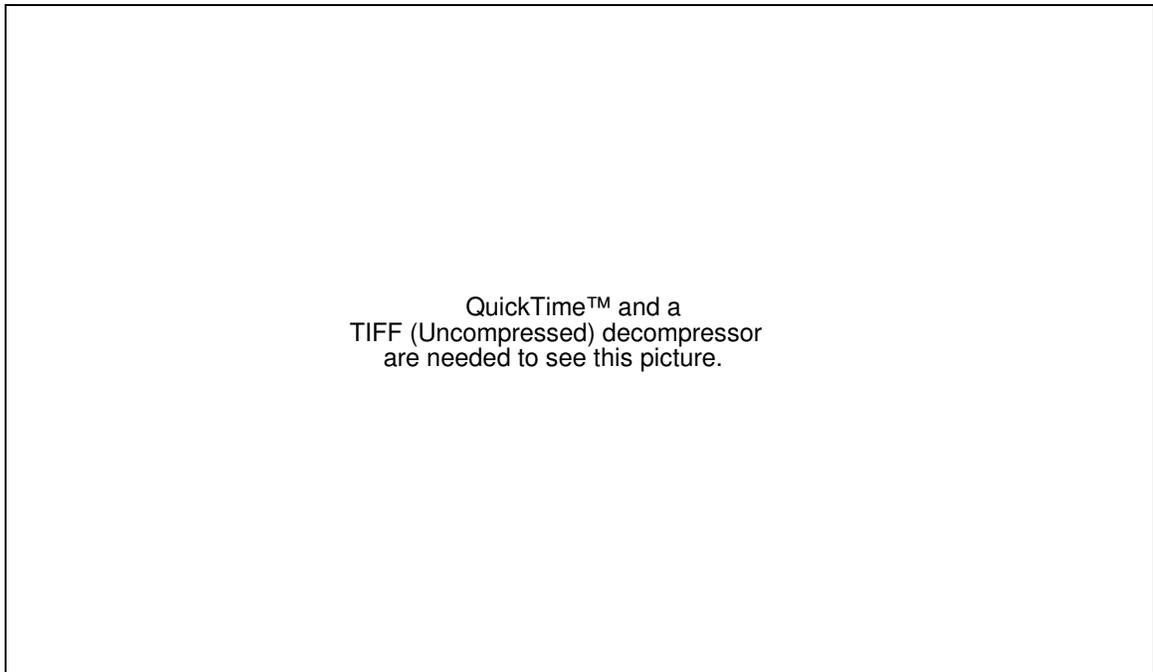
The process of integrating technology takes a cyclic path.

Not all teachers experienced completion of this cycle. Diane does not always have confidence in her abilities with technology. Although she saw her students motivated during their first experiences at the computer, her second activity in the computer lab did not work out well. The students were disappointed in an assignment that mirrored those that they had done from their textbook. For Diane to achieve technology integration, she needs to find time to extend her skills and develop creative ways to engage her students when using technology.

To provide some background information on the participants in the study, teachers in the cohort were asked how they used technology in the past and why they volunteered for the program. John, an eighth grade teacher, said that he used grading software and word processing to show notes on overhead transparencies, but he hadn't

used technology with his students. "It was never a tech driven classroom. I'm right next door to the computer room and I barely knew it was there before this year." He joined the cohort because he felt that since he enjoys trying new things, using technology would be "the best way to reach kids." Marion, who has been a library media specialist for seventeen years, knew that in teaching her students, she would need to help teachers as well. "I thought that by joining the cohort, I would be able to keep up with the available technologies that teachers would be using with student projects and library activities. So many of our resources are electronic and it's important for me to continue to learn as much as I can in the tech area." She has always used the Internet extensively with her classes, demonstrating with the LCD projector in the computer lab. Alice is a special education teacher who provides supplemental support to students in small group individualized instruction. She felt that she had "plateaued out" and wasn't getting any further with her technical abilities. She hasn't used technology in direct instruction, but her students need to use word-processing, the web and electronic spelling aids to work on their regular classroom assignments.

Student Motivation:

Cohort members felt that students were more engaged when using technology. Diane, a seventh grade teacher, does not use technology to a great extent. She views technology as a motivational tool and occasionally uses the LCD projector to show content she previously taught at the blackboard. She feels that her students are more interested when she uses the projector to show Internet sources for her lessons. When she brought her class to the lab to do an internet vocabulary assignment, students were more focused and engaged then they might have been had the assignment been done from

textbooks in the classroom. John has seen his use of iPhoto historical slideshows as a great way to gain his student's interest. Showing Henry Ford and an assembly line then compared to an assembly line today, gave his students an immediate connection to the lesson he was giving. He often shows a three to four minute clip as he talks about historical events in his curriculum. He feels that students, who did not show much interest in History at the beginning of the year, were more engaged now, since he's been a part of the EETT cohort. Other teachers have witnessed more student interest when using technology. They seem to respond better "because it's an integral part of their lives." They are more active. Problem solving skills are more evident. Marion felt that "students are further ahead this year than in previous years."

Increased Integration:

Data collected during the study indicate that since the adoption of the EETT grant, technology use has increased in our schools. Teachers are more confident when using technology and use technology more often. Enthusiasm was evident, both during interviews with teachers, and observations in their classes and full day work sessions. Cohort members felt that being in the program was fun and informative. They had learned a great deal. " I really like the small group work sessions", Alice remarked. We have the whole day with only about six of us. You can ask questions without feeling intimidated." Susan, a foreign language teacher, along with six other teachers, was observed during a full day work session led by Sam, one of the EETT instructors. Sam began the session by conducting a group activity in which teachers were asked to find a given set of objects in the room. Once the objects were found, the group was to appear in front of him to have their picture taken. In an activity that took no longer than seven

minutes, the photographs were portrayed in an iPhoto slideshow. Teacher exuberance and competitive sprit was evident as they ran through the scavenger hunt to meet the given time frame. The demonstration of using digital media to motivate students provided a snapshot of the enthusiasm that teachers felt with the program. Susan's students also became excited with what technology can provide when they worked on a brochure written in Spanish, depicting various rooms in a home. One of the students printed out his brochure in color. His classmates were impressed with what he had done. "Wow that's great!" was one of the remarks made as he showed the brochure to the class. Susan feels that they're proud of how nice their work can look. "It's interesting and exciting for them to be able to use the computer," Susan said. "Especially kids who don't have a computer at home. I think they take a lot of pride in the kinds of things they produce."

Susan feels that "the kids that have seen the Inspiration documents are so much better at learning and getting a grasp of what they're learning." The cohort learned about the applications and technologies listed in the chart below. As seen in Table 3, the type of applications and their use varies among the five teachers who were interviewed. During classroom observations it was evident that the software was used both as an instructional tool and used by students in their various assignments. Diane, who has the least experience with technology, has used the applications less often, however questionnaire responses from other novice cohort members indicate that they are using technology much more often than they had before participating in the program.

Table 3. Use of Applications

Teachers:	John	Susan	Diane	Alice	Marion
Application/ Technology	N = Never S = Seldom O = Occasional X = Often				
Teacher web pages	N	O	N	O	O
Inspiration	X	O	N	N	N
Internet research	O	O	S	O	X
Web quest	S	N	N	N	O
AppleWorks	O	O	S	X	X
LCD Projector	X	X	S	N	X

This table demonstrates which applications the participants used during the study.

Extension of Skills:

To a great extent, teachers exhibited a desire to increase the use of the skills and applications they have learned. As they observe gains in the use of technology, they see the benefits that can be achieved through more use of technology in the future. John uses Inspiration as a way to demonstrate contrast and compare concepts, but he would like to take the software "to a new level". Marion wants to be more efficient in her use of technology. She feels that using share folders with her classes will help in cutting down on paper and allowing her to exchange work with students in a more effective way. She also feels that improvement is needed in the way that students do Internet research. "We need a clear understanding of starting with our objectives. Students are still too concerned with the "look" of the product rather than the content. We need to use websites for the information it contains, not just because it's a cool website." Alice feels that creating a teacher web page would provide a better means of communication with parents. Her goal is to be able to make changes on her site on a daily basis. She would also like to be able

to have her students use Inspiration as a graphic organizer to help them plan writing assignments. "The hardest part of the program is that you don't get a chance to practice the software right away. The next day you're back in the classroom and confronted with day-to-day issues. We learned Inspiration in December and if I want to use it again, I'd have to have someone give me another lesson on how to use certain parts of it."

Need for Time:

This need for more time to experiment and prepare lessons that use technology was a common thread during interviews. Despite the full day work sessions and follow-up instructor visits, time commitments were still an issue for some teachers in the study. Diane expressed her concern this way: "I am finding it hard fitting all the time in. After workshops it is difficult finding the time to do further research and finding ways to change the way that I teach." She sees the value in doing so however, and sets goals to that end. Marion's wants more of the students who come to the library with research questions to be able to apply what they've researched in more creative ways. She thinks it important that teachers "come up with well designed projects that encourage higher level thinking skills." Waddoups, Wentworth and Earle see the real power of technology in the way its use causes teachers to develop different ideas through rethinking teaching and learning. (Waddoups et. al., 2004, p. 114) In another study, Earle states that there is a realistic need for extended, consistent practice over years to develop successful technology integration. (Earle, 2002) Diane and Marion have seen benefits to using technology, realize that there is a need for time to expand their knowledge, and continue to set goals, thus continuing the cycle in learning how to integrate technology.

As a suggestion for overcoming the issue of time restraints, some faculty members expressed a desire for summer workshop sessions. These sessions would provide extended time for reflection and lesson development. Donald Ely lists the need for time as one of his conditions for change. "Implementators need time to acquire knowledge and skills, plan for use, adapt, integrate and reflect upon what they are doing." This can mean "paid time arranged for by the organization where the innovation will be implemented" or "the willingness of individuals to contribute some of their own personal time to the process." (Ely, 1999, p. 4)

Section 3: Description of the Case and its Context

This Central New York school district serves the residents of a small city in Upstate New York. Five elementary schools, two middle schools and one high school provide the educational program for approximately 4,900 students. Each of the two middle schools is equipped with two computer labs housing 25-30 eMacs each. There is at least one computer in each classroom and two mobile laptop carts are available in each school. Two mobile computers, equipped with a projector and a DVD player, are available for teacher use at any time.

As schools in America approached the 21st century, many made significant gains in acquiring hardware and providing connectivity. (CEO Forum, 2000) Teachers began to receive the training needed to use technology. They began to see the advantages of using technology to perform administrative functions and many began to use it as an instructional tool. Teachers are now facing the responsibility of preparing students for tomorrow's technologically based workplace with technology-rich integration. Students need to learn how to plan, organize, assimilate knowledge and problem solve. The 2000 CEO School Technology and Readiness Report states, "Professional development, remains a key issue to creating digital learning environments. Specifically, professional development that guides teachers on the effective integration of digital content and tools rather than just offering technical know-how proves particularly successful." (p. 13) The district has had two staff developers in our district since 1999. One is based at the High School, which has 94 faculty members and the second travels between two middle schools serving a staff of 120. In September of 2003, it added a part time consultant to instruct staff at our five elementary schools. During much of this time, the staff

developers not only instructed faculty, but served as technical consultants in the labs as well.

According to the District's Technology Plan, "technology resources will be used across the curriculum to engage learners in accomplishing curriculum objectives, analyzing information, solving problems, communicating ideas, developing personal skills, and enhancing overall knowledge so students will become self-motivated, lifelong learners." (District Technology Plan, 2004) One source of assistance in attaining these goals has recently become available in the form of federal grant money authorized by the No Child Left Behind Act (NCLB) of 2001. NCLB seeks "to improve the performance of America's elementary and secondary schools while at the same time ensuring that no child is trapped in a failing school." (Executive Summary of the No Child Left Behind Act, 2002) Last year the district, along with several other area schools, applied for the Enhancing Education Through Technology Grant (EETT). The grant seeks to improve student academic achievement through the use of technology, by providing assistance to schools for the implementation and support of a comprehensive system that effectively uses technology to improve student academic achievement. (US Department of Education, 2002) The schools in this study will receive assistance through professional staff development. Educational Technology Integration Specialists (ETIS) "will help teachers manage the use of technology to achieve a balance of rigor, relevancy and engagement." (Cayuga-Onondaga BOCES, 2004) The grant was awarded to schools in this study based on student achievement scores. These schools had demonstrated a 20% to 40% drop in achievement from elementary to intermediate level math and english language arts State Learning Standards.

This $1.25 million grant is available for three years. Middle schools will be served during the first year of the grant. During the second and third years, instruction will extend to the elementary and high school level. Two ETI Specialists are assigned to provide professional development to teachers who have volunteered to be part of a Cohort receiving support, mentoring and coaching during the 2004-2005 school year. The grant application highlights the professional development project as a means of introducing teachers to many forms of technology and through the training, allow them to make decisions about how to structure standards based lessons with technology tools. Cohort activities will explore "alternative ways of linking technology to the curriculum, and demonstrating how technology can transform student learning from a model of teacher-directed instruction to a model of student exploration, analysis of information and problem solving". (Cayuga-Onondaga BOCES, 2004, p. 10) Money from the grant will go towards salaries, substitute pay during full day work session and equipment.

At the onset of the grant, the Cohort was to consist of teachers with middle level technical skills, but the invitation was enlarged, to include any and all teachers who would volunteer to be involved in the project. Each teacher was promised a projector to use with their computer in their classroom. Thirty-one teachers, having a wide range of technical background and ability, signed up to be part of the cohort.

Training began in November 2004, during an afternoon work session. Teachers and ETIS became acquainted and an online survey was taken to assess the needs of the group. Four full day work sessions took place during the next six months and instructors met one-to-one with Cohort teachers on a weekly basis. The ETIS hoped to "design opportunities for teachers to examine important questions: Why is technology important

to instruction? What technology can be used to enhance instruction and how do I integrate technology with quality instruction?" (Cayuga-Onondaga BOCES, 2004)

The four full-day work sessions centered on several themes. The first dealt with integration in the single computer classroom. Teachers were shown how to use their projectors and learned how to effectively use this technology in their classroom. AppleWorks presentation software was used as a means of creating slideshows for instruction. Other work sessions centered on using the web as an instructional and learning tool, using Inspiration software, creating teacher web pages and web quests, sharing digital documents and using collaboration and assessment techniques for improved communication and productivity. Throughout the year, National educational technology standards for teachers were addressed and followed as an integral part of instruction. Student learning styles and the diverse needs of students were embedded into each lesson.

Section 4: Description of the Theory

Aspects of Change Theory and its applications in education will form the theoretical perspective in this study. Integrating technology requires change in our way of teaching and a restructuring of traditional teaching methods. In <u>Change Forces: Probing the Depths of Educational Reform</u>, Michael Fullan tells us that the way "to make improvements in an ever changing world is to contend with and manage the forces of change on an ongoing basis." (Fullan, 1993, p.15) Students are entering a globalized society that demands collaboration, communication and problem solving skills. The way that they learn from technology and the way that educators use technology, affects how they think about and react in relation to change. As change occurs, the emphasis is on what is best in the student's learning process. Many of the teachers in this study volunteered to participate with the hope of learning new ways to integrate technology with their curriculum. This learning process would undoubtedly require using different methods of instruction. About one-fourth of the cohort was low-end technology users. For these teachers, the adjustments would be even greater.

Donald Ely lists eight conditions that need to be considered in order to promote change (Ellsworth, 2000):

Dissatisfaction with the status quo

Ely finds that most teachers believe that using technology improves the quality of education, but two thirds feel that they don't use the Internet in a well-integrated manner and only one-fourth "feel pressure to use it in learning activities" (Ely, 2002, p.32). Teachers in this case study expressed the need to use computers more effectively and

learn about ways to use available technology resources. They felt the need to improve the current status of technology use in their instruction.

Sufficient knowledge and skills

Those concerned with implementing change in their environment need to possess specific knowledge and skills to realize their goals. In order for the teachers in this study to adopt technology in their curriculum, they need to obtain the necessary knowledge about software and Internet resources. Their skills in using computers to teach their students would have to be refined.

Available resources

This condition refers to the things that are required to make implementation work. Hardware, software, Internet access and other teaching materials need to be easily accessed. Along with the school's available technologies, the EETT instructors in this study were on site for one-on-one assistance, giving the cohort the resources they needed to accomplish implementation.

Rewards or incentives

Benefits need to be realized for change to occur. Extrinsic or observable incentives can move an individual to action. In this study, teachers who volunteered to be in the cohort were given LCD projectors to use in their classroom. Intrinsic rewards demonstrate satisfaction with a job well done.

There is participation through shared decision-making and communication

Shared decision-making and communication among all participants helps to ensure that each person feels that there has been an opportunity to comment on topics that will directly affect their work.

Time must be available.

Users need to have time to learn, adapt, integrate and reflect on what they are

doing. Ely suggests that this time be company paid time but it can also mean that

participants contribute some of their own personal time to the process. In the case studied

here, time was a recurring theme in interviews with teachers.

Commitment

Adopters, who invest time and effort into a process, look to their leaders for long-

tem backing and support. Both financial and personal commitment will be needed to

ensure that new practices continue to be followed.

Leadership

Continuous encouragement is provided throughout all phases of implementation.

Both executive leadership and project leadership is needed to "provide those around them

with inspiration and encouragement throughout all phases of implementation" (Ellsworth,

2000, p. 71).

Section 5: Themes

Integration

Several generalizations can be drawn from careful research and observations of this case study.

Staff Development

This study concurs with research findings that quality staff development is needed for successful technology integration. Success was evident as teachers overcame their anxiety about technology and began using the hardware and software available after full day work sessions followed by individual instruction over an extended period of time. Conditions related to change theory were met in the instruction provided by the ETIS. Resources and incentives were made available and users developed the knowledge and skills to use technology in the classroom.

Benefits

Integrating technology into the classroom benefits students by motivating them, providing them with additional and timely resources, and allows engaging learning experiences. Learners benefit from seeing relationships more clearly with the visual aids that technology can provide. Students are motivated by ownership in their work and the pride that they feel when they experience an increased interaction with the subjects they are studying. This was evident when teachers extend technology beyond use as an instructional tool to student hands-on learning activities. Not all teachers in the study are at the level of having their students actively use technology in an engaging manner that promotes higher level thinking skills. They see benefits to students at the instructional

level but interpretive project based learning activities have not been part of their experience so far. Teachers who have moved towards a model of student exploration and problem solving have expressed a higher level of satisfaction with their experiences in the EETT program. The benefits for them extend from the increased motivation and production they see in their students.

Need for Time

The study concurs with tenets of the literature and change theory. A personal commitment, over an extended period of time is needed to reach the goal of technology integration (Earle, 2002). Learning doesn't end when involvement in the EETT program is over. Some teachers may take longer to fully integrate technology into their curriculum. Change is a process that continuously follows a path of extending one's skills (given enough time for learning), regaining confidence as student show benefits in using technology, achieving teacher competence with increased technology integration and developing creativity in designing lessons that promote student life long learning skills.

Further Developments

As the EETT program moves on to its second and third year of operation, and as teachers at the middle school level continue to build on the skills they've learned, several areas of interest can be addressed.

As teachers become experienced with using technology, the school environment will benefit from their expertise. In sharing what they've learned with their colleagues, cohort members will help future students and other teachers learn to integrate technology.

Collaboration can take place within grade levels, departments and school-wide forums where cohort members become leaders in promoting increased use of technology in hopes of improving student achievement.

Research should continue. Questions may still exist as to whether student achievement does indeed increase with the help of technology. Many variables affect the results of achievement assessment. Studies can be established to find how technology balances this equation. Follow-up observations can also prove valuable to the programs success. Will teachers continue to use the skills they've gained this year? The degree to which technology has been integrated in the cohort's instruction should also be investigated. Will cohort members extend what they've learned to include student hands-on learning experiences? Since the barrier of time restraints came up during interviews in this study, continued observation would indicate if more time does provide the conditions needed for technology integration to occur. The EETT literature states that the Educational Technology Integration Specialists will continue to provide support to teachers after the year long training has ended. This will be an important additional factor in determining the success of the program.

Conclusion

The implementation of an EETT staff development program holds promise for successful technology integration at the middle school level. Since participation in the program, teachers have gained knowledge and enthusiasm for applying technology in their instruction. Benefits to student learning include increased motivation, interest and pride in their work. The degree to which technology has been integrated into the cohort member's classrooms varied according to teacher skill level and time restraints. The

extent to which teachers encouraged their students to use of technology in project based

learning experiences also varied among the participants in the program. As teachers

become more experienced with technology, extend their learning and overcome time

restraints, they will realize continued benefits of technology integration. Continued study

is recommended in order to see the long-term benefits of this staff development program.

Section 6: Assertions

As the EETT program progressed, the conditions for implementing technology integration became evident. The degree to which they were met differed, according to teacher skill level and motivation.

Status quo, rewards and resources

Teachers expressed the need to use computers more effectively and learn about ways to use available technology resources. They felt the need to improve the current status of technology use in their instruction. Each participant was given an LCD projector as part of his or her participation. This provided additional incentive towards success in their efforts. Along with the school's available technologies, the EETT instructors were on site for one-on-one assistance, giving the cohort the resources they needed to accomplish implementation. Four full day work sessions and weekly visits by instructors afforded the opportunity for teachers to develop knowledge and skills to integrate technology with their curriculum.

Participation

Near the end of the study a focus group met and some teachers felt that work sessions could have been better directed if split into technology ability levels. There were times when novice teachers felt overwhelmed at the amount of new materials presented. Working one-on-one with the instructors allowed the opportunity for teachers to communicate about technologies that would directly involve their classroom situations and individual curriculum. Ely feels that getting involved in the process with one's own time, effort, and ideas contributes to a sense of ownership in the innovation. (Ellsworth, 2000)

Ely's final three conditions of change are being met at various levels and to some extent require further study as the EETT program moves into it's second and third years at other schools in the district.

Time

Ely feels that "time is a vital element in the total process of educational change." (Ellsworth, p. 69) Interviews with teachers in the EETT program study revealed to some extent, that the need for more time to practice and plan was an important factor in how they were using technology. Data was collected for the study less than five months after training sessions began. Although teachers are accorded time during work sessions to devote to learning new applications for technology, finding the personal time that they need to reflect on what they've learned is still a process that they are going through.

Commitment and Leadership

"Potential adopters who are being asked to commit time and effort to the innovation's success will be looking to their leaders for evidence of long term backing."

(Ellsworth, p. 71) When the EETT instructors move on to other schools next year, there needs to be evidence for continuing support of implementation. In our District technology integration is encouraged at the district and building level. A Technology Planning Team meets once a month to discuss development of the District's use of technology to enhance student learning, professional development and administrative productivity. Through monthly meetings the TPT recommends technology program goals and monitors and communicates the overall effectiveness of the technology program. TPT coordinates its planning and program development with the Instructional Technology Committees (ITC) at each of the district's eight schools and the District Professional Development Planning

Committee (PDP). The Middle School Staff Developer is a member of each of these committees and has worked closely with the EETT cohort. Endorsement and continuing support for implementation is evident.

Ely brings this concept of encouragement one step further in his final condition. Not only is concrete evidence of long term backing needed, but also motivation and continuous encouragement must be available throughout the process of change. This affective influence can come, not only from administration, but can also be tied to the earlier mention of Earle's premise that teachers grow from learner to adopter to leader. Teachers and other members of the system "provide those around them with inspiration and encouragement throughout all phases of implementation." (Ellsworth p. 72) Members of the cohort who are successful in their attempts at technology integration can become leaders by sharing their knowledge and enthusiasm with other teachers in their school. Michael Fullan stresses this. "Teachers working with other teachers at the school and classroom levels is a necessary condition for improving practice." (Fullan, 1993 p. 139) He speaks of visions that lead to productive learning through sharing knowledge. People need to be committed to a vision because it reflects their own personal vision as opposed to a vision imposed on an organization." (p. 39) A sharing environment is presently evident in this case study. At one of the Middle Schools, the entire eighth grade is involved in an Oral History project involving English, Social Studies and Technology classes. Students are researching an historical event, interviewing someone about their experiences and completing the project by creating a short movie. Three teachers involved in the project are in the cohort. They have shared their new knowledge with their team members and students. The English department has also worked together using

Inspiration software as a graphic organizer with their classes. I've observed two activities led by teachers who are not in the cohort, but have seen cohort members use the application and have adopted it for use with their own students. Future leadership roles by members of the cohort will play an important part in this change process.

James Ellsworth writes of Fullan's three fundamental recommendations for stakeholders involved in teacher education. Professional development should (1) align with school improvement, not merely with developments in abstractions, (2) be applied throughout the curriculum, not just in isolated events without follow-through and (3) concentration shouldn't be on the innovation, but on fostering "life-long learning as a core value throughout the school culture" through as many activities as possible. (Ellsworth, 2000, p. 102) Continued study of the ways in which teachers in these middle schools are using technology can provide additional insight into how our students are using technology to enhance their learning process.

Change strategies work within a communication system. Our school system relies on the combined efforts of many. Community, members of the Board of Education, principals, technology integration specialists, teachers, school technicians, computer aides and students all play a role in the successful diffusion of innovation. There will be many groups contributing to the long-range impact of the EETT grant.

Section 7: Final Vignette

Mrs. Roth and her students were once again in the computer lab. Seventeen sixth grade students were seated at the computers, waiting for directions from Mrs. Roth. The plastic bottles of glue were not evident, and no one was using pencil and paper to copy data from the web. Using a projector from her computer, she began a demonstration on setting up a slideshow for an oral presentation of their book reports. She directed them to set the page orientation, page view and number of slides. Next she gave instructions for setting the background and inserting a text box. The students followed her example and took time to investigate the options for color, font ant size of text. When directing them to websites that offer images that pertain to their topic, Mrs. Roth had some difficulty finding them, but was able to give instructions on how to insert the images they find into their presentation.

When she completed her demonstration she answered questions from the class about finding information about the author of their book. They talked briefly about searching for relevant information on the Internet. As students began working on their presentation, Mrs. Roth worked with students individually, offering help when needed. It was evident that this teacher had gained knowledge in using available technologies. Her students were engaged in creating a document that was more relevant for them than a written report. They were proud of their work, knowing that they will be able to show it to their classmates while they make an oral presentation of the book they'd chosen to read.

Appendix A: Glossary

Analysis of Themes: "The researcher analyses the data for specific themes, aggregating information into large clusters of ideas and providing details that support the themes." (Creswell, 1998)

AppleWorks: A software application used with the Macintosh computer. It includes word processing, spreadsheets, and databases, draw and paint programs and presentations.

Assertions: During the final steps of analysis, statements are made which provide an interpretation of the lessons learned during research.

Bounded System: The case being studied has boundaries in time or place. Since the parts of the study are interrelated to form a whole, the case is also considered a system. (Creswell, 1998) This case began in September of 2004 and continued to June of 2005. The study took place in two Middle Schools in a small city school district.

Case Study: "In qualitative research, this is the study of a 'bounded system' with the focus being either the case of an issue that is illustrated by the case." (Creswell, 1998); This case study describes the ways in which teachers use technology in the classroom, after participating in the EETT program.

Cohort: The group of instructors and teachers involved in this case study. There are 1.5 ETIS and thirty-one teachers in the cohort.

EETT: Enhancing Education through Technology is the name of the grant provided to State educational agencies. It is funded through the US Department of Education and is also known as the Ed-Tech program.

ETIS: Educational Technology Integration Specialists are the instructors who provide training and staff development to teachers in the cohort.

Holistic Analysis: In this approach to data analysis, the researcher examines the entire case and presents descriptions, themes and interpretation or assertions related to the whole case" (Creswell, 1998)

Inspiration Software: A software application that students and teachers use to build graphic organizers. The software can be used to represent concepts and relationships, as well as a means of presenting information in outline and diagram mode.

NCLB: No Child Left Behind Act of 2001 which seeks "to improve the performance of America's elementary and secondary schools while at the same time ensuring that no child is trapped in a failing school." (Executive Summary of the No Child Left Behind Act, 2002) One of the programs included in NCLB is the Ed-Tech program.

STaR Report: School Technology and Readiness Report prepared by the CEO Forum on Education and Technology. The report is designed to help ensure that America's schools effectively prepare all students for the skills they will need in the 21st century. To meet this objective, the Forum issued assessments of the nation's progress toward integrating technology into American classrooms. Four annual reports were generated from 1998 to 2001.

Technology: The technologies referred to in this study include using computers, Internet resources, educational and desktop publishing software.

Technology Integration: Incorporating different technologies into methods of instruction. Using technology as a tool during the learning process.

Appendix B: Ethics Permission Form

Ethics Protocol for Case Study Research
[Regina Scalisi]

This authorization is being requested in part to fulfill requirements of the State University of NY Institute of Technology's Human Subjects Research Review Board as well as state and federal regulations regarding the use of human subjects in research.

The project involves a case study that may be used in my master's research at the SUNYIT Information Design and Technology Master's program. Excerpts or rewritten versions may also be submitted to professional journals for publication. The case study involves a federally funded Enhancing Education through Technology (EETT) grant program and the ways that teachers in a Middle School cohort use technology in the classroom. The work involves participant observations, one-on-one interviews, and scheduled visits.

I can be reached at *[315.255.8480 ext #2471, which is at East Middle School, where I am a full-time faculty member]*. I would be happy to answer any questions about the project.

I would like to reassure you that as a participant in this project you have several, rights.

- Your participation in these studies is entirely voluntary.

- A fictional name will be used in place of your own.

- You are free to decline to answer any question at any time,

- You are free to withdraw from the study at any time.

My notes from meetings, interviews, and observations will be kept strictly confidential. Excerpts from these notes may be made part of the final thesis. Copies of the final publications will be supplied whenever possible and as requested.

I would be grateful if you would sign this form to show that you have read its contents.

_____ Signed

_____ Printed

_____ Dated

Appendix C: Interview Form

Project: Case Study of EETT program in the Auburn Middle Schools

Time of Interview: _____   Date: _____   Place: _____

Interviewer: <u>Regina Scalisi</u>   Interviewee: _____

Position of Interviewee: _____

═══════════════════════════════════

Questions:

1. Tell me a little bit about your teaching experience.

2. Why did you volunteer for the Cohort?

3. Can you tell me in your own words, what it's been like to be involved in the program?

4. How did you use technology with your students before becoming involved in the cohort?

5. How are you using technology now [how has your comfort level been changed by the experience?

6. What is the impact on your classroom since we've gotten the grant?

7. What are your feelings about how technology benefits students in their learning process?

8. How are your students using technology?

9. What does it mean for you to integrate technology in your curriculum?

References

Barnett, H. (2003, Sept). Investing in technology: The payoff in student learning. *ERIC Digest*, Retrieved January 10, 2005, from http://www.eric.ed.gov.

The CEO Forum on Education and Technology, (1999). Key Building Blocks for Student Achievement in the 21st Century. Professional Development: A Link to Better Learning: Year Two. Washington D.C. Retrieved Mar. 8, 2005, from CEO Forum Home Page Web site: http://www.ceoforum.org/.

The CEO Forum on Education and Technology, (2000). Key Building Blocks for Student Achievement in the 21st Century. The Power of Digital Learning: Integrating Digital Learning Year Three. Washington D.C. Retrieved Mar. 8, 2005, from CEO Forum Home Page Web site: http://www.ceoforum.org/

Creswell, J. (1998). *Qualitative inquiry and research design: Choosing among five traditions*. 1st ed. Thousand Oaks, Ca.: Sage Publications Inc.

Earle, R. S. (2002). The integration of instructional technology into public education: Promises and challenges. *Educational Technology Magazine*, *42*(1), 5-13.

Ellsworth, J. (2000). *Surviving change: A survey of educational change models*. 1st ed. Syracuse, NY: Eric Clearing House on Information and Technology.

Ely, D. (1999). *New perspectives on the implementation of educational technology innovations.* Syracuse, NY: ERIC Clearinghouse on Information and Technology.

Ely, D. (2002). *Trends in educational technology*. 5th ed. Syracuse, NY: ERIC Clearinghouse on Information and Technology.

Enhancing Education Through Technology (2004). Title II Part D Competitive Grant Application, Cayuga-Onondaga BOCES Partnership.

Fullan, M. (1993). *Change forces: probing the depths of educational reform*. 1st ed. Bristol, Pa: The Falmer Press.

Mouza, C. (2003). Learning to teach with new technology: Implications for professional development. *Journal of Research on Technology in Education*, *35*(2), 272-290.

Pierson, M. E. (2001). Technology Integration Practice as a Function of Pedagogical Expertise. *Journal of Research on Computing in Education*, *33*(4), 413-429.

U.S. Department of Education, Office of Educational Technology, (2004). Toward a new golden age in American education: How the internet, the law and today's students are revolutionizing expectations, Washington, D.C.

US Department of Education, (2002). Executive summary of the No Child Left Behind Act of 2001. Retrieved Mar. 02, 2005, from http://www.ed.gov/nclb/overview/intro/execsumm.html.

US Department of Education, (2002). Guidance on the enhancing education through technology (Ed Tech) program. Retrieved Mar. 03, 2005, from ED.gov US Department of   Education Web site: http://www.ed.gov/programs/edtech

Waddoups, G. L., Wentworth, N., & Earle R. (2004). Teaming with technology: A case study of a faculty design team developing electronic portfolios. *Journal of Computing in Teacher Education, 20*(3), 113-120.

Woodbridge, J. (2004, March). Technology integration as a transforming teaching strategy. *Techlearning*, Retrieved January 15, 2005, from http://www.techlearning.com/story/showArticle.jhtml?articleID=17701367.