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Lasso the Future: The Daily Integration of Technology into Elementary Classrooms

Candace Figg

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Introduction

As the digital economy emerges, the computer is impacting the very essence of American life as we know it. The current American workforce may be employed in jobs that require a high level of technical skills, familiarity with new technologies, or the capability of being networked with their co-workers. Or, perhaps, the worker remains at home and performs his/her responsibilities via online communication links. Telecommuting is a term recently added to the dictionaries, as are the words, "e-commerce", "e-tailers", and "e-shopping". The Internet alone is revolutionizing the way Americans communicate, purchase goods, attain information, and obtain services (U.S. Department of Commerce, 1999), and computer technologies pervade almost every aspect of our daily existence. However, computers have yet to make a major impact upon the way our students learn in American classrooms today (Morrison, Lowther, & DeMeulle, 1999), and many teachers believe that, although they possess more skills and personally use technology more than in the past, they are still unprepared to effectively integrate instructional technology into their daily teaching practices (Northrup & Little, 1996; Office of Technology Assessment, April 1995).

Current research attributes the fact that computer technology has had little impact upon student education to several external forces influencing teachers and the choices they make in their preparation of daily instruction. First, classroom access to computers has served as a barrier to the daily use of computers within the daily instruction (Becker, Ravitz, Riel, & Wong, 1999;

Education Week, 1998; Hadley & Sheingold, 1993). Secondly, traditional teaching methods utilized computer tools as a means of instructional delivery, rather than tools to support student-centered, real world teaching contexts (Morrison et al., 1999). Additional barriers to technology integration (the use of technologically-enhanced activities as part of the students' everyday learning and teachers' instructional practices) indicated in current research include the lack of on-campus technical support for hardware/software problems, lack of administrative support for developing technologically-enhanced learning situations, and lack of continued training that updates or enhances teacher skill levels (Becker, 1998; Becker et al., 1999; Education Week, 1998; Hadley & Sheingold, 1993; Sheingold & Hadley, 1990; U.S. Department of Education, 1996). And, finally, support from parents, teachers, administrators, politicians, as well as educational reformers, remained concerned with acquisition of hardware and software, rather than support for teacher training (Evans-Andris, 1995; Morrison et al., 1999; Northrup & Little, 1996). Lowther, Morrison, and Bassopo-Moyo (1998) propose that training should strive not only to produce "computer literate" teachers, but should create the "technologically-competent" teacher, an educator who not only "understands the relationship between basic computer functions and student learning" and "use(s) this understanding to design, facilitate, and manage a student-centered multidimensional learning environment that embeds the use of technology into the curriculum," but also understands that the computer should be utilized as more of a learning tool rather than an instructional

delivery system (Lowther, Bassoppo-Moyo, & Morrison, 1998, p. 93). Teacher training which emphasizes the mere acquisition of skills remains inadequate to encourage teacher use of computer technology within their daily teaching practices. Morrison, Lowther, and DeMeulle (1999) further suggest that after twenty years of exploring how computers can and cannot be used effectively in the classroom, these educators, trained in "technological-competence," may finally be on the verge of using computers to lasso the future and bring it into our classrooms on a daily basis.

So, the focus of inquiry has begun a shift from the impact of barriers affecting the use of computers within student education to the teacher and his/her propensity for using computers in the daily instruction of students. If the aforementioned barriers were addressed in an educational setting, what would teachers then perceive as a valuable contribution, either in their training or their work environment, to their successful quest of becoming technologically competent? With barriers eliminated or under control, what would teachers perceive the impact of computers to be on their students in their classroom context? In other words, research is able to focus its inquiry on the teacher and the factors that influence teachers to use technology-based activities as a part of their students' everyday learning activities, as well as a part of the teacher's everyday teaching activities.

Thus, the purpose of this exploratory research was to investigate the factors perceived by elementary teachers as contributing to their successful

integration of technology into their daily teaching practices and instructional designs.

Setting

Corazon Elementary[1], located in the northeastern portion of a thriving southern metropolis, opened it's doors to a population of over 500 students (ethnic breakdown: 42% African American, 40% Hispanic, 18% Anglo; 85% economically disadvantaged) in the fall of 1998. The principal hired staff committed to completing their district technology certification during this first year of operation, worked with the campus curriculum director to secure grants for outside training and acquire hardware and software for classroom technology use, and secured a technology specialist for on-campus technical assistance and training. Throughout the first year, faculty attended training sessions conducted not only by the on-campus technology specialist, but also by a regional educational development laboratory whose services provided continuing enhancement or updating of skills throughout the year. Teachers were encouraged to share, mentor, and work together to solve technical problems and develop instructional activities that could be infused into the curriculum. In addition, computers were distributed to the classrooms as access to them became available, with classrooms having from one to four computers available for teacher and student use. A school-wide computer lab with projection device became available for teacher/student use in the spring of 1999.

With a teaching environment that controlled many of the barriers (at least one computer in the teacher's classroom and access to a school computer lab, on-campus technical support, administrative commitment to the goal of technology integration, training that provided technical skills and modeling of use of technologies within the classroom, and a school-wide community of mentorship and sharing) identified by research as problematic to infusion of technology, Corazon Elementary became the ideal situation for an exploratory investigation of what teachers perceive as valuable in a teacher's process of becoming "technologically-competent."

Method: Naturalistic Inquiry

Naturalistic Inquiry is the strategy chosen for this exploration of teacher perceptions of factors influencing their successful quest to become "technologically-competent" teachers. Defined as a collection of methods with "the commitment to studying human action in some setting that is not contrived, manipulated, or artificially fashioned by the inquirer (Schwandt, 1997, p. 102). Naturalistic Inquiry relies upon a study design which allows the findings to "emerge" from the data as the value systems of the researcher and informants "interact in unpredictable ways to influence the outcome" (Lincoln & Guba, 1985, p. 41). Therefore, in order to document the phenomenon as it emerges, certain procedures for data generation and analysis consistent with the principles of Naturalistic Inquiry, as described by Lincoln and Guba (1985) and Erlandson, et. al. (1993), were followed. These procedures included:

[1] Pseudonyms have been substituted for names of individuals, schools, cities, and other identifiable characteristics.

- the selection of a purposive sample, a selection of participants for the study "that will most help to answer the basic research questions and fit the basic purpose of the study " (Erlandson, Harris, Skipper, & Allen, 1993, p. 83) and bring diversity of backgrounds, perceptions, and experiences to the discovery process.

- development of a "Researcher as Instrument" statement, a statement that informs the reader of values and perceptions that the researcher holds regarding the topic of study and which could impact the eventual presentation of findings.

- maintenance of the researcher's Reflexive Journal, a journal record of the researcher's own insights and reflective thought processes throughout the study, including decisions made by the researcher, the influence of readings, strategies for working with study participants, difficulties arising from the research process, and as such, these reflections form a chronology of the research study.

- preparation of case studies, a thick description of the phenomenon encountered which records "the circumstances, meanings, intentions, strategies, motivations, and so on that characterize a particular episode" (Schwandt, 1997, p. 161) so that the reader is able to judge the information held within the case study and make decisions whether or not the themes that emerge can be transferred to their own situations.

- collection and analysis of data from which the working hypotheses emerge, an emergent process in which data collection and data analysis are inseparable. Data is generated through interview, observation, review of documentation, or creation of documents and analyzed by sorting and organizing text into emerging categories which are then grouped together and their relationships discovered so that themes or working hypotheses evolve.

- use of member checking, a procedure which "solici(ts) feedback from respondents on the inquirer's findings" (Schwandt, 1997, p. 88) through the process of reviewing the summarization of the participant's statements with the participant at three points in the data generation. First, the summarizations are checked with the participant during each of the interviews. After the interview, the researcher reviews all data generated, and forms a second summarization of the perceptions of the participant. Level 2 Member Checking occurs when these perceptions are revealed to the informant who clarifies and refines these perceptions for the researcher. The participant is given a third chance to review and clarify the data at the conclusion of the data generation, by reading and responding to the written case studies generated from the data.

- use of peer debriefing teams, a group of knowledgeable peers who review samples of data generation, test data analysis against emerging themes, and generally provide a sounding board for the researcher's ideas, questions, and conclusions.
- triangulation of multiple sources and types of data, the use of multiple sources and multiple methods of data generation provides a greater "confidence in the observed findings" (Erlandson et al., 1993, p. 139).

Careful attention to the manner in which the procedures are controlled during the study provide assurance for the reader that the study has been conducted in a rigorous fashion, and that therefore, the findings are trustworthy.

Purposive Sample and Introduction of Participants

Four teachers working in the technologically rich environment at Corazon Elementary were chosen as a purposive sample, a group of participants chosen because they possess a basic level of computer literacy, have expressed an interest in learning to use these technologies regularly within their daily classroom instruction, but who are searching for ways in which to accomplish this feat. In addition, the teachers represent a variety of teaching expertise, teaching experiences, and teaching styles. The case studies that follow are reports constructed with the help of the participants, and are meant to depict the perceptions expressed by the four teachers as their current beliefs regarding the factors that are influencing them as they endeavor to become "technologically-competent" teachers.

Mandy

Mandy's afternoon Pre-K class swirls about her feet ready for their group session of sharing and instruction. During this observation, Mandy is talking about the structure of a plant, root, stem and flower with petals. Later, the students will take a bean, place it on a wet piece of paper towel, slip the bean and towel into a plastic bag, and hang the plastic bag on the wall so that the growth of sprouting roots and stems can be observed. When asked how computer technology could ever play a part in such a hands-on environment as a Pre-K class, Mandy enthusiastically points out that "with Pre-K, we're geared more towards going with the children's interests, not as much a structured lesson. And, so by having the flexibility to just say,':Well, let's go see what's on the Internet and find out about that, because I don't know anything about that.' You have the resources available right there in the classroom." In fact, Mandy cites the availability of Internet resources in her classroom as probably the reason she has been able to bring the computer into her lessons. "I never would have thought I would have used the Internet as much as I did, but that's probably the biggest thing that motivates my use in the classroom," and she gives the example of looking for wildflower pictures to use with her class. She asked her students, "So how could we find out about wildflowers?" And, they said, "You could get on the computer! You can find flowers on there!" So, Mandy and her students got on the Internet, located pictures of local wildflowers, and "talked about the colors and just the different shapes." Later, the students went out in the field of flowers, and the students

were able to identify at least four of the flowers in the field by name. Mandy adds, "They were correcting me, because I had the name wrong!"

In addition, Mandy has structured her teaching with the computer by connecting the TV monitor to her classroom computer. Mandy describes the process she uses (large group to small group to individual use) in this way:

> Because everybody can see, I use the TV with large group to reinforce our themes. Like with the Freddie Fish game, for example, we talked about all the steps, and how to problem solve, and how to work through each part of the game. And the kids that couldn't have gone over and sat down and figured out what to do got to observe from the other kids who could figure it out real quickly. So everyone got the modeling of how to use the program, which would have taken forever to work through with one or two kids at a time. By doing it large group, everybody got that exposure at the same time."

Although she developed this structure of instruction because of her personal interest in using computers, Mandy feels that the training and support provided by the school through a regional educational lab and the on-campus technician have been beneficial for supporting her computer skills and her ability to teach with computers. "I think probably one of the biggest frustrations with people trying to use technology in the classroom is that they don't have the knowledge to figure out what' s missing." So when the sound did not record during an initial session with KidPix, Mandy was able to realize that the mike had not been activated. Her co-worker became very frustrated until Mandy was able to show her how to turn the mike on for recording. For Mandy, perhaps the most valuable aspect of the training has been the

incorporation of a sharing day where teachers could see what other teachers were doing with technology, and ask "Okay. How did you do that?" Sharing suggestions, working through technical problems together, and "observing strategies that others were using in working with computers in the classroom with students" have helped her think about different ways she could use technology in her classroom.

Shelley

Shelley's class of active second graders gives off an air of confident learners and mentors. Through many class observations, it is clear that Shelley expects her students to learn from each other and work together to devise answers and solve problems (personal as well as academic). Because she uses a variety of instructional methods and collaborative groupings, Shelley feels that a "hands-on experience with a computer every week" is a valuable way to support her thematic teaching. For example, the students had research projects that were completed with resources from the Internet. "Having the kids work on the computers during centers has been wonderful, because in exploring, they can usually figure out a lot of stuff that it would take me hours to get across, and then they can teach each other. And that's very effective."

Part of the instructional day in Shelley's class is a weekly set of centers with various activities, usually thematically-oriented. For example, one week,

Shelley prepared various center stations that dealt with Tall Tales, and the students completed one center each day until they had rotated through all centers. One of the activities is always stationed around the four computers in Shelley's classroom. When asked how she decided to use her computers in this particular fashion, Shelley described her thought processes as:

> I was concerned that if you use the computers as something that the kids do when they are finished with their other work, you're going to have some kids that never get experiences on the computer. I also knew that with only four workstations, whole class instruction was going to be very difficult. So, it just seemed logical that I would have them do things in small groups over there as opposed to trying to do something whole class. And for the things that I want to do whole class, we can go to the lab. It just makes sense!

However, Shelley feels that the computers can be used to impact learning throughout other activities as well, such as listening to a Thunderstorm CD while the students write on their weather journals or reading information off of the computer during DEAR (Drop Everything And Read) time.

For Shelley, the most important factors that are influencing her to successfully use computers in her daily instruction are twofold. First, having a teacher workstation and four computers in the classroom supported by a school network and an on-campus technician, Shelley feels, have been principal reasons for her success. "Teachers don't know hardware for the most part…And so when you have a hardware issue, to be able to call on somebody to come in and fix it so that you can move on about your business"

makes the difference in having a successful implementation or a frustrating encounter. Secondly, the training from the regional educational lab allowed the teachers "a day where we all sat down and worked with KidPiks or HyperStudio," just explore with the tools, and days set aside for the sharing of ideas between teachers. "Since everybody's doing technology, we all gave each other ideas. We shared whatever we knew."

Nancy

Organized and working quietly together at tables of four, Nancy's large class of fifth graders appear comfortable working in collaborative groups or individually as required by the instructional situation. Nancy's students do a lot of writing and publishing activities to support state-wide testing standards, and Nancy relishes lessons that incorporate the computer as a tool that supports these publishing efforts by providing the students with a polished professional product.

However, Nancy freely shares that she has struggled with the process of developing lessons that integrate technology. "I keep finding (that the students) are familiar enough with computers to not have any fear of them, but then they don't know enough to get over the hurdles" or perform all the tasks needed for a command. "Finding what skills the students have and how to take them beyond that point" has been very influential in the types of activities that she has been designing for her students. Perhaps most frustrating for her has been developing classroom management techniques that are needed for

designing and implementing lessons that incorporate computers as part of the resources used in the lesson. Procedures that Nancy would like to develop include:

- a checklist similar to the one the regional educational lab used during teacher training which would allow her to pinpoint what skills her students have, with follow-up activities to further develop student application skills, "an entire project focusing on just graphics or word processing."
- Rubrics, "or something to say, "Here is what I'm gonna be grading. Did you follow the directions?"
- Procedures for using the computers, such as "using a timer to switch groups who work at the computer"

Many of the Nancy's ideas wants to implement come from the training that the regional educational lab and the on-campus technician have provided for the teachers at Corazon Elementary. The regional educational lab training required "every teacher had to present a lesson that incorporated technology into it (based on) a format." The teachers worked in stages to prepare the lesson, with the final stage being a demonstration to the other teachers in the school. "By the end of that day, what everyone discovered was there were a whole bunch of lessons that were just cross-grade level." Nancy felt that these experiences were very valuable in helping her see how she could use different technologies in her classroom.

Elaine

Although Elaine is not a newcomer to teaching, as evidenced by her skillful use of large and small groups in her bilingual fifth grade

class, she is new to technology integration. The excitement that she has seen from her students as they use computers has encouraged her to complete the training sessions and begin working with technology in her classroom. "You have so much power when you have computers. The kids love them!" And, she further explains her enthusiasm for lessons supported with technology by giving an example of one of her students with special learning requirements. The class assignment had been to pick a topic about space and start looking at books over the weekend. Elaine further explains:

> This particular student came to class on Monday with drawings and work that she had taken from the books that she wanted to input on the computer for the HyperStudio project. She was so ecstatic that she was gonna be able to do something she could share with the class that she had it done! What a motivator!

As Elaine is just completing her technical training and beginning the process of creating instructional designs that integrate computer technology, she is enthusiastically seeking out activities that she feels will support her instruction. By looking at her unit plans for the year, she has outlined the places where technologically-enhanced instruction would support her thematic teaching during the year, so that she provides her students with opportunities to work with a multitude of applications. "We could do spreadsheets on whales (for the ocean unit) which would show the type, length, speed, and location, or the virtual tour of the body which is available on the web for our health unit

on the body," or the use of polygons created in a draw application to explore the number of sides and angles of polygons.

Elaine's sources of inspiration and encouragement come from books her co-workers have loaned to her, the regional educational lab training sessions, and watching her neighboring fourth grade teacher, Mrs. English. "Mrs. English motivates me by seeing what she's doing with her class. She works with her class whole group, and then the students got to a Center. Right now, they're researching Indians on the Internet, and I would love to do centers in this way." Elaine has another reason to be excited about next year as the students in Mrs. English's class will be moving up into her classroom, and "most of them are literate and comfortable and all those wonderful words that allow them to get on the computer and just go."

Data Collection and Analysis

> In the collection and analysis of data, it is sometimes hard to distinguish between when the collecting ends and when the analysis begins, for gathering and analysis are complementary, ongoing, and often simultaneous processes (Erlandson et al., 1993, p. 85).

Data generation for the purposes of this study was conducted during the Spring 1999 semester, and incorporated an unstructured, open-ended, emergent interviewing process which was conducted with the four informants described in the purposive sample. The interviews were scheduled bi-weekly, and were tape-recorded, transcribed, and member-checked through follow-up

interviews with the informants. In addition, summaries of serendipitous conversations held with the participants during informal meetings and classroom observations were recorded, transcribed and member-checked, as were e-mail conversations, field notes generated during classroom observations, and dialog journals between researcher and individual participants.

The emergent interviewing process was characterized by an open-ended interview situation that is initiated through a single question. The interview process began with the following question: "What are the factors perceived as most valuable in influencing elementary teachers to use technology-based activities as a part of their students' everyday learning activities, as well as a part of the teachers' everyday teaching activities? During the ensuing dialogue, the researcher continuously sought to clarify the meanings of participants' perceptions by using two processes: seeking clarification through follow up questions that asked the participant to elaborate and expand upon previous responses and "member checking" responses throughout the construction of the participant's case study.

Data analysis began with the tape-recording and transpiration of the first interview, a process of analysis that involved three steps:

- The text was broken into small segments that each represented an independent thought about the research context. These smaller segments were coded with a label that the researcher determined was a descriptor of the thought contained within the segment. This process is called unitizing the data.

- Next, the researcher sorted the unitized data into categories the researcher identified as describing the relationships between the units of data.
- Themes or working hypotheses, which can be defined as "general statements applicable to the specific context under investigation" (Erlandson et al., 1993, p. 61), emerged as similar categories were grouped together and the relationships between the categories identified.

The data generated from each contact with the participants and the ensuing analysis and formation of tentative working hypotheses may have led the researcher to probe some areas of discussion more deeply with the participant or change strategies for observation and data generation. This process of adjusting data collection procedures continued as additional data was generated and tested against the tentative working hypotheses. The process continued until the point of thematic saturation was reached (i.e., no more new categories or themes made themselves apparent (Erlandson et al., 1993).)

Throughout the data generation and analysis phase of the study, the researcher relied upon a peer debriefing team, composed of three colleagues with whom the researcher shared a bond of trust and confidentiality, and who were knowledgeable about the details and procedures of the research being undertaken in this study. The team reviewed data samples and data generation techniques, revised coding procedures, confirmed or disconfirmed emergent themes and working hypotheses as logical and proper, and provided final editing suggestions.

Findings

Themes

The purpose of this inquiry is not to formulate generalizations that will be true from situation to situation, but to "illuminate a particular context and provide working hypotheses for the investigation of others (Erlandson et al., 1993) p. 45). By providing thick description of the perceptions, values, and situations experienced by the four teachers who served as participants in this inquiry, the researcher has endeavored to describe the factors that are unique to this context. Analysis procedures consisted of sorting the data generated from the participants into data units, which were then categorized into chunks. Themes emerged from the chunks. A process of constant checking of the themes against each new bit of data generated from the participants resulted in the emergence of the following four "working hypotheses" or themes. These themes are not meant to be generalizable to other situations, but to provide direction for "the investigation of others " (Erlandson et al., 1993)p. 45).

Theme #1: Teachers are willing to integrate computer technology because they feel it impacts student learning favorably and provides resources.

Each of the participants in this inquiry expressed a commitment to using technology on a daily basis with their students and within their instruction. Their reasons for this commitment stems from their belief that

activities that incorporate technology provide a motivational component that other activities lack and provide resources available on a wide scale. Mandy believes that her Pre-K students have been raised on interactive media that provides constant stimulus. She further adds, "I can't keep up that much stimulus. I can't compete. The computer can compete." Plus, Mandy values the ability of the computer to provide individual attention and immediate feedback to students who are in the initial stages of language learning and number learning, while giving her students access to pictures of the "real world". Elaine also expresses enthusiasm for the motivational power the computer exerts over her fifth graders. "The computer just makes them want to do so much more. And they do! I have no trouble getting work out of my students when it involves the computer." Shelley points out that the computer is capable of multitasking while the students work. For example, music from the computer sets the mood for journal or creative writing, and then the students have the opportunity to gather further information on their topics or illustrate with graphics clipped from the web or created in KidPixs. Nancy agrees with Shelley that the ability of the computer to do support many activities, such as individual skill work from the state-wide assessment test, word processing for published writings, search for zipcodes on the Internet, and diagram labels of parts of the body, present information in a different or novel way which motivates students to participate.

The viewpoints of these participants is consistent with research (Cuban, 1986; Doyle & Ponder, 1977-78; Pajares, 1992) that explores the role

that teachers play in the implementation of educational and curricular reforms. Saye (1996) suggests that the research indicates that "teachers will accept only changes that they perceive will help them do their job as they have defined it" (p. 211). And, often, when the teachers' professional knowledge regarding instructional decisions is insufficient, they will rely upon personal beliefs about education and teaching to form the foundations for those decisions (Nespor, 1987). Pedagogical beliefs are considered to be one of three major factors influencing the impact of the Internet upon teacher use of the Internet in daily instruction (Becker et al., 1999).

Theme #2: Teachers go through a process of developing procedures that match their perceptions of their instructional needs and goals.

As the Apple Classrooms of Tomorrow (Dwyer, Ringstaff, & Sandholtz, 1990a; Dwyer, Ringstaff, & Sandholtz, 1990b; Sandholtz, Ringstaff, & Dwyer, 1990) demonstrated in the early 1990s, teachers incorporating technology into their instructional designs encounter special hardships and frustrations. "Experienced teachers found themselves facing first-year-teacher problems: discipline, resource management, and personal frustration" (Dwyer et al., 1990a). The process is on-going for the teachers at Corazon Elementary as each of them is developing strategies for designing and managing technologically-rich teaching environments. Perhaps, Nancy expressed it most emphatically when she stated "There is no technology book like a math book or a spelling book. I am going to have to just take the time to sit down

and literally plan out lessons." Nancy mentioned many management issues that she would like to have seen in a training session, including "a scope and sequence so that the teacher would know what technologies were appropriate for this age, written resources with techniques for using computers in the classroom (some kind of book or some kind of written documentation), tips for classroom routines, lab scheduling hints, or anything that had worked well for others in using the technology in the classroom. Elaine's strategy for implementation is to work out a year-long plan that meshes technologically-enhanced lessons with her current curriculum plan while experimenting with use of the computers as centers. Shelley and Mandy have both developed a lesson structure that allows them to work with large groups first, small groups with peer teachers, and later independent activities for individuals.

However, all of these participants are looking at ways that technology can be used to enhance activities that are currently in use. Hadley and Sheingold (1993) suggested that a typical first step for teachers on the road to becoming "technologically-competent" includes a period of experimentation with activities with which the teacher has had success in another format or media.

Theme #3: Successful instances of using integration within instruction act as a catalyst for change in teachers' thinking about how technology is used as a tool.

As the focus question for this inquiry centered on factors that were influencing the teachers to use technology in their classroom, the most

surprising theme emerging from the data generation was that the teachers felt that their personal thinking about how technology is used in classroom instruction was changing. All four participants described how helpful the sharing day (provided by the regional educational lab during campus training) and the training provided by the on-campus technician had been. Shelley mentioned that the technician was able to work with the students in the lab so that "every kid was on a computer, and they were walking through the steps as they were watching him." Nancy explained further that often when the technician is working with the students, she is so amazed that she "just totally tunes out all the kids because I am sitting there thinking, my goodness, starting off the year with this project could be something that the students work on all year long. See! That's all I need… just the little idea!" Elaine has already requested that the technician help her begin the next school year with mini-units that would focus on specific applications and employ projects similar to those she had seen at the sharing session or observed other teachers using. This would allow her to work with her students back in the classroom in small groups or individually. Even Mandy, who had the most advanced technical skills of the group, appreciated the opportunity to enhance her personal skills by learning to "create teacher products for her students to use" in the HyperStudio and KidPixs training sessions. She could envision creating stacks that her students would work through and learn to use, and even though the her students are too young to create with HyperStudio, she

feels that "they'll be a lot better off" by having the "concept of how a finished stack functions." Each of these participants felt that they were able to broaden their understanding of how computer technology serves lesson designs as a tool, could be supported by teaching in the lab, and could sustain curricular needs.

In addition, Nancy voiced her own shift in thought processes as she discussed how at the beginning of her training, she was given games to use with her students in a "reward" type situation. However, as she acquired more skills, she was able to see the potential for using computer applications as a tool to support instruction rather than a delivery device. Morrison, Lowther, and DeMeulle (1999) agree that this "shift in thinking about computers as a tool instead of a delivery mechanism is consistent with the use of computers outside of the classroom" (p. 14), and may be one of the precursors to helping teachers really make an impact upon student learning with technology.

Theme #4: Environmental influences that provide technical support, modeling, a continued training program, and commitment of administration speed implementation.

As pointed out by Dwyer, Ringstaff, and Sandholtz (1990) and Hadley and Sheingold (1993), the advantages of a technologically-rich learning environment can be negated by a working environment in which administration is critical of integration efforts and lacking in technical support

or opportunities to observe others and share questions, concerns, and problems. Therefore, it is plausible that the favorable comments from these participants (that technical support, modeling of how to use technology, a continued training program, and commitment of the staff and faculty to the goal of technology integration) are echoed by other participants throughout research regarding methods that best provide technology training for teachers (Roblyer & Erlanger, 1998-99). Each of the participants in this inquiry express excitement and enthusiasm for a continuation of their training and the deepening of their understandings of how to best use technology within daily classroom instruction. Shelley has branched out to providing after school classes in logo programming of small computer-controlled robots; Nancy plans to use her time this summer to work on her personal and instructional design skills; Mandy plans to achieve mastery of HyperStudio this summer; and Elaine intends to continue her location and review of written materials that use computers to support instruction.

In addition, their feeling of accomplishment is shared by most of the teachers on campus, as well as the curriculum and project development coordinator. The coordinator had left a technologically-rich school to join the charter staff at Corazon Elementary. Part of her job has been to secure the grants that underwrite the regional educational lab. During the last few days of school, she confided to me that the progress of the campus teachers in integrating technology during this one year of effort rivaled the entire ten year period or so that she had spent at her previous school.

Researcher's Reflections and Recommendations

In our quest to lasso technology and bring it into the daily instructional experiences of students in classrooms all across America, educational research seems to be shifting our focus from using the technology to that of supporting the teacher in their efforts to use the technology within instruction. And, although the lessons to be learned from the research presented in this inquiry are generally decisions that remain the responsibility of the reader, the findings tend to suggest certain implications for transferability to the context of teacher education and technology training.

First, within the experiences of the teachers who served as participants in this inquiry, the inclusion of methods that support the teaching beliefs and styles the teachers are currently using as they initiate integration could impact how relevant and successful the teachers feel technology training is to their teaching, and promote use.

Secondly, technology training should include components that encourage teachers to continue updating and enhancing their personal technical skills through:

- modeling successful uses of integration
- mentorship to provide continued support
- maintenance of technical support

And finally, technology training should provide a component within the training that allows modeling of a variety of methods, activities, collaborations, projects, and other examples of technologically-enhanced lesson designs and

classroom management techniques that broaden teacher exposure to thinking about how technology is used in the classroom as a tool.

It is important to remember that the purpose of this inquiry was not to provide findings that were representative of a larger population, but to investigate the phenomenon that was lived by these four participants as they entered a technologically-rich teaching environment, acquired technical skills, and endeavored to become "technologically-competent" teachers. It is the intention of the researcher to describe factors that were dependent upon and unique to the context of the inquiry in rich detail, so that the reader is able to decide if there are meanings and insights that are valuable to their own struggles and experiences.

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