

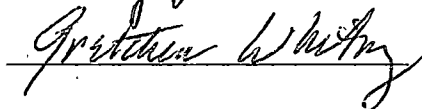
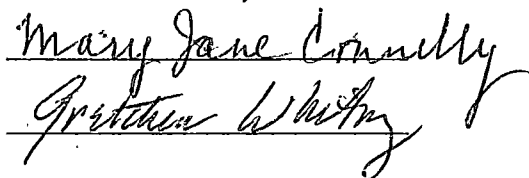
To the Graduate Council

I am submitting herewith a dissertation written by Joella Ashley Montgomery entitled "Teaching With Technology: A Qualitative Study Exploring The Experiences Of Teachers". I have examined the final copy of the dissertation for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy, with a major in Education.

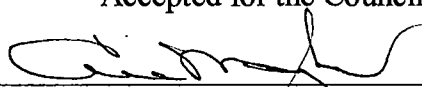


E. Dale Doak, Major Professor

We have read this dissertation
and recommend its acceptance:



Accepted for the Council:



Interim Vice Provost and
Dean of The Graduate School

TEACHING WITH TECHNOLOGY: A QUALITATIVE STUDY
EXPLORING THE EXPERIENCES OF TEACHERS

A Dissertation
Presented for the
Doctor of Philosophy
Degree
The University of Tennessee, Knoxville

Joella Ashley Montgomery
December 2000

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DEDICATION

This dissertation is dedicated to my parents

Mr. James E. Montgomery, Jr.

and

Mrs. Joan C. Montgomery

who have given me invaluable educational opportunities.

ACKNOWLEDGEMENTS

There are many people to whom I am grateful for making my experience as a student so rewarding. I am particularly grateful to my Dissertation Committee, Dale Doak, Colleen Gilrane, Gretchen Whitney, and Mary Jane Connelly for their support and encouragement. They have all read many versions and revisions of this dissertation and contributed in innumerable ways to my development as a writer and researcher.

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Lastly, the greatest debt is owed to Fred Martinson. Without his help, encouragement, and faith in my abilities I would never have reached for this moment.

ABSTRACT

This study uses grounded theory methodology to develop a model of how a group of teachers integrate technology into their teaching practice. Unlike other studies that have looked only at exemplary examples of technology integration or at teachers in technology-rich schools, this study is concerned with how teachers in a single elementary school with typical technology resources make technology part of their teaching practice.

The study addresses the absence of the teacher's perspective in the literature on teaching with technology. It describes the experiences of a group of teachers working to integrate computer-related technology into the curriculum. The purpose of the study is to gain an understanding of how the teachers negotiate the discontinuities inherent in working to integrate technology in the classroom. The study examines the attitudes, knowledge, skills, dispositions, barriers and events, which shape and give meaning to their teaching experiences.

Teachers have historically been overlooked as knowledge producers; their perspectives have been deemed irrelevant. As a result, school reform often becomes a case of the outsiders telling the insiders (teachers) what to do. Within a qualitative/interpretive framework, this study privileges the teachers' perspective. It assumes that teachers with experience teaching with technology have much to offer to an understanding of teaching with computer-related technology.

For the teachers at Blue Hills Elementary, the computer is part of their classroom environment. Their experiences are characterized by four themes: resources or how each teacher sees the equipment available to them, scheduling or how each teacher creates room for technology in the classroom, support or how each teacher defines the assistance available to them, and teacher productivity or how each teacher addresses technology integration vs. time requirements.

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CHAPTER I

INTRODUCTION TO THE STUDY

Introduction

In this study I examined teachers' knowledge based on their experience using computer-related technology in their classrooms. The normal approach in studying a phenomenon like the act of teaching with technology would be to pass through the moment itself, and study the objects of the moment; the students, the course materials, the relationships, and the learning. The aim in this normal approach would be to pronounce a connection between the objects of the moment and the experience of the moment. This method approaches the moment of successfully teaching with computer-related technology circuitously by attempting to describe the things in the lived world of the teacher, which cause the successful integration, as if these factors explain the moment of teaching with technology. In effect, we ignore the richness of the moment itself and assume that we understand the experience of teaching with computer-related technology. In this study, by focusing on the actual moment, we attempted to avoid making causal assumptions. This is done in an effort to closely document the experiences of the participating teachers. We set aside our interests in explaining the connection of experienced integration of technology to any external reality. The reality of the lived moment of integration-- how the experience of

teaching with computer-technology is given in the moment-- is what interested us. We did not assume a causal connection between objective reality and our experience. The objective reality does not explain our feelings. Rather, it may be more correct to say that our feelings give meaning to, and make intelligible, our objective reality.

The moment that forms the substance of this study, then, is the moment when the teacher seeks to use computer-related technology as part of classroom teaching. Our journey through the structures of this moment culminated through the stories of the participating teachers in reflections on the pedagogical significance of the moments when they began using computer-related technology in their classrooms.

Cuban (1986) calls the teacher the gatekeeper of innovation. Since the 1920s, educators have seen a number of educational technologies introduced to the classroom. The computer is the most important of among the latest technologies applied by educators with high expectations (Cuban, 1986). Technological advances have created the possibility of new ways of teaching and learning. However, taking full advantage of this potential requires teachers to think about the teaching/learning process in new ways as well as to master the technology itself. Instructional technology creates a whole new world of possibilities for teaching and learning. As William Geoghegan pointed out in 1994, however, only a very small proportion of teachers are actively using instructional technology, and these tend to be "innovators" or "early adopters" rather than "mainstream" faculty.

Although shortage of equipment, facilities, and institutional support may play a role in inhibiting use of technology, Geoghegan (1994) argues that the most

important reason for limited use is in the human realm. He puts forth a model of innovation and change, which indicates an approximately normal distribution when number of new adopters are plotted against time. Along this continuum, he identifies five categories of adopter: innovators, early adopters, early majority, late majority, and laggards (Geoghegan, 1994; Rogers, 1995). There can be a "chasm" between early adopters and the early majority, such that the innovation is never adopted by the mainstream.

The computer, our most modern and powerful technological artifact, is in itself not technology, but is made possible by technology, and, as a consequence, the computer experience helps make possible a discussion of technology. Through the experiences of teachers working to use computers in their classrooms we see technology amplified, made more obvious. For a brief moment, as the teacher and his/her classroom encounters the computer, we are able to more clearly recognize the securing, the ordering and the regulating nature inherent in the technological perspective.

For a moment we might find the teacher in reflection, questioning themselves, questioning their intellect, questioning their abilities, questioning their social reality, questioning their relationship with the technology. For a moment we might have a magnifying glass and can see an accentuated version of the computer experience. We must take advantage of the moment and allow the teacher user to "live" the experience as it manifests itself in the encounter. We must not euphemistically disguise it.

What is the problem?

A school can have the best software and access to the Internet in every classroom, but that won't foment student learning unless the teacher is able to incorporate it in appropriate ways. It is necessary for teachers to know how, and be comfortable with the integrating of digital offerings in their classrooms. This concept was one of the central themes from the Technology Counts 99: Building the Digital Curriculum report by the publishers of Education Week with the Milken Exchange on Educational Technology (1999). In this national survey of teacher's use of digital content, they found that 97% of the teachers surveyed said they have regular access to computers and 58% had from one to five hours of basic computer skills and curriculum integration training in the last year, but less than three in ten said their students spend up to one hour using the computer per week (1999).

The national movement to connect all schools to the Internet is wonderful, but simply having access to the Internet is not enough. Educators must know where they want to go, why, and how they can get there before the use of technology can truly benefit students in the classroom. While there is still a need for the technological infrastructure to be put in place as quickly as possible, simultaneously, we must move beyond the logistics of wiring and technical concerns to focus on the pedagogical and organizational changes necessary for success.

Learning to use technologies like a computer is necessary but not sufficient. A large chasm exists between knowing how to do a search on the Internet and being able

to build on the capabilities of the computer or the video camera in one's curriculum. Too often, new technologies are simply being pasted onto old methods of teaching. Using PowerPoint to make presentations instead of a chalkboard, or trying to have the entire class make use of a search conducted by a few kids at the computer, does not begin to touch the power of what is possible.

In growing numbers of schools, we are starting to see the maturation of these innovations. The boldest teachers have learned that they must rethink their entire approach to instruction, and are changing their process of transforming content into curriculum, often recognizing that it is student participation in that process that produces the most learning. The results these teachers are achieving as they allow students to reach new levels of insight and ability are literally thrilling.

In one project, for example, teachers guided 4th graders through a complex interdisciplinary ecology unit designed to determine which of four watersheds would be best for release of salmon fingerlings raised by the students (Foa, Johnson & Schwab, 1998). Pupils at the four sites tested water quality, shared statistical data via the Internet, conducted distance-project meetings using CU-C-ME software, recorded their progress with video and digital photography, and made presentations to community members.

As this kind of project demonstrates, optimal uses of technologies often require more work on the part of educators, not less. Significant planning and time are needed to research, prepare, and share resources. Considerably more effort has to be

expended to restructure both a style of teaching and a classroom to accommodate this open style of learning. Not least important, teachers must make conscious efforts to realign the expectations of parents and administrators so that these transformed goals are communicated and shared, and unnecessary obstacles are not imposed.

What evidence suggests there is a problem?

Researchers who study classroom educational technology adoption have found that, while the number of computers and Internet connections have increased, this increased availability has not always filtered down to students (Cuban, August 1999, Fatemi, 1999). Cuban in a commentary entitled "The Technology Puzzle" noted:

Out of every 10 teachers in the country, fewer than two are serious users of computers and other information technologies in their classroom (several times a week); three to four are occasional users (about once a month); and the rest-- four to five teachers out of every 10-- never use the machines at all (p. 68).

Educational research, like the ACOT (Apple Classrooms of Tomorrow) study, show that while physical access to technology is an issue in classroom integration, it is the social impact of computers that pose the most serious challenge to teachers (Dwyer, Ringstaff, & Sandholtz, 1991). Technology in the classroom can change the teacher's role from "sage on the stage to guide on the side" because it promotes student-centered, rather than curriculum-centered or activities (White, 1987).

It is easy for all parties to be misled about the difficulty of this process, both by the claims of software and hardware vendors and by the sometimes naive enthusiasm of new converts or trainers. The "guide on the side" phrase has been somewhat oversimplified and overused to characterize this new style of teaching, but it simply paraphrases in catchier language everything that John Dewey championed almost a century ago (Dewey, 1997). Like Dewey's ideas, it will be increasingly dismissed unless educators, and the public, understand that student-centered learning environments demand more structure and feedback than traditional teacher-centered ones.

Flexibility and structure are the yin and yang of effective use of technologies. As teachers move to new levels of comfort with computers, most recognize that the power of the technologies cannot be creatively exploited in a context of lock-step learning by everyone at the same time. In many classrooms, project-based learning successfully provides the framework or template that makes it possible to move away from the whole-classroom model of teaching (Foa, Johnson & Schwab, 1998). But projects for projects' sake can just as easily be a waste of time if students' learning goals and the means to achieve them are not clearly structured, communicated, and assessed.

A useful analogy to the teacher's new role, used by Foa, Johnson & Schwab (1998), is the preparation a climbing guide goes through before taking a group of new climbers to the top of a mountain. Basic expertise and techniques must be mastered,

then flexibly combined with new routes or new approaches. A lot of psychology has to be learned or intuited, and a fine balance between calming fears and setting up challenges established. Often, it is climbers' unexpected experiences along the way (the journey itself) that create the foundation for continued exploration. And the marvel of reaching the top is quite comparable to the "peak" learning experiences we want all our children to achieve.

Why does anyone care?

Outside school walls, technology has fundamentally transformed the way people live and work. From ATM machines to e-mail, technology use is embedded in our personal lives. The same is true at work. Technology is now a primary tool used in every job from bookstore clerk to corporate CEO. At the same time, administrators in the educational arena view the use of technology in the classroom as a fundamental step in both improving and enhancing the teaching-learning process (The National Commission on Excellence in Education, 1994).

The explosive growth of the Internet and the World Wide Web coupled with networked technology creates new and exciting opportunities for melding technology and learning. Capitalizing on these opportunities depends on more than the presence of hardware and access to the Internet in the classroom. As President Clinton articulated in 1996 the Department of Education's Technology Literacy Challenge, our national education and technology objectives must include improvements in "Four

Pillars": 1) hardware; 2) connectivity; 3) digital content; and 4) professional development (Department of Education, 1996). These Four Pillars provide a foundation for creating an innovative learning environment where students and teachers can reach beyond the confines of a single school building for information, interaction and enrichment.

America's strength as a nation has always depended on a strong educational system that prepares its students to be contributing citizens and productive members of the work force. Today, hardware and connectivity are still issues in all but the wealthiest schools, but a critical mass has been reached. More than half of the nation's K-12 classrooms are connected to the Internet, and schools have an average of one instructional computer for every 5.7 students ("Survey Highlights," 1999). For the state of Tennessee, where the study will be conducted, 97% of the schools have Internet access and there are 6.7 students per instructional computer ("Survey Highlights," 1999). Instructional computers refer to any computer used for student instruction and Internet access is anything from a T1 (27%) to an individual/network modem (13%) and includes cable modems (6%), 56Kb lines (5%) and ISDN (46%).

Why does this research need to be done?

Technology is not a panacea for all education challenges (Tyack & Cuban, 1995). At the same time many educators feel that computer technology is different from past technologies in its power to bring about educational change. Computer-related technologies are simply tools for learning. They should be considered as such,

not as ends or entities valued in and of themselves. As schools at the leading edge of technology integration have learned, however, technology can be an effective tool for engaging student in the learning process and meeting other core objectives.

As this country races to provide every school, and eventually every classroom, with access to computer technology, there is a need to better understand the opportunities and problems this new technology presents for the teachers implementing the resources. Although much time and money has been put into providing schools and classrooms with the necessary technology and infrastructure, little effort has been expended understanding teachers' use of this technology or how its introduction has affected the classroom environment (Ehrmann, 1999). The benefits students ultimately derive from increased access to technology are dependent on effective use of these new technological resources by classroom teachers in pedagogically appropriate ways (Peck & Dorricott, 1994).

If technology is to bring about educational change, then there is a necessity to know how teachers are using technology. The teacher is both the factor that must change and the agent for change (Loveless, 1996). This study may help set the tone for future research. It provides information that could be valuable for framing questions for practitioners in the future, and provide information on specific areas where additional research is needed.

The Purpose of the Study

This study addresses the absence of the teacher's perspective in the literature by focusing on the experiences of teachers involved in teaching with technology and integrating it into the curriculum. The purpose of this study was to better understand the relationships between these teachers' beliefs about teaching and learning, their experiences teaching with technology and their plans for classroom technology use. This study examined the attitudes, knowledge, skills, dispositions, barriers and events, which construct, shape, and give meaning to their experience teaching with technology.

Research Questions and Design

The approach of this study is exploratory under a qualitative framework, so it was expected that many sub-questions would be generated as the study proceeded.

The key research questions which guide this study are:

1. What are the experiences of teachers teaching with technology in their classrooms?
2. How do these teachers respond to this experience?
3. What are the factors that shape and give meaning to their experience?

The experience of a teacher working to incorporate technology cannot be readily observed by a spectator in the classroom. This is not to say it is not possible to

observe how learners respond in the classroom environment when technology is used, but the personal experiences and feeling of the teachers in this situation are individual, mostly internalized and specific to each teacher. The meaning resides in the memory of those teachers who have had such an experience. To access this experience, I will use in-depth qualitative interviews. This method is acknowledged as an effective and powerful technique for gaining insight into another person's experience (Bogdan & Biklen, 1992). Clandinin and Connelly (1994) propose that the exploration of personal experience must be simultaneously focused in four directions: inward and outward, backward and forward. By this they mean the internal condition of feelings, hopes, aesthetic reactions, and moral dispositions and the outward existential conditions of the environment and reality. By backward and forward they are referring to past, present, and future.

Significance of the Study

Ever since the introduction of computers in education nearly twenty years ago, educators have expressed high hopes for the potential of technology to bring about improved teaching and learning. Over the ensuing decades, however, results have been mixed. It is estimated that school districts now spend more than \$5 billion a year on technology for schools (Archer, 1998). Nevertheless, the amount of actual classroom change has not come anywhere near the expectations of educators who hoped for a revolution in teaching and learning that might equal the sea change

created by technology in the daily activities of business, industry, agriculture, entertainment, and all other aspects of American life.

Impatient with the inability of schools to avail themselves of the tools of the information age, the news media have increasingly questioned the very premise of educators' goals for technology, lambasting the hype over technology in schools as "silicon snake oil" (Stoll, 1996) and "the computer delusion" (Oppenheimer, 1997). While this concern for accountability is understandable, given the large investments schools have made in technology and the exaggerated promises of technophiles, one of the most unfortunate results has been teacher-bashing, blaming the teachers for not embracing educational technology more enthusiastically, or using it more creatively.

Clearly this focus on teachers has also had some positive outcomes, one of which has been to bring to light a better understanding of the factors affecting teachers' use of technology (Means & Olson, 1995; OTA, 1995; Schofield, 1995; Sheingold & Hadley, 1990). Nonetheless, the result of much of this analysis, with its focus on external conditions, has led to an emphasis on "quick fix" solutions and/or long-term systemic changes in teaching conditions.

What has been given far less attention are deeper factors embedded in the heart of the classroom, that is, the role of teachers' views of learning and pedagogical beliefs, and how these beliefs affect the ways technology is used in the classroom. Although it has long been understood that the beliefs teachers hold about learning form a framework for how and why they adopt new content, programs, and ways of teaching (Cuban, 1993; Fullan, 1982, 1991; Loucks-Horsley & Steigelbauer, 1991),

this attention to belief structures has been given far less study relative to the adoption of new technologies. This research study brings together the interlocking issues of teachers' beliefs about teaching and learning, how these beliefs shape their views of best uses of technology, and the ways these beliefs are carried out in actual classroom activities.

Although the data in the study represents one interpretation of the teacher's shifting and evolving experiences and constructions, the use of narrative can enhance the power-sharing relationship between the participants and the researcher. Thus, the study contributes to the research literature on the phenomena of voice and experience within the experience teaching with technology (Mishler, 1986).

Limitations

1. Data is limited to the participants' recollections of their experiences and their perceptions.
2. This study focused on teachers at one small rural elementary school and their specific experiences as interpreted in collaboration with the researcher so the results are not generalizable.
3. Since the participants were not randomly selected from the population of teachers, results are not generalizable to all teachers at Blue Hills Elementary.

Delimitations

1. This study is delimited to the examination of the phenomena of voice and experience in the experiences of teachers working to incorporate computer-related technology in the classroom.
2. The study is delimited to their experiences. For this reason, no attempt can be made to generalize the experiences or perceptions of the participants to other teachers working to incorporate computer-related technology into their teaching practice.
3. Although it is likely that the amount of home computer use may affect teachers' attitudes and experience with instructional applications of technology, the issue was not addressed in this study.

Organization of the Study

Chapter I contains the introduction to the study, including the statement of the problem, purpose of the study, research questions, significance of the study, limitations and delimitations, organization of the study, and definition of terms. Chapter II presents a review of related literature. Chapter III explains data collection methods and analysis procedures. Chapter IV focuses on data presentation, discussion, and findings. Chapter V discusses the conclusions, implications of the study, and recommendations for further research.

Definition of Key Terms

The following are key terms used throughout this study and their operational definitions within the context of this investigation.

Construction of Knowledge.

Each person constructs his/her own reality, actively making sense of the world by constructing knowledge, and therefore understanding. This is in opposition to the stance that knowledge can be deposited and transmitted to a learner. Constructivists believe that the learner is responsible for the formation of knowledge within the mind, and that it is not simply transmitted from teacher to learner, then memorized.

Knowledge construction is synonymous with learning.

Instructional Technology

In 1994, the Association for Educational Communications and Technology (AECT) defined instructional technology as "the theory and practice of design, development, utilization, management and evaluation of processes and resources for learning" (Seels & Richey, 1994). This definition of instructional technology will be used for the purposes of this study.

Integration

Integration of technology is defined broadly in this study. Because of the exploratory nature of this research, teachers were allowed to define integration for themselves.

Learner-Centered Education

This approach to instruction focuses on what the learner needs, and on the learning processes, as opposed to teacher-centered where the teacher decides what and how things will be taught. Learner-centered incorporates much less of the traditional transmission style of teaching (from the expert, the teacher, to the learner). Learners are viewed as active participants in the construction of their own knowledge, and this learning occurs within a learners' interactivity. Learners, it is hoped, become self-directed, self-regulated.

Reflection

Thinking about something separated from actual involvement and interactivity. In other words, it is not doing. but rather thinking about what was done, what is going on, or what might be done. Students reflect on their learning experiences, activities, content, and materials. It is a meta-cognitive activity that is considered an integral part of constructivist learning processes.

Situated Learning

Human minds learn and develop in social situations, and learning is situated on this social based interactivity. Learning, as a cognitive process, comes through participation and interaction. That is, learners are engaged in the learning process, actively finding meaning and knowledge; and, this process is situated within a particular context.

Technology

Saettler (1990) defines technology as process rather than things such as hardware or software. In his most recent history of instructional technology, he defines technology as focusing on improvement of skills and organization of work rather than on tools and materials. Saettler describes modern technology as systematized practical knowledge which improves productivity. For the purposes of this study, technology is defined by the teachers involved in this research and the researcher acknowledges that the teachers may offer many diverse independent definitions.

CHAPTER II

REVIEW OF THE LITERATURE

Introduction

Major political and societal forces are coming together to create an unprecedented push to infuse technology into the classrooms (Papert, 1993). This infusion represents a serious challenge and an opportunity for teachers to explore the powerful resources and processes technology makes available and for researchers to better understand how technology is shaped by and shapes beliefs about teaching and learning. According to Clemon and her experience as a teacher trying to integrate technology into the classroom (1999),

Technology is not the only change in the American classroom in the last 28 years, but it is the most dramatic and arguably the one with the most far-reaching implications for how we teach and learn. (p. 70)

Teacher's use of technology

In order to understand how technology has been used in the classroom when it is made available to teachers, researchers have looked at so-called "early adopters" of educational technology who are estimated collectively to represent less than ten percent (10%) of the total population of teachers (Anderson, 1993). These are teachers who have embraced educational technology, usually on their own, and who

are often cited as technology-using educators in the literature. Rogers (1995) defines early adopters as a minority of computer users that are the first to perceive value in new resources, services, or ideas, begin to use them, and become adept with them before the majority of the eventual users. Diffusion theory labels the first 2.5% of adopters as innovators, and the next 13.5% as early adopters. Diffusion beyond the innovators was generally expected to occur through social processes.

The Technology Counts 99 report found that on average three teachers in 10 were integrating technology into their classroom teaching (1999). Their development of mastery in educational uses of technology was a gradual process requiring several years of work, while nearly four in 10 teachers don't use technology at all during a typical week (1999).

Honey and Henriquez (1993) surveyed the characteristics of proficient technology teachers and found they were "highly motivated to learn and use technology" for their own reasons and most of them were self-taught. Studies like these have examined individual characteristics of technology-using teachers in an effort to understand why some teachers have already adopted technology while others have not. Why have not more teachers integrated technology into their regular teaching practices? One possible explanation supported by the literature is a conflict between the perceived pedagogical value of technology by teachers and their own beliefs about teaching and learning.

Honey and Moeller (1990) suggested that, until teaching practices change, technology will not be widely integrated into the classrooms because of a mismatch between teacher beliefs about teaching and learning and the perceived value of educational technology. Hodas (1993) argued that one reason technology often fails to be integrated into the classrooms is a "mismatch between the values of school organizations and those values that are embedded within the contested technology itself" (p. 7). Hodas argued that teachers adopt neutral and value-free technologies that do not require substantive teaching changes, and as a result schools have been largely impervious to substantive change surrounding technology adoption.

Even those teachers who have had adopted technology seem to be using it in ways that are consistent with their views of teaching and learning. A study by Hadley & Sheingold (1993) found that:

unless teachers are personally ambivalent about computers or have lacked the opportunity to get involved with computer technology, it appears that their educational beliefs play an important role in how they choose to appropriate and make use of technologies in their classrooms (p. 10).

The most comprehensive longitudinal study of technology-using teachers undertaken to date is the Apple Classrooms of Tomorrow (ACOT) program. A key aspect of the ACOT program were the extensive resources, both monetary and personal, provided to all teachers who participated. One author called the ACOT schools technology-saturated, perhaps because all teachers and students who participated in the program received a computer at school and at home. This level of support, while perhaps ideal, is impractical for most schools and districts with already

100-100-100

dwindling resources. Principal findings from the ACOT research are (a) that it takes up to six years for teachers to use technology in support of student-centered instruction, (b) that teacher beliefs largely shape how technology is ultimately used, and (c) that a supportive context for technology adoption is required for successful integration into curriculum (Sandholtz, Ringstaff & Dwyer, 1996).

In one ACOT study, researchers found changes in teachers' beliefs, management issues, instructional strategies, and student assessment activities associated with technology adoption. For example, Dwyer, Ringstaff, and Sandoltz (1991) found that changes associated with technology adoption forced many teachers to confront their beliefs about learning and the efficacy of their instructional activities. The 32 teachers who were part of ACOT shifted from curriculum-centered towards student-centered instruction, from individual towards collaborative tasks, and from passive towards active learning. These researchers also found that teachers' struggles to use technology "were compounded by the inflexibility of the contexts in which they worked" (Dwyer, Ringstaff, and Sandoltz, 1991, p. 50).

These studies suggest that teachers who are currently using technology in their classroom – the early adopters – are using it primarily to support their existing teaching practices or to provide students with practice and skills in basic computer literacy, such as keyboarding, word processing, and database applications (Becker, 1993). So it appears that when technology is adopted and used by classroom teachers it is used in ways that are consistent with their knowledge and beliefs about teaching.

Unfortunately, a large percentage of the popular and practitioner research about the integration of technology in the classroom emphasize the potentials of new technology, and understate the extent to which instructors may need to develop new pedagogies as well as different approaches to communication practices in their teaching. Kozma and Johnston (1991) conceptualized seven ways in which instructional technology can support learning:

- enabling active engagement in construction of knowledge
- making available real-world situations
- providing representations in multiple modalities (e.g., 3-D, auditory, graphic, text)
- drilling students on basic concepts to reach mastery
- facilitating collaborative activity among students
- seeing interconnections among concepts through hypertext
- learning to use the tools of scholarship
- simulating laboratory work.

Although much focus and effort has been put into providing the hardware necessary for classroom technology use, little energy has been spent understanding how the introduction of technology might shape individual teacher beliefs or actions and vice versa. Scant research has focused on the intersection of technology, teacher beliefs, and teacher knowledge. The literature on teacher beliefs and knowledge might provide a lens through which to understand the complex influences on teachers as they struggle to embrace technology as an educational innovation.

School culture and technology adoption

Technology and society are inseparable. The design, development, adoption, utilization, and diffusion of technology are inherently social processes. As Howard Segal writes in his book *Future Imperfect* (1994), "all structures and machines, primitive or sophisticated, exist in a social context and, unless designed for the sake of design itself, serve a social function" (p. 2). Technology and society interact and influence each other, sometimes benignly, other times violently. Technology impacts, shapes, and redefines society and, in turn, a variety of social factors affect the development, implementation, and spread of technology. As with all other technologies, society and the technology of instruction are irrevocably intertwined. Many instructional design theories, however, neglect or ignore the social context in which instructional products are intended to be used.

Technology adoption, like any other educational innovation, is shaped by teacher beliefs about teaching and learning as well as the context in which adoption takes place. Teacher knowledge and beliefs shape the sense that teachers make of any educational innovation, technology included, and play a critical role in how technology is applied for learning. Likewise, as pointed out above, the school culture or context plays an important part in supporting or constraining classroom changes that are brought about or required by the introduction of technology. School culture is a shared, learned, symbolic system of values, beliefs and attitudes that shapes and influences perception and behavior within the classroom environment.

The literature on educational reform and change offers some insight into why educational technology has not yet been instrumental in changing teaching practices and been slow to be adopted by most teachers. For example, Tyack and Cuban (1995) argue that educational reform efforts have failed because they have not accounted for the institutional nature of schools, they have largely disregarded the culture of teachers, and they have been ignorant of the localized nature of all reform efforts. The authors suggest an alternative way of conceptualizing school reform, which they describe as an "inside-out" process, where the focus is on supporting teachers as major change agents within public education (Tyack & Cuban, 1995).

The main thrust of their argument is that all reform efforts are transformed and hybridized, if not simply ignored, by teachers. Reformers must therefore plan for this process including teachers as active participants in reform. To the extent that educational innovations are adaptable to local circumstances, the authors argue, is the extent to which they will be incorporated into teaching practices. Tyack and Cuban suggest instead that educational innovations be considered as resources for teachers that may or may not be adapted individually to improve classroom instruction.

Tyack and Cuban (1995) make a strong case for why educational change has been hindered in school systems. They suggest that, "reforms should be designed to be hybridized, adapted by educators working together to take advantage of their knowledge of their own diverse students and communities and supporting each other in new ways of teaching" (Tyack & Cuban, 1995, p. 135).

In his seminal work, the Diffusion of Innovations (1995), Everett Rogers defines diffusion as:

The process by which an innovation is communicated through certain channels over time among the members of a social system. It is a special type of communication, in that the messages are concerned with new ideas. Communication is a process in which participants create and share information with one another in order to reach a mutual understanding. (pp.5-6)

In his theory, Rogers defines several categories for classifying individuals according to how they approach the diffusion process. At a base level, the individual is the decision-maker in the process, and how he or she views innovation has a direct effect on the success of the process. These categories are based on the degree of “innovativeness” of the individual. This is the degree to which an individual adopts new ideas than the others in a system.

Rogers also assigns two specific roles to more innovative individuals within the diffusion process. The first is that of “opinion leader.” This is someone who is able to influence the attitudes or overt behavior of others in the environment. The second role is that of “change agent.” A change agent works to influence members’ innovation-decisions based on the desired direction of those implementing the change.

This theoretical framework of individuals acting within the diffusion process provides a typology for viewing the individual teacher in this study. A categorization of their role in the diffusion process in integrating technology in the classroom allows

them to be classified according to Rogers' categories of individuals within the innovation diffusion process.

The focus of innovation diffusion theory is on social interaction, not the innovation itself. Diffusion is, by definition, a social process. Rogers (1995) defines it as "the process by which alteration occurs in the structure and function of a social system" (p. 6). He subsequently defines a social system as "a set of interrelated units that are engaged in joint problem-solving to accomplish a common goal" (p. 23).

Rogers goes on to identify the four main channels in the diffusion process as: the innovation, communication channels, time, and the social system. He defines the innovation as, "an idea, practice, or object that is perceived as new by an individual or other unit of adoption." Some innovations do not represent new ideas or practices but are merely perceived as new to the educational populations adopting them.

Teacher beliefs and technology

Researchers have developed a variety of ways for thinking about teacher knowledge and beliefs that shape their classroom practices. Teacher beliefs – encompassing suppositions, commitments, and ideologies – have been studied in a variety of settings and contexts. It is generally assumed that beliefs are more often associated with affective and evaluative cognitive components than teacher knowledge, but that beliefs play an important role in teaching practices.

Calderhead (1996) identified five categories of teacher beliefs: (a) beliefs about learners and learning, (b) beliefs about teaching, (c) beliefs about subject areas,

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(d) beliefs about learning to teach, and (e) beliefs about self and the role of teachers in learning. Teacher beliefs about learners and learning often come from assumptions about student abilities, although beliefs about teaching usually reflect a teacher's overall beliefs about teaching and sustaining positive social relationships with their students.

Building on the work of Shulman (1987), Grossman (1990) offered a framework for thinking about teacher knowledge that includes: (a) general pedagogical knowledge, (b) subject matter knowledge, (c) pedagogical content knowledge, and (d) knowledge of context. General pedagogical knowledge describes a body of general knowledge, beliefs, and skills related to teaching and learning not specific to any particular content or domain. Subject matter knowledge includes not only factual knowledge of the domain, but also knowledge of the substantive and syntactic structures of the discipline. Pedagogical content knowledge incorporates beliefs about the purposes of teaching a specific subject area, knowledge of students' understandings of that subject area, curricular knowledge, and knowledge of instructional strategies and representations. Contextual knowledge refers to individual teachers' understandings of the school culture and setting in which they teach.

Teachers' knowledge and beliefs play an essential role in their practices and shape the learning that goes on inside and outside their classroom (Borko & Putnam, 1995). These beliefs and knowledge shape teachers' learning as they work to improve their teaching, acting as filters through which teachers view educational change. In order for teachers to adopt new educational innovations, such as technology, they will

Putnam
1995

need to "think in new ways about students, subject matter, and the teaching-learning process" (Borko & Putnam, 1995, p. 38).

A number of researchers in other countries have argued that the advent of the computer affects the teacher's role in the class (Dupagne & Krendl, 1992; Schofield Eurich-Fulcer, & Britt, 1994; Chisholme, in press). Classroom culture is heavily influenced by the role of the teacher. The ways in which teachers organize instruction (Newman, 1990) and shape the class culture have a definite impact on learning (Guernsey, 1989, Grossman, 1991).

Hadley and Sheingold (1993) conducted a study in the USA on patterns in teachers' integration of computers into classrooms. Their large-scale survey yielded information on trends in teachers' responses. They selected 608 teachers, known for integrating computers into their classrooms, from 576 schools across the United States. Their findings indicate that the use of computers in the class has challenged many teachers' assumptions. Of the total 608 teachers, 494 said computers made a difference.

- Teachers expect more from their students.
- Teachers can better meet the needs of individual students.
- The classrooms moved from teacher-centered to student-centered classes.
- More collaboration and work in small groups takes place.

The findings suggest that many of these teachers are incorporating technology into their practice and classrooms in ways that 'may deeply affect their teaching and their students' learning' (Hadley & Sheingold, 1993, p. 277).

Schofield, Eurich-Fulcer, & Britt.(1994) argue that the role of the teacher tends to change from that of the expert to coach or tutor; teachers move from providing information to assisting students in their independent work. They qualify this general statement, however, stating that the amount of change that a classroom undergoes seems to depend upon a number of factors including the existing structure of the class and the numbers of computers available.

Chisholme (in press) writes that the advent of computers changes the social and language processes of the classroom. How teachers plan for, use, supplement, and integrate computers determines the educational value of the computer as well as what and how their students learn via the technology. She states that use of the computer alters both the teachers' and the students' roles, activities and behaviors in that the unidirectional learning paradigm of an adult teaching a child disappears. Computers can also help teachers achieve previously unattainable goals: such as bringing together students from different cultural backgrounds. Snyder (1994) argues, in her study on writing with and without word-processors in Australia, that students using word-processors were more work-focused and task-oriented as well as more interactive, co-operative and collaborative than the students in classrooms without the computers. The teacher's role also changed as the class became more student-centered. Teachers were now peripheral and students independent.

Although studies do not tend to specifically address the statement that computers do not change classroom cultures some studies do present a mixed picture.

Cuban (1993), for example, argues that while some teachers view the computer as a valuable tool others see it is a threat to their role as a teacher.

Teachers who ignore or disdain technology may have difficulty understanding how technology might support their notions of good teaching. Their beliefs and knowledge shape and are shaped by technology in complicated ways that are not well understood. In a personal account of technology adoption, Clemon (1999) stresses the point that once she stopped worrying about knowing everything, she stopped worrying about the time it takes to integrate technology successfully into the teaching practice.

As part of the integration process, she learned:

I don't have to know it all to bring technology into my classroom. My students have taught me more about using software than I've ever absorbed from the manuals. (p. 72)

The Campus Computing Project had similar findings in their annual survey of higher education technology officials from 557 public and private colleges and universities in the United States. Kenneth C. Green, founder and director of the Campus Computing Project, said "I think its fair to say that many faculty members have ceded to their students the whole issue of technology skills" (Olsen, 1999, p. A65).

According to Knupfer (1993), computers in the classroom will change the teachers role from information provider to partner with the students in the educational process. She emphasizes that the social world of the classroom will change to create a forum where:

Knupfer, 1993

Teachers are not only directing their students to realize different outcomes, but are also engaging in different roles as students experience different processes of learning. The teacher's role is no longer focused on providing information, nor is it to be straight forward facilitator as was believed in the early stages of educational computing. Instead, the teacher's role is emerging as a learning partner and collaborator in the educational process (p. 166).

Teacher knowledge

Increasingly, educational researchers have paid attention to teachers and their experience as sources of knowledge about teaching and schooling. This research has taken several forms among which are biographies, case studies, interviews, collaborative research, action research, and critical reflection. What teachers know through experience can be discussed as knowledge, insight and good practice. This new approach is described in Teacher Lore: Learning from Our Own Experience by Schubert and Ayers (1992):

the secret to teaching is to be found in the local detail and the everyday life of teachers; teachers can be the richest and most useful source of knowledge about teaching; those who hope to understand teaching must turn at some point to the teachers themselves (p. v).

The focus of the modern era with its demand on measurable results and objectivity is challenged by this new way of knowing that emphasizes particularity, diversity, and subjectivity (Giroux, 1983). According to Welker (1992, p. 14), "There is a celebration of plurality, bringing recognition and respect to the many areas of understanding that should comprise human conversation." In this climate of many voices, teachers are emerging and prospering.

In early work on teacher's narratives, the focus was on trying to understand teachers' personal practical knowledge, that is, the embodied, narrative, relational knowledge (Hollingsworth, 1994; Johnson, 1989) teachers carry autobiographically and by virtue of their formal education. This includes research on teachers' personal practical knowledge as in the teacher's past experience, in the teacher's present mind and body, and in the future plans and actions. Personal practical knowledge is found in the teacher's practice. It is, for any one teacher, a particular way of reconstructing the past and the intentions of the future to deal with the exigencies of a present situation. (Connelly and Clandinin, 1988, p. 25.)

Following Polanyi (1962), research of this type defines the personal in intersubjective terms. There is an intellectual risk in this approach to work which might, for some, encourage too partial a view of teachers' knowledge. The research reiterates constantly that teachers do not work in isolation nor do they work in environments solely of their own choosing.

The voice of the teacher and their sharing of first-hand experience has gained strength and recognition in the area of educational research. The practitioner has a strong place in the research relationship, because no longer is the teacher just an object to be studied, but instead a participant in the creation of knowledge (Clandinin & Connelly, 1994). Their experience is given authority and validity. Although they emerge from their own personal and unique perspectives, they can contribute to our understanding of the intricacies of teaching (Ben-Peretz, 1995). The value found in teacher knowledge and experience can be approached in three broad categories: (a) as

a source of knowledge for others (i.e. administrators, policy makers, teacher educators, parents), (b) as a source of knowledge for other teachers, and (c) as a source of empowerment for teachers.

Teachers, in general, live at the center of education reform, in "the maelstrom of rhetoric, vilification, and conflict over making our educational system better" (Cohn & Kottkamp, 1993, p. iv). Teacher experience and knowledge at the center of this "maelstrom" can lend information to the body of knowledge regarding teacher education, the evaluation of teachers, as well as the future design and planning of curriculum (Pulviano & Pundt, 1993; Cohn & Kottkamp, 1993; Clandinin & Connelly, 1994).

This experiential knowledge and understanding is a type of craft knowledge. It represents the cumulative experience of the individual teacher and the experiences of other teachers. This craft knowledge is found in the everyday lives of teachers (Schubert & Ayres, 1992). The use of craft knowledge by fellow educators can be a catalyst for change as well as professional growth and development (Kagan, 1993). According to Welker (1992), from stories and descriptions of good teaching, teachers learn about the need to be prepared, to have specific objectives, to alter method to content, and that no method can be successful in every instance.

Welker (1992) also discusses how the concept of voice is "connected to emancipation and the creation of a responsible and active citizenry" (p. 16). This means that as teacher knowledge is solicited and respected, teachers realize they have a voice, and may possibly become more willing to speak. Ben-Peretz (1995) suggests

that a sense of professional identity is the most important outcome of shared discourse. As the pool of experience grows, teachers experience a changed "sense of belonging to a well-defined professional culture with a common knowledge base" (Ben-Peretz, 1995, p. 146).

Teachers' lives on the landscape

Now much of the research in this area of teacher knowledge has turned more directly to what can be call the professional knowledge landscape of teachers, that is, to those storied knowledge contexts in which teachers live and work in schools. A landscape metaphor seemed particularly well-suited to this study. It allows the researcher to talk about space, place and time. It has a sense of expansiveness and the possibility of being filled with diverse people, things and events in different relationships. Because the professional knowledge landscape can be seen as composed of relationships among people, places and things, it can be seen as both an intellectual and moral landscape.

Clandinin and Connelly's (1994) research found that teachers live in two fundamentally different kinds of places in schools, the one in classrooms with students and the one outside of classrooms with other teachers, administrators, policy makers, and so on. Teachers cross the boundary between those places many times each day. The landscape outside of the classrooms is a place filled with knowledge that is funneled into the school system for the purpose of altering teachers' and children's classroom lives. Teachers talk about this knowledge all the time. Teachers

make reference to 'what's coming down the pike'; 'what's coming down next'; 'what will they throw down on us next'. In these metaphorical expressions, Clandinin and Connelly (1994) hear teachers express their knowledge of their out-of-classroom place as a place littered with imposed prescriptions. It is a place filled with other people's visions of what is right for children. Researchers, policy makers, senior administrators and others push research findings, policy statements, plans, improvement schemes and so on down what Clandinin and Connelly (1994) call the "conduit" onto this out-of-classroom place on the professional knowledge landscape.

Using these distinctions among teacher stories, school stories and stories of school to understand teachers' lives on the landscape draws attention to two key points, that is, both to the complexity and to the moral side of life on the landscape.

Understanding the teacher

Along with the literature that views the teacher as a vast pool of knowledge and experience, there is also a body of research that seeks to understand the teacher as an individual. Not unlike most, they are unique people with lives outside of the classroom. It is the outside life that contributes depth to the teacher's perpetual development as an educator. There is much research that indicates the teacher's development is strongly influenced by their outside life and personal history. In

Speculations on the Nature and Facilitation of Teacher Development as Derived from Teachers' Stories (1990), Butt encapsulate this idea:

The overall process of teacher development and the nature of the knowledge that results is applied in the classroom, is rooted in mostly personal experience.... The degree to which a teacher's private life history feeds into their dispositions as a teacher is clearly very powerful (p. 10).

The personal experiences of teachers are innately tied to their work in the classroom. In Ben-Peretz's (1995) study involving retired teachers, they discussed the vital role of their interpersonal experiences with their professional experiences in the classroom. Butt and others (1990) concluded from a lengthy study of teacher stories that teacher development is individual and unique, taking place over a lifetime, and is autobiographical in nature.

Life experiences outside the classroom, can serve as a type of professional development. Whether in a formal setting or as part of an individual teacher's personal development, these moments shape the way in which the teacher works within the classroom, because each teacher has different assumptions, interests, ways of seeing the world, they can experience seemingly common situations in quite different ways. McLaughlin (1993) takes this idea to the next level with the observation that teacher's interpretations are shaped by their purposes, past, and personalities and molded by the context in which they live and work.

Voice

Stories are all around us and provide a rich source for research. "Humans are storytelling organisms who, individually and socially, lead storied lives" (Connelly & Clandinin, 1990, p. 2). Narratives are created quite naturally as we make of sense of

and give meaning to events in our lives (Chase, 1995; Connelly & Clandinin, 1988; Cortazzi, 1993; Mattingly, 1998; Polkinghorne, 1988). We are surrounded by narrative knowing as we learn to read stories in school, learn about important historical events, watch movies and TV shows, tell a friend or spouse how our day went (Polkinghorne, 1988). A "nonfictional educational story" is a narrative. It is nonfictional in that it is based on events that really happened and/or experiences people really had. It is "educational" in this case because the setting is the education system and what emerges may persuade readers to rethink their own role or situation (Barone, 1995) related to systemic change efforts.

Nonfictional educational stories are typically found in popular literature and are composed in the style and format of literary journalism (Barone, 1992). They focus on human experience and "bring theoretical ideas about the nature of human life as lived to bear on educational experience as lived" (Connelly & Clandinin, 1990, p. 3). Telling stories is a very human thing to do and we all have stories. In fact, telling our stories might be the most human thing we do. By telling stories, we remember our past, invent our present, revision our future, discover compassion and create community with kindred souls.

Through the process of crafting the nonfictional educational story of teachers working to incorporate technology into their teaching practice and experiences, there is a struggle with where and how to place the voice of the researcher. Fine (1994) reminds us that researchers are not transparent and particularly in this type of research, they are "chronically and uncomfortably engaged in ethical decisions about

how deeply to work with/for/despite" their storytellers (p. 75). Narrative research is essentially a study of experience (Clandinin & Connelly, 1994). The challenge is to craft an authentic story that maintained the integrity of the individual narrator's experience. Yet, because the researcher seeks out the stories, their voice becomes entangled with that of the others (Denzin, 1997). There is a danger that a story then becomes "a form of social and political prioritizing, a particular way of telling stories that in its way privileges some story lines and silences others" (Goodson, 1995, p. 94).

The teller is not the only person telling the tale. The listener also shapes the story. Questions too, determine the direction and emphasis of the narrative so the influence of the researcher on the way a story is told is unavoidable. Even interviewer silence can have its meanings (Hatch & Wisniewski, 1995, p. 21). If the researcher chooses what to describe, she cannot remain neutral (Eisner, 1991). In fact, it is the researcher's intentionality that defines the starting and stopping points of the story (Clandinin & Connelly, 1994). Hatch and Wisniewski (1995, p. 131) tell us oftentimes, "the loudest voice is that of the author." An author's passions and prejudices not only motivate but accompany their writing (Webster, 1996). This makes for a "messy" text: "The writer-as-scribe for the other also becomes a cultural critic: a person who voices interpretations about the events recorded and observed" (Denzin, 1997, p. 225).

To reflect rather than distort the narrator's story, active collaboration between the storyteller(s) and the researcher is required. Casey (1995-96) advises, "interviewers need to respect the authenticity and integrity of narrators' stories, to see

them as subjects creating their own history rather than as objects of research" (pp. 231-232). The researcher and storyteller must work together closely to come to a shared understanding of the narrator's story. It is a process of collaboration "involving mutual storytelling and restorying as the research proceeds" (Connelly & Clandinin, 1990, p. 4). The researcher is then responsible for faithfully reproducing that story (Blumenfeld-Jones, 1995; Goodson, 1995; Lincoln, 1986). As researchers, we must remind ourselves of Josselson's (1996) statement: "No matter how gentle and sensitive our touch, we still entangle ourselves in others' intricately woven tapestries" (p. 70).

Implications of the Research

The research performed so far shows that technology can provide a fertile medium for learning and when integrated successfully, technology can enhance the subject without overwhelming it (Trotter, 1999). Much has been written on the potential benefits of using computers in the classroom, including research on student engagement, individualized instruction, critical thinking skills and problem solving (Trotter, 1999). The problem is that much of this writing is anecdotal and based on small-scale observations (Fatemi, 1999). This study, while it does seek to tell the story of the teacher participants, it involves rigorous methodology and scientific accuracy in the telling of these stories. In addition, while the breadth of this research is relatively small-scale, the depth of stories and experiences offer the opportunity for

a very detailed illustration of the experience working with technology in the classroom.

Historically the focus has been on getting the computers in the classroom with much supposition on the potential impact of computers on the teaching/learning process. Many of the studies that have been done involve "early-adopters," a group of primarily non-traditional very self-motivated teachers (Dwyer, 1994). This study is concerned, not with "early-adopter," but with the regular classroom teacher in the process of integrating technology, and with how the teacher's experience of technology shapes, and is shaped by, their implementation of technology in the classroom. The goal of this work is to better understand the relationships between these teachers' beliefs about teaching and learning, their experiences teaching with technology, and their plans for classroom technology use. There is a limited body of research in this specific area. Because of this, the research lies at the juncture of three lines of study: (a) research on technology adoption in the classroom, (b) inquiry into teacher experience of educational innovation, and (c) research involving the teacher's role as an expert in the teaching/learning process.

CHAPTER III

THEORETICAL FRAMEWORK AND METHODOLOGY

The Theoretical Framework

Early research in the instructional applications of technology emphasized determining the effectiveness of computers as an instructional tool, and was less aware of the teacher's experience of teaching with them, or at the ways in which computers are actually used in the classroom, or even at the changed social relationship that occurs when technology is introduced to the classroom (Lowe & Vespestad, 1999, Cuban, January 1999). While research on actual teachers and their experience of integrating technology into the curriculum and teaching with technology has been limited, recent research on what technology accomplishes in the classroom is best when viewed from the perspective of the teacher (Bogdan & Biklen, 1992). Ehrmann (1999) stated:

Very few institutions are asking whether their uses of technology are fostering change in the teaching and learning practices.... teaching and learning practices are the province of individual faculty teaching isolated courses. It is hard to see what is going on in more than one class at a time, but necessary. We need to be able to see across the curriculum (p. 28).

The holistic experience

Teaching differs from other types of work that has been "automated" with technology to improve productivity and performance. The essence of teaching is an intertwining of emotional and intellectual bonds with students to assist them with the learning process. The lure to raise productivity by bringing technology into the classroom has, in many cases, convinced administrators to approach teachers like others who have attempted to integrate technology into the workplace. The conflict at this point is not whether or not technology has a place in the classroom, but instead, who is best to consult on the integration process?

Interpreting experience

Qualitative research is concerned with trying to understand the meaning that people place on their experiences, along with discovering what they are experiencing, how they interpret their experiences, and how they structure the social world in which they exist (deMarrais, 1998). Although some qualitative studies address teacher attitudes toward technology and some even highlight technologically successful schools, these studies provide narrow perspective on where technology is in the classroom with particular regard to the teacher's perspective. While these studies are not intended to tell the entire story, they are lacking the dimension and depth of experience. Currently there are many misguided beliefs about the nature of teaching with technology, so there is a need to explore the experiences of individual teachers as they integrate technology into the curriculum and into their teaching practice.

There are factors beyond wiring schools, putting new hardware into classrooms and sending teachers to workshops, that motivate teachers to successfully integrate of technology into the curriculum and into their teaching practice. In a piece entitled "High-tech schools, low-tech teaching" Cuban (January 1999) stated, "value conflicts seldom succumb to technical fixes. These are honest-to-God dilemmas that need far more investigation than they have gotten so far" (p. 54).

Denzin and Lincoln (1994) describe the framework of a study as the net that contains "a basic set of beliefs that guide their actions" (p.13). The net for this study was shaped by the qualitative/interpretive research paradigm and the assumptions that teachers' experience constitutes relevant knowledge and should be the heart of inquiry into classroom practice.

The task of this type of qualitative research seeks to understand the experience of teachers given the responsibility of incorporating and teaching with technology resources in their classrooms. Research like this has a framework which (a) emphasizes the teacher's perspective; (b) assumes there are many ways of experiencing and interpreting experience; and (c) assumes that reality does not exist independent from people's perspective of it. Reality is instead a personal, socially constructed, complex and constantly changing event (Glesne & Peshkin, 1992).

Contextual description

This type of research is descriptive rather than predictive. It provides a means for knowing that emphasizes the specific experience and is not generalizable (Giroux, 1983). In a holistic sense, each story is individual in its complexity, so that the participants are not reduced to bits of data. To gain the essence of experience rather than measurements and explanation, the researcher obtains descriptions through first person accounts (Bogdan & Biklen 1992).

Qualitative research does not begin with a theory generated outside of the experience of the participants with the idea that the participants' responses will fit within the theory. Instead, qualitative research is inductive, because understanding begins with the collection of data (Glaser & Strauss, 1967). The researcher works to reconstruct an understanding of the participant's experience through a process of synthesizing the data so that theories emerge as the evidence reveals the interconnections (Bogdan & Biklen, 1992).

"Self-conscious" is the term Bogdan & Biklen (1992) use when referring to the relationship qualitative research has with the participants. There is an acknowledged intersubjectivity between research and participant as they mutually create data through the research process. Ethics are understood by qualitative researchers in terms of their lifelong obligations to the people who have touched their lives in the course of living the life as a qualitative researcher" (Bogdan & Biklen, 1992, p. 55). Each participant is a unique individual, a learner, and a constructor of their own understanding. This means that even though each participant was placed in

the same situations, each participant has their own experience based on their qualifications, beliefs, and personal history (McLaughlin, 1993). Through the prism of each experience may come new understanding about the experiences of teaching with technology.

When the participant's stories and experiences are worked together, the shared experiences can become part of "a community memory, which constitutes part of the culture of teaching" (Ben-Peretz, 1995, p. 138). These "community memories" reveal the collective as well as the unique in the participants' shared experiences (Ben-Peretz, 1995).

Qualitative and interpretive research along with its guiding theory developed out of interest in the lives and perspectives of people in society who had little or no voice. The specifics of action and of meaning-perspectives of participants in interpretive research are "often those that are overlooked in other approaches to research" (Erickson, 1986, p. 125). Teachers have historically been overlooked as knowledge producers. Their perspectives have been deemed as essentially irrelevant (Goodson, 1992). It is appropriate therefor to use this type of research to bring forth the voice of teachers, to assist them in communicating their wealth of knowledge.

This theoretical framework serves to situate this study within the larger body of research. The study lends a voice to the holistic, first person, contextual descriptions of the experience of teaching with technology.

Bias/Presuppositions

It is important to acknowledge that the researcher has a vested interest in this research (Colaizzi, 1978). The researcher brings presuppositions to the research as a function of personal background and life experience. It is the researcher's responsibility as the researcher to identify personal biases and presuppositions and keep them in the forefront of consciousness throughout the research process (Hycner, 1985).

To that end, in preparation for this research, the researcher participated in a "bracketing interview" with two members of the Instructional Technology Cohort Group. Throughout the interview process with participants and subsequent data analysis, it is critical that the researcher's presuppositions, theories or belief systems do not direct the process. Analysis of the bracketing interview, in which the researcher responded to the same questions asked of the participants, indicated that the researcher expected the experience of teaching with, and integrating technology into the curriculum to be difficult, challenging, but overall a positive experience. Further, the researcher believed that the integration of computer-related technology into the classroom to be a worthwhile endeavor and an opportunity to further develop skills as a teacher. While the researcher cannot eradicate personal biases, knowing them helps to refrain from leading the participants or their text in a particular direction, toward the researcher's experience, and away from their own.

Research Design/Methodology

This section contains an overview of the research design and defines the variables investigated by the study. The procedures utilized in this study included: the selection of the teacher participants, data collection, data analysis and the presentation of the findings. Permission was granted for this research by The University of Tennessee Human Subject Committee and the participating school's Board of Education Research Office (Appendix C).

Grounded theory involves the basic data collection techniques of qualitative research: interviews and observations. Different types of data collected with grounded theory provide different vantage points from which to understand a category and to develop its properties. Glaser and Strauss call these views "slices of data" (1967, p. 65). The different types of data collected, including interviews and observations, are not used to test each other, but to provide different ways of understanding the data (Glaser & Strauss, 1967).

Grounded Theory

Grounded theory is a complex iterative process. The research begins with the raising of generative questions, which help to guide the research but are not intended to be either static or confining. As the researcher begins to gather data, core theoretical concept(s) are identified. Tentative linkages are developed between the theoretical core concepts and the data. This early phase of the research tends to be

very open and can take months. Later on the researcher is more engaged in verification and summary. The effort tends to evolve toward one core category that is central. There are several key analytic strategies:

- **Coding** is a process for both categorizing qualitative data and for describing the implications and details of these categories. Initially one does open coding, considering the data in minute detail while developing some initial categories. Later, one moves to more selective coding where one systematically codes with respect to a core concept.
- **Memoing** is a process for recording the thoughts and ideas of the researcher as they evolve throughout the study. You might think of memoing as extensive marginal notes and comments. Again, early in the process these memos tend to be very open while later on they tend to increasingly focus in on the core concept.
- **Integrative diagrams** and sessions are used to pull all of the detail together, to help make sense of the data with respect to the emerging theory. The diagrams can be any form of graphic that is useful at that point in theory development. They might be concept maps or directed graphs or even simple cartoons that can act as summarizing devices. This integrative work is best done in group sessions where different members of the research team are able to interact and share ideas to increase insight.

Eventually one approaches conceptually dense theory as new observation leads to new linkages, which lead to revisions in the theory and more data collection. The core concept or category is identified and fleshed out in detail.

Conceptual Framework

The purpose of the present study was to explore and examine teachers' attitudes, knowledge, skills, dispositions, barriers and events which construct, shape, and give meaning to their experiences teaching with computer-related technology in their classrooms and to gain an understanding of how the teachers negotiate the challenges inherent in teaching with this new medium. As discussed in the review of literature, there is an absence of the teacher's perspective in the literature on teaching with computer-related technology and integrating it into the curriculum.

Identification and Selection of Participants

Situated in the Elloise River Valley, Blue Hills has a population of 6147 (US Census Bureau, 1990) with a median household income of \$18,014. The area was once a part of the Cherokee Indians' hunting and farming territory until Major Charles David Smith developed Blue Hills in the early nineteenth century as an agricultural and industrial plantation. He inherited part of this land from his father, General George Smith, hero of the Battle of Kings Mountain and recipient of a land grant for his Revolutionary War leadership. The quiet, peaceful atmosphere of Blue Hills, its friendly people, and the beautiful scenery of its rolling hillsides make an inviting blend of small town intimacy and progressive, purposeful growth.

The Blue Hills School System was organized in 1907, and consists of an elementary school (grades K-5), a middle school (grades 6-8), a high school (grades 9-12) and a Central Office. The system is governed by a five-member school board,

which is elected by the general population. The Blue Hills system serves a student population of 1694 with a student/teacher ratio of 21.7:1.

The citizens of Blue Hills take great pride in their school system and have made a commitment toward excellence. Blue Hills was the first municipality in the state of Tennessee to levy a local sales tax for educational purposes. The current elementary facility was built in 1987 and received the School Architectural Award of Tennessee as well as the County's Beautification Award. Through a strong academic program, progressive use of technology, commitment to fine arts, outstanding vocational classes, competitive athletic program, and active school-community partnership, the Blue Hills School System is actively pursuing its goal of striving for excellence.

The research was conducted at Blue Hills Elementary School. The mission of Blue Hills Elementary School is to provide a safe and nourishing environment where (k-5) students experience personal success and achieve their potential in order to become responsible citizens and lifelong learners. Participants in this study were five teachers out of 33 (3 teachers in pre-kindergarten, 6 in kindergarten, 6 first grade, 5 second grade, 5 third grade, 4 fourth grade and 4 teachers in fifth grade) from Blue Hills Elementary School who shared the common experience of teaching with computer-related technology and integrating it into the curriculum. Their experience with the phenomena studied (integrating and teaching with computer-related technology into their classroom) and their willingness to discuss their experience made them ideal participants in the study.

The teachers' participation in this study was completely voluntary. The participants in this study volunteered to participate based on a letter sent to all teachers at Blue Hills Elementary describing the project and inviting them to participate (Appendix D). It was explained to them that this research project focuses on the absence of the teacher's perspective in the literature by focusing on the experiences of teachers involved in teaching with computer-related technology and integrating it into the curriculum.

The participants were interviewed with the interview lasting approximately one hour. They were asked to not discuss their interview or the topics discussed with other participants in the study. These interviews were audio taped so that there was an accurate account of their stories. The audiotapes were stored in a secured location at the University of Tennessee, Knoxville. Only the project advisor and the researcher had access to the tapes. When the study was completed, the transcripts, identified by pseudonyms, were destroyed and the participants were provided with a copy of the finished project for their information. The consent form will be maintained and stored for three years after completion of the study in a secured location at the University of Tennessee, Knoxville (Appendix B). These measures were to ensure that the participant information remains confidential.

There were no anticipated risks to participants beyond those experienced in the course of everyday life. Although there were no direct benefits for the participants, there was a clear indirect benefit in the possibility for an increased understanding of the experience of teaching with technology. Their participation was completely

voluntary and they had the opportunity to end the interview at any time and withdraw from the project at any time. There was no compensation or incentives for participation and no penalty for withdrawal from the study.

Description of Participants

The teacher participants in this study self-selected based on an invitation letter describing the research project (Appendix D). The letter was placed in the mailboxes of all teachers at Blue Hills Elementary on April 18, 2000. Any teachers who were interested in participating were asked to let the researcher's contact know either by leaving a note in her mailbox or by emailing her. She then forwarded the information on to the researcher and the interested participants were contacted to arrange an interview and to provide additional information about the project if the teachers had any additional questions.

The first teacher to respond was Rebecca. She just completed her fifth year of teaching. She did her internship in a neighboring county at Emerson Elementary in the third grade and taught one year of first grade reading and the remainder of her teaching experience has been in fifth grade self-contained. All of her teaching experience, excluding her internship, has been with Blue Hills Elementary.

Amy was the second participant to respond. She teaches third grade at Blue Hills Elementary and just completed her first year of teaching. Like Rebecca, she did her internship in a neighboring county at Paul Thomas Elementary where she spent time in several grades. Most of her internship was with second grade, but she also had

six weeks rotations in kindergarten and fifth grade.

The third participant, Ellen has the most seniority of the teacher participants. She has been teaching for just over 29 years and most of that time has been with fourth grade. She started out in special education for the first two and a half years of her teaching career and then she went into fourth grade, then third grade, and the finally settled back into fourth grade. All of her teaching experience has been with Blue Hills Elementary.

Linda started teaching in the middle of the school year in a kindergarten classroom. She then taught fourth grade for seven years, a split grade of fourth and fifth for one year, and then the last 10 years she has been in first grade. Like the previously described participants, all of her teaching experience has been with Blue Hills Elementary.

The last participant, Bonnie, taught one year of earth science and seven years of seventh grade physics and chemistry in the North East. She was then released due to low enrollment. Over the next 17 years she worked a variety of jobs in business all over the country before moving to Blue Hills. She has been teaching kindergarten at Blue Hills Elementary for seven years.

Data Collection Timeline

The initial scope of the study was to collect at least ten interviews. When the initial letter was left in the teachers' mailboxes on 04/18/00, there were responses from two potential participants. Their interviews were both conducted on 06/16/00.

After an additional two weeks had passed, the researcher spoke with the Blue Hills Elementary contact to check on the status of additional participants. At that time there were eight additional potential participants. They were all contacted. Interviews were conducted with three of the eight potential participants were interviewed on 07/14/00, 07/25/00 and 08/07/00.

Of the remaining five, three responded either to email or by telephone.

Potential interview dates and times were discussed and one of the three selected a date and time while the others because of their busy schedules, chose to hold. The selected date and time were rescheduled twice and eventually cancelled due to other commitments. The remaining potential participants did not respond and attempts were made by the researcher to contact them through the end of September 2000 but no additional interviews were conducted.

Data Collection

The experience of how the teachers negotiate the challenges inherent in teaching with this new medium of technology cannot be readily observed. It's meaning resides in the memory of those teachers who have had such an experience. To access this experience, the researcher used in-depth qualitative interviews. This method is acknowledged as an effective and powerful technique for gaining insight into another person's experience (Kvale, 1983).

Seidman refers to the work of Vygotsky in articulating her argument that putting thought to language is a meaning-making process and telling stories is "essentially a meaning-making process" (Siedman 1991, p. 12). Polkinghorne (1989) expands this argument by presenting the idea that "narrative is the fundamental scheme for linking individual human actions and events into interrelated aspects of an understandable composite" (p. 13). He uses a definition of narrative, which we use in our research: narrative is the process of making a story, the cognitive scheme of the story, and the result of the process (Polkinghorne, 1989).

Clandinin and Connelly (1994) propose that the exploration of personal experience must be simultaneously focused in four directions: inward and outward, backward and forward. By this they mean the internal condition of feelings, hopes, aesthetic reactions and moral dispositions. By outward they mean existential conditions, the environment, the reality. By backward and forward they are referring to past, present and future. "To experience an experience is to experience is simultaneously in these four ways and to ask questions pointing each way" (Clandinin and Connelly, p. 417). With Clandinin and Connelly's perspective in mind, the interview guide was constructed. The questions generated explored the personal biography of each participant as well as their experience teaching with technology (Appendix A).

It is important to note, however, that while the researcher selected the topics for framing, guiding, and focusing the interviews, the interviews remained open ended to allow the participants to follow their own paths. Subsequent questions

served the purpose of clarification, to evoke a fuller description or a fuller understanding. The researcher probed as necessary in order to come as close as possible to grasping each participants' experience from their point of view (Polkinghorne, 1989). Each interview was audio taped and transcribed.

The interviews were conducted at the teachers' location. This provided an opportunity for the researcher to visit their school and see the classroom in which they teach. Before each interview, the participants were asked to read and sign a consent form (Appendix B). It was made clear that they could withdraw from the study at any time, and that their data would be removed from consideration.

In order to faithfully reproduce the stories gathered, it was integral to craft a text that corresponds to the lives of the teachers and was authentic. Authenticity means that the text was not only faithful to the story lines provided by the teachers; it also needed to convey the "feeling tone" of the lives involved, inviting the reader into a vicarious experience (Barone, 1995; Lincoln, 1993). Because the researcher shared Etter-Lewis' (1996) view that storytellers are the authorities of their own life stories, the researcher first interviewed the teachers to collect their narrative. This approach sets up a dialogic process where the researcher started to clarify understanding of the teacher's stories and experiences using computer-related technology as part of their classroom (Bohm, 1990; Casey, 1995-96; Lincoln, 1993).

After the researcher conducted the initial interviews and they were transcribed, word for word, utterance by utterance, the researcher followed up by providing each one with transcripts of their interviews for commentary. Thus, while each person was

given similar guidelines for the first interview, each follow-up discussion was unique. Each teacher was provided the opportunity for revising and clarifying their story. Each participant had the liberty and authority to change their actual words and comments. This continued the dialogic relationship as the research continued beside each person.

Data Analysis

Data analysis is an ongoing process, which began with the transcription of the first interview and continued throughout the writing process. The researcher used a Dictaphone to transcribe the interview tapes. The researcher listened to each of the tapes while reading the text to check for omissions and as reminder of the vocal inflections and timings, which were part of the conversation. The first step in the data analysis was constructing individual portraits of the teachers as they described themselves in their classrooms. The researcher included in these portraits the demographic information they provide. The researcher used the term portrait and its intent from Sarah Laurence Lightfoot (1983) who said "Portraits make subjects feel 'seen' in a way they have never felt seen before, fully attended to, wrapped up in an empathetic gaze" (p. 5). The researcher constructed the stories of individual teachers intentionally in order to understand them as they approach their technology-infused teaching experience.

Coding is the basic process of analyzing qualitative data. The type of coding used with grounded theory is very detailed. In grounded theory, there are two procedures that make-up the process of coding: making comparisons and asking questions. These procedures are used to conceptualize and categorize the data. Conceptualizing the data is different than summarizing data. Conceptualizing data is looking at the data and finding concepts, while summarizing data is saying what happened in a descriptive way.

The purpose of the constant comparative method of joint coding and analysis is to generate theory more systematically by using explicit coding and analytic procedures. While more systematic than analysis that wishes only to generate theoretical ideas, this method does not analyses to convert qualitative data into a crudely quantifiable form which hinders the development of theory because it is designed for provisional testing, not discovering, of hypotheses.

Glaser and Strauss (1967) describe the constant comparative method of grounded theory in four stages: 1) comparing incidents applicable to each category, 2) integrating categories and their properties, 3) delimiting the theory and 4) writing the theory. Although this method of generating theory is a continuously growing process where each stage after a time is transformed into the next, earlier stages do remain in operation simultaneously throughout the analysis and each provides continuous development to its successive stage until the analysis ends.

The analysis started by coding each incident in as many categories of analysis as possible, as categories emerged or as data emerged that fits with an existing

category (LeCompte & Preissle, 1993). While coding an incident for a category, it was compared with the previous incidents in the same and different groups coded in the same category. This process started out in a small way with memos and notes. But as the coding continued, the constant comparative units change from comparison of incident with incident to comparison of incidents with properties of the category that resulted from initial comparison of incidents.

As the theory developed, various delimiting features of the constant comparative method begin to curb what could otherwise become an overwhelming task (Glaser & Strauss, 1967). Delimiting occurred at two levels: theory and the categories. First, the theory solidified, in the sense that major modifications became fewer and fewer as the analyst compared the next incidents of a category to its properties (Bogdan & Biklen, 1992). Later modifications were mainly on the order of clarifying the logic, taking out non-relevant properties, integrating elaborating details of properties into the major outline of interrelated categories and reduction. Reduction occurred when there were underlying uniformities in the set of categories or in their properties and the theory could be formulated with a smaller set of higher-level concepts. This delimited its terminology and text.

Assumptions Relating to Methodology

There are a series of assumptions associated with the use of a qualitative method. The first major assumption is the belief that this study was exploratory in nature and attempted to determine the experience of teachers teaching with and

integrating technology in their classrooms. The second assumption involved an acknowledgement that, given the nature of the research, this method provided the broadest and perhaps richest data possible because of its open coding and lack of rigidity. The third assumption was that the experience of integrating technology into the classroom has a strong effect on teachers and on the interns they mentor. The natives' perceptions were important for understanding those elements in their environment, which had meaning for them rather than for the researcher (Spradley, 1979). It was believed that this method represents the least intrusive means of collecting the data.

CHAPTER IV

DATA PRESENTATION, DISCUSSION, AND FINDINGS

Introduction

In education there has always been a problem of how in scholarly accounts researchers present this thing called practice, these things called teachers. It is always very difficult to actually re-present those in a text. And so there has always been that structural problem of the relationship between theory and practice. But the researcher believes that at this historical point in time, that ongoing structural problem is overlaid by a basic representational crisis. That representational crisis, as Lather (1986) and others have called it, has been addressed in a number of fields, and it's only now working its way into education. Jameson (1998) eloquently outlines the nature of that crisis. He says,

The challenge to writing accounts about schooling grows from an essentially realistic epistemology, which conceives of representation as the production for subjectivity of an objectivity that lies outside it (p.24).

Telling teachers' stories

The argument for listening to teachers is substantial and long overdue. The narrative in stories, journaling, action research and phenomenology, all in their

different ways, contributed to this bringing back of the teacher's voice. In the case of stories and narratives, Carter (1993) has provided a valuable summary of this growing movement:

With increasing frequency over the past several years, we as members of the community of investigative practitioners have been telling stories about teaching and teacher education, rather than simply reporting correlation coefficients. This trend has been upsetting to some who mourn the loss of quantitative groups, of quantitative precision, and, they would argue, scientific rigor. For many of us, however, these stories capture more than scores of mathematical formulas--the richness and indeterminacy of teachers' lives. It is not altogether surprising, then, that this attraction to stories has evolved into an explicit attempt to use the literature on story and narrative to define both the method and the object of inquiry. Story has become, in other words, more than simply a rhetorical device for expressing sentiments about teachers. It is now a central focus for conducting research in the field (p. 5).

This emphasis on teachers' stories and narratives encouragingly signifies a new turn. Like all new genres, stories and narratives are Janus-faced. They may move educational research toward new insights, or backward into constrained consciousness, and sometimes they may do the same thing simultaneously. This uncertainty is well stated in Carter's (1993) summary of the place of story:

Anyone with an even passing familiarity with the literature on story realizes, however, that these are quite turbulent intellectual waters, and quickly abandons the expectation of safe passage, towards the resolution, once and for all, of the many puzzles and dilemmas we face in studying teaching. Much needs to be learned about the nature of story and its value to our common expertise, and of how the wide range of purposes, approaches, and claims made by those who have adopted story as a central analytic framework (p.12).

Stories exist in history. They are in fact deeply located in time and space.

Stories work differently in different social contexts and historical times. Stories, in other words, can be put to work in different ways. Stories then need to be, not only, narrated, called, but sociologically and morally located. Again, Carter (1993) hints at both the enormous appeal, but also the underlying worry, about narrative and story.

She says:

At the moment the appeal is substantial after long years of silencing, but the dangers are more shadowed. I believe, and I believe it very profoundly, that unless these dangers are confronted now, narrative and story may end up silencing, or at least marginalizing in new ways, the very people to whom it appears to give voice. For many of us, these arguments about the personal storied nature of teaching and about voice, gender and power in our professional lives, ring very true. We can readily point to instances in which we've felt excluded by researchers' language, or powerlessness in the face of administrative decrees and evaluative instruments (p. 11).

It is easy to imagine that the analysis of stories summarized here, if pushed ever so slightly forward, leads directly to a rejection of all generalization about teaching, as distortions of teachers' real stories and as complicity with the power elite. From this perspective, only the teacher owns her or his story and its meaning. As researchers and teacher educators, we can only serve by getting this message across to the larger society and by helping teachers to come to know their own stories. One of the books that relates to Clandinin's metaphor of landscape, is Steedman's Landscape for a Good Woman: A Story (1987). She talks about the landscape of stories and how it's located in a phrase. She says,

Once a story is told, it ceases to be a story. It becomes a piece of history, an interpretive device. In this sense, a story works, works for us, when its rationale is comprehended, and its historical significance grasped (p. 142).

Steedman never loses sight of how writers may develop skills to rewrite the life script in which they find themselves embedded, and the issue of how researchers go beyond the story that they are narrating, which is a story that has been written for the researcher in some ways. This is a critical point with the collaborations that occurs with the participants and the researcher. This point of going beyond the story that has been written is a critical point. It focuses acutely on the dangers of a belief that merely by allowing people to narrate their stories, we give them voice or agency in any serious way.

Factors that influence the teachers' use of technology

This study presents the experiences of teachers working to incorporate technology into their classrooms. The research questions guided the data analysis process, and the resulting interpretations rest within a meta-theoretical framework in which the following major themes emerged from the teacher's experiences. The four major themes that emerged from the data include:

Theme 1:

Resources- How each teacher sees the equipment available to them.

Theme 2:

Scheduling- How each teacher creates room for technology in the classroom.

Theme 3:

Support- How each teacher defines the assistance available to them.

Theme 4:

Teacher productivity- How each teacher addresses technology integration vs. time requirements.

These themes were created *with* rather than *for* the teachers who participated in the study. The categories from which the themes derived were not predetermined prior to the interviews but developed as a result of the data analyses. In the data presentation, each theme will be explained and then illustrated in relation to the data. The research findings cannot be generalized to the experiences of all teachers working with technology but are particularized to the individual experiences of the teachers in this study (Clandinin & Connelly, 1994). Emerging between and within each teacher's story (Randall, 1995), the themes demonstrate how the teacher participants experience the process of using computer-related technology in the classroom. The data suggests that how each participant experiences the day-in and day-out labor of using computer-related technology in their classroom, has and continues, to develop and evolve. Therefore, the data analysis must be viewed as one interpretation of the experiences of these teachers, which can be useful in examining the experiences of teachers working to incorporate technology into their classroom practice.

Theme 1: Resources

This theme examines how each teacher sees the computer-related technology resources available to them at Blue Hills Elementary School. One basic prerequisite for effective teacher use of technology is access. Schools like Blue Hills Elementary have made substantial investments in hardware and software over the past several years to increase their physical access to technology. The teacher participants expressed concerns that, despite past investments in technology, Blue Hills Elementary still lacks the basic technology infrastructure to support the most promising applications of educational technology. This aging inventory limits the ability of many teachers to use some of the most exciting applications of computers:

The problem I'm having now is that my student workstations don't have the power to play a lot of the new CDs that are on the market. So I'm waiting to have those either upgraded or replaced or something... I do a lot of reading, and I look at a lot of magazines and that kind of thing that talk about technology, and the latest things out there. But like I said, a lot of it I can't buy right now because I can't play them (Linda).

Another issue related to resources that the participants commented on, was that they do not feel that their school makes the most of the equipment they already have, and do not capitalize on what resources they have available. This was a significant issue with several of the teachers and the grant-funded electronic portfolios project:

I'm frustrated over the electronic portfolio because every year it's my goal to get it off the ground and get it going, and then at the end of the year it's not done (Linda).

Rebecca spoke of her disappointment with the sluggishness of instituting resources like the electronic portfolios:

Sometimes [implementation] it's really fast, and then like the electronic portfolio, it's been four years and it's not been implemented yet. It's very frustrating. Sadly, we are waiting on cords, basically.

In a different tone, Bonnie mused:

We had a workshop on electronic portfolios that was a grant so all of the teachers and aids went to it and we were suppose to have CD burners as part of the project. They aren't here again. We have the money. We have the equipment and we get the training and it never happens because this glitch or that glitch. We can't get to it so how to use it in the classroom is not something that has been addressed because we didn't get over the bump of how to make it all work first. I can't say how we would use those CD Burners in the classrooms, because the burners sitting in a closet for 3 years collecting dust because nobody has unpacked them yet.

Along the same lines regarding the pace at which some resources are made available,

Rebecca expressed her frustration with using the school's digital camera:

We have a digital camera at school and I would like to use it. There is a cord missing and when we find it, I would like to use the digital cameras for them to take pictures and for projects and conferencing and to make a web page with the pictures each week for parents to be able to look and see what we are doing. It can be very frustrating. I want to use it but we are waiting on cords (Rebecca).

The teachers at Blue Hills Elementary have developed a variety of ways to manage the limited computer-related resources, which are shared by both teachers and students. The most common uses of the computer resources are for basic skill practice, word processing and for development of basic computer literacy skills. Amy, because of her own background and upbringing, dedicates time to providing her students with opportunities to explore the computer's capabilities:

Because a lot of our kids at our school come from a lower SES background I try to give them experiences. I try to get them familiar with using the keyboard and knowing different things of how to use the keyboard and how to make their capital letters and different things like that. Because they are going to have to be able to do that all through their life and all through their educational careers and on jobs. I think that is pretty important tool for them to have so we just start out with basic stuff like learning how to type on the computer.

Other uses, such as desktop publishing, developing math or science reasoning with computer simulations, gathering information from databases, or communicating by electronic mail (e-mail) are less frequent:

There is excellent web site that I use at home. It is called epals.com. It is a teacher web site and it is a teacher magazine and it is to set up email within the schools of kids from different countries. Well I went to school and it is blocked at school and we can't get on, and when I call to find out what I can do to clear this block, they are like, "No. If you do that we'll have to come in every time you want to use it and put our password in." So I've got to figure out a way around this stuff, because there is a lot of good stuff out there, but it is blocked. For what reason, I don't know (Rebecca).

There are additional issues for the teachers with regard to the resources they have, or might not have, available to them. For several of the teachers, when they spoke of the electronic portfolio project, they also mentioned software that was purchased but they never got trained to use or software that when they did get it, their training was long past and the version might have even changed:

Another thing is we can take the training for it sometimes and then we don't have the access to it the following year. It may be a year or two down the road so we have for sure lost what knowledge we have gained then (Ellen).

The general sentiment can be summed up by Bonnie's comments:

The focus is to have the machines and be a showplace. It is not on training so we can really use them. And look what we have. Look we have tremendous capability, but until everyone is using it at 85% level it is a frustration for me because I see the machines becoming obsolete faster than the percentage they are used.

Looking outside the box

After looking at some of what the teachers perceive to be negative aspects to the resources they have available to them, there were also glimmers of possibility. For the teacher participants at Blue Hills Elementary there is an interesting trend starting to appear in their classroom. Each year the level of exposure the children have to computers outside of the classroom increases, and they in turn are becoming stronger contributors to the classes understanding of technology. Amy utilizes what she perceives to be her students strong Internet searching skills:

I feel that a lot of times the kids know more than I do about the computer sometimes. So I think they find stuff better on the Internet than if I was telling them what to do... There have been several times this year when they have had free time to get on the computer and they doing something. And I am, like, "How did you do that"? So then they show me. They show me and I learn from the kids. I've learned a lot of stuff from the kids on how to do different things with the computers.

Ellen has been teaching over 29 years and commented that she has noticed a trend with regard to the general computing skill levels of the children that are entering her classroom:

Their [the students] general computer skills and knowledge sometimes makes it difficult to use the computers, but that is changing because last year I had probably 7 or 8 who had computers at home and they would bring in their own kinds of information from the computer when

before almost none of my children had access to computers outside of the classroom.

Rather than feeling alienated by some of her students computer proficiency, Ellen chose instead to highlight the children that she believed to be more skilled with using the computers:

Wow! I was impressed with some of the things the children bring in to class off of the computer. I put their work up on the bulletin board. We put their names on it and they put it in the portfolios when they were finished... I'm glad they have that much access and knowledge and it wasn't always children that I expected to have that level of access, so I was very, very pleased and the ones who don't have computers at home some of them come knowing quite a bit about them just from their interest and previous experiences.

She then used them as a resource for training other children in the class who were less familiar and experienced with using the computers.

Besides utilizing the students in the classroom as a resource to support the instructional applications of technology, the study participant also spoke of the experience of other teachers and how they knew whom to talk with if they had a question:

I know when I want to talk to someone about technology and computers. I know who I would go to and ask about it. You know what I mean? I know the teachers. I don't know all of the teachers, but I know the ones that could help me out and are really using it, whether once a month, or if they use it onne a day. So I would know I could go to that person and say, "What have you found that is really great? What are you using? What do you like to use?" (Amy).

Rebecca spoke of utilizing her fellow teachers in very practical terms, "I'm like, what are you doing? Show me what you are doing. Show me how."

All of the teachers who participated in the study spoke specifically of one resource as the greatest asset in their development and use of instructional applications of technology, their interns:

I'll tell you one thing. Our interns are really excellent resources because they come in excited, very excited, about learning new stuff, and one intern this year was in fourth grade and he started my class doing a newsletter on the computer. We did a newsletter before, but not on the computer. Well, he wanted to do his action research on a newsletter in the classroom where the kids could do it on the computer, so he looked at my newsletter to learn from me and then he went ahead and used ClarisWorks. So he taught his kids on the computer how to do a newsletter, which motivates me. I learn from him and he taught me what he knew and what was a good thing/bad thing about using this to do a newsletter. So I think our interns are an excellent resource. They really seem to have a focus on technology and then I can learn from them. I learned from him this year and I hope that I can start that [the newsletter] next year sometime for my writing program (Rebecca).

When asked about what resources she uses to aid her in utilizing and developing technology in her classroom, Linda spoke of the valuable role her interns have played in her development as a user of instructional technology:

I feel it's been a very big benefit the last five years to have an intern in my classroom. They come with a lot of knowledge and help me figure out ways to use the computers. And with two teachers in the classroom, planning and organizing, it really works a lot better. So probably from that perspective, that I have someone else who comes in with new ideas on technology and ways to plan, and knows more about it usually than I do.

Through this discourse on resources, the participating teachers' contributed to a new definition of what constitutes "access" to technology resources for teachers and students. Counts of equipment, student-computer ratios, dollars spent and requirements, while important, alone are not sufficient to define meaningful access to technologies. It is appropriate rather to consider infrastructure in a broader sense: type of technology, age, capacity, connectivity, software, and services. Organizational arrangements --the placement and flexibility of technology-- also affect the ease of use by teachers and students. For example, a computer on a cart that can be moved anywhere may be used much more often than a computer lab far from the classroom:

For a while we had a computer lab, but we didn't feel like the kids had enough time and access to the computers, so we divided them up between the classrooms, put them on mobile teachers' stations and that works much better (Linda).

An additional component of a new definition of access includes the kinds of support teachers need to use the infrastructure effectively: exposure to innovative uses, flexible "just-in-time" training, and ongoing technical support and expert advice. If access to technology is an equity concern, then the definition should be expanded to encompass access to necessary information.

Summary

With this theme of resources, the participating teachers see the computer-related technology resources available to them at Blue Hills Elementary as lacking the basic technology infrastructure, as well as an aging inventory that cannot support the

most promising applications of educational technology, despite the school's past investments in technology. In addition, the participants do not feel that their school makes the most of the equipment and resources they already have available.

On the more positive side of the theme of resources, the participating teachers are finding that more and more of their students are coming into the classroom with a heightened understanding of how to use computer-related technology so they are able to contribute to the class by mentoring their fellow students and supplement the teacher's knowledge of technology. In addition, they also utilize their fellow teachers and resources for information on what has worked for them integrating technology in their classrooms. The last, and probably strongest resources for the participating teachers are their interns. Because these interning teachers have taken coursework with instructional applications of technology and an often times display a higher level of comfort with technology than the mentoring teacher, the interns are able to model the technology integration process in the classroom as well as provide information on the latest applications and strategies.

Theme 2: Scheduling

Student access

The theme of scheduling involves for the teacher participants, both the time to use the technology as part of their classroom practice, and the time needed for their own learning and development as users of computer-related technology. Many of the participants spoke of feeling that they had so much already to cover in their classes

and then trying to work the technology in around that was difficult. To work around an already busy schedule, Linda's approach is:

I keep my computers on all day long, and when the kids finish with their work, they can go there, plus I have a designated time of centers where I know that each child is going to have access to it.

For Bonnie and for several of the other teacher participants, planning for using the technology in the classroom also means planning for a variety of skill levels. "Some children jump to the computer in different ways and I have been able to manipulate my programs a little but, but I can't be over there, and here and there." With that in mind, the participants emphasize the importance of just providing their students, whatever their skill level, with as many computer experiences as possible:

I make sure that every child had a good experience with it [the computer], and had time to use it. That has been my thing, planning for every child to have access. In some of the programs, you know, we have picked things that they could get on and move at their own pace through different reading skills or whatever, it was just really time-consuming and putting where every child is all the time (Bonnie).

Amy's personal background reinforces for her the importance of giving her children time with the technology and opportunities for self-guided exploration:

But many of my lessons have a lot of software that the children have opportunities. These times are not very teacher monitored when they are just using the games and the software like we have a Magic School Bus inside the human body so it goes through the human body and they have time to explore on that and look through it as much as they would like.

Teacher exploration

Besides planning and scheduling for using technology in the classroom, there is the issue of planning and scheduling opportunities for the teachers to learn and explore the computers for themselves. Just as the teachers work to provide their students with opportunities for computer time, the teachers themselves expressed their need for more time to explore and learn with the technology:

I want to learn as much as can because I want to be a resource, even though there are a lot of technology things that I am not excited about a lot of things, I want the kids to know "Hey, this is what your school has and you are going to encounter it in the world." I'm not comfortable doing a lot of things, because I don't know how, but that just goes along with my ignorance on things I need to find out. And that goes back to, where can I get these training classes? Where can I learn? I need training on it. So I get a little frustrated with that because I can't find training. So a lot of the time I just stay after school and try and figure things out for myself. Sometimes the kids can figure it out (Amanda).

The teachers mentioned several concerns they have with the provided in-service training they have available to them at Blue Hills Elementary. The first of these is that training is not offered at a variety of skill levels and is usually only offered at the beginning level:

There are classes, I noticed we got in our mailbox, we can take, but they are basic for basic skills. That's great. I don't need that. I need something more advanced. I need specific training in certain things that we have. I don't know if a list needs to be sent out where you check what you want. Half of them don't put anything. Many times, I put when we have a workshop, here is what I need, but then it doesn't get offered (Rebecca).

As a result many teachers, like Linda, seek technology training outside of the school's limited offerings:

We have had some things offered here, school-wide or system-wide. But they've mostly been like Using the Internet, or that kind of thing. Most of it has just been learning on my own or attending workshops on my own, just getting in there and figuring it out myself.

The timing of the teacher's technology training is also an issue. Whether it is the lag time between when the training is provided and when it actually makes it into the classroom (sometimes never), or the fact that most of the training is offered in the summer, the teachers have difficulty taking what they learn and implementing it in the classroom. "The problem lies in the transference of the knowledge that we gain into the classroom, because we forget what we have learned immediately (Ellen)." Bonnie reinforces this theme with her experiences with the 21st century classrooms:

They gave us two days worth of "whoop-la" and then you go back and try and use it. Well, I say try because very often you have a one day in-service and you are really excited but sometimes the training you have happens ahead of when the capability is. For instance, with the first grade and their 21st century classrooms, by the time we were actually seeing the stuff, the training period was months old. The email accounts had expired and we weren't connected to email until years later. The training doesn't always coincide.

Even more extreme, sometimes the case is that training is provided over the summer and the programs are never brought into school.

Last week we had a workshop that was over a program we don't even have yet. That is the second time that has happened. We are supposed to be getting it this summer, but we found out we won't be getting it till next year. If we are going to be trained on stuff, I need, personally, I need to be trained on that computer right then and there. I don't need to

be expected to sit here and take notes on it and expect me to use it after a long time. It is going to take me a long time to do that, and if it takes me a long time, it is going to take other people a really long time. But if we have training, lets have that software and be sure we have it and lets use it right now when we learn it (Rebecca).

Along those same lines, one of the participants mentioned that they took training on programs that by the time they do get the software, the version has changed:

We had training a couple of year ago on some software and we still don't have it. We aren't using it, because it is different version than what we were trained to use. We were trained on the upgrade and we have the older version of it. It is totally different and it felt like a waste of time (Rebecca).

Speaking generally about the teacher technology training available at Blue Hills Elementary, Bonnie said:

I don't believe in the past 2 or 3 years their focus has been on any technology training from the outside coming to us. It is pushed aside. Their focus is not there. The focus was to have the machines and be a showplace. And look what we have, look we have tremendous capability, but until everyone is using it at 85% level it is a frustration for me because I see the machines becoming obsolete faster than the percentage they are used.

Summary

The theme of scheduling has two central issues for the teacher participants. There is on one side, the issues of the scheduling necessary to use the technology as part of their classroom practice and the variety of skill levels that they have among the students in their classrooms. On the other side is the scheduling necessary for their own learning and development as users of computer-related technology. This involves the timing of the teacher's technology training, whether it is the lag time between

when the training is provided and when it actually makes it into the classroom (sometimes never), or the fact that most of the training is offered in the summer, the teachers have difficulty taking what they learn and implementing it in the classroom.

Theme 3: Support

This theme examines how each teacher sees the computer-related technology support available to them at Blue Hills Elementary. This theme involves both the support they experience within the classroom for the use of instructional applications of technology and the external support. All of the teachers spoke very highly of the opportunity they are given every year to take their computers home for the summer. Many of the participants feel that this opportunity affords them some time to get to know their computer better and become more familiar with what options are available.

Blue Hills Elementary shares one technology coordinator with the entire system, so she is not only responsible for the Elementary School, but also the Middle School and the High School. All of the participants spoke very highly of her skills at fixing technical problems. Their issue with her is that she is only one person for an entire system and she has a business background rather than an education background so she is very technically skilled but has no curriculum integration skills. She is able to provide technical support, but not instructional technology support.

I have learned a tremendous amount working with the technology coordinator who has the technical skills. She comes from business. She does not come from education. She is not going to tell me how

to use it in my classroom. She is not an educator. She is a techie. She fixes things. She connects things. She is wonderful but she is only one. For the whole system she is only one and she is stretched real thin because of the renovation process (Bonnie).

There is also an on-site contact available for technical problems. She is a full-time teacher and beyond those duties she provides some basic technical support to the teachers at Blue Hills Elementary.

With one person doing it [on-site support] part time on top of my teaching schedule, I barely have time to make sure that all of the machines are plugged in. It takes me over a month, because after they take them home for the summer, they can't remember how to plug them up at school. I've got to rewire things. Connecting things up, that is a month's work. At the end of the year, cleaning them, looking at them, vacuuming them out and all the little techie things like handing out ink. I am the "Queen of ink." "Who needs it?" "Who wants it?" Cleaning out the mice and doing all this doesn't really give me any other time to do the educational and integration part. I am barely keeping my head above water with the physical maintenance of the machines and unpacking them out of boxes and setting them up for people so I am repaid with lunch money. For me it is not about pay, it is about the possibility of what these machines offer to the children in my classroom (Bonnie).

As mentioned with the theme of resources, for many of the teachers their interns are both a resource for information about technology and ways it can be integrated into their classrooms and a strong source of support.

They're [interns] able to help me supervise and watch the kids as they work and help them where they're needed, and help me find programs. A lot of times they see things that I don't see. And most of the time it's just that hands-on kid-watcher that really benefits me. But like I said, most of them come with a lot of knowledge of the computers and that kind of thing, that's really beneficial. (Linda)

The last portion of the support theme involves the indirect support the teachers experience from their students regarding the use of instructional technology as part of the classroom practice. Increasingly, the teachers feel that when they choose to use technology as part of their classroom teaching it is not as new and exciting for the kids. The children are coming into the classroom with more exposure to technology than in earlier years. Just using the computer as part of the classroom instruction is no longer a guaranteed way of maintaining the children's attention and interest. It is now a familiar tool and an expected part of the classroom experience.

They like it, but it isn't a big deal to them anymore. They don't get excited over it. You know when I first started using them a couple of years ago some of them were more excited. I don't know if it is just the technology age or what, they just use them for playing games. Nothing is exciting to them about technology. Umm I'm sure there is a lot of stuff out there that if I got it in my class, they would be. I don't see it, like "whoo" lets use computers today (Amanda).

Amy commented that this was not this case with her fourth grade class, she said:

My kids still get a little excited and it might just be because they are still not use to it yet by third grade, but we use it a lot in third grade and they do in fourth and a lot in fifth. I don't know if its just because they haven't had as much previous experience by the third grade or they've had more, but they still get a little excited about it. Mine love to type out their stories in word processing and I'll tell them how I think that is a really important tool now because you just use computers so much. So that I think that is a pretty important tool for them to have.

Summary

The theme of support involves both the support the teacher participants experience within the classroom for the use of instructional applications of technology and the external support from the technology coordinator. The technology coordinator is only one person for an entire system and she has a business background rather than an education background so she is very technically skilled but has no skills with instructional technology integration support. Inside the classroom, the teachers feel that when they choose to use technology as part of their classroom teaching it is not as new and exciting for the kids. The children are coming into the classroom with more exposure to technology than in earlier years. In addition, as mentioned with the theme of resources, for many of the teachers their interns are both a resource for information about technology and ways it can be integrated into their classrooms and a strong source of support.

Theme 4: Teacher productivity

Threaded through all of the discourse on using computer-related technology in the classroom there was the issue of teacher productivity. For the teacher's who participated in this study there is a struggle at play:

I try my best to do things with it [the computer], but it is only a matter of so many hours in the day that you can devote to this at the cost of other things that have to be done (Bonnie).

They know of the potential benefits for using their computers and related resources as part of their teaching, but also worry about the balance between the time required to

prepare for using the technology effectively in the classroom and the point at which they are no longer using their planning and preparation time productively.

This is an issue for the teacher's of Blue Hills Elementary because of two reasons. The first of these has to do with the possibility that the technology might fail, whether that means the Internet connection is down or the software does not work as expected or the computer locks-up and crashes. There is no time to problem solve and they feel their only option is to move on:

Its like if the Internet will work we go online and they can see so much more and there is a lot more detail... I don't find myself planning at home an entire lesson around something I'm going to have to use, the Internet or something like that on the computer, because it is so iffy. But I'll use it, if it is available and we can get on. We will use it, but if its not, then I just kind of move on (Amy).

With regard to technology failing, many of the teacher participants in the lower grades don't feel their classroom environments, because of the young age and attention span of the children in their classrooms, afford them the time to figure out the technical problems when (and if) they occur:

I fear technical failure, because when things don't work it is awful. I work with twenty 5 year olds and when something doesn't work I have to be on it within two minutes. If there are two minutes lag time chaos reins. There is no "Honey, can you sit their and talk amongst yourselves while I fix things.". No. No. I switch it off and go "Whoop! Now we are doing this. I'll get to that later.". There is no window of even two minutes to resolve the problem so I have to know whatever I do I'm going to have to do it smoothly.... I think I also the fear the potential for lag time, the fact that I have to be on them so much, and that in the higher grades I could say "Gee. What is going on?" and it is no longer an issue but a lesson in problem solving. You can turn it right around. In the higher grade I would be saying, "Who are my techie people? Lets get over here." and I would turn that right around and make it into a lesson about what is going wrong and what is the

problem which might be more valuable than what I was doing in the first place with some of the kids. (Bonnie)

This means that preparing a lesson that incorporates technology requires preparing an alternate lesson plan just in case. The nature of the population that they are serving and their class size does not generally allow the time necessary to figure out the technical glitch. In addition, it is more difficult with the younger children to turn the technical difficulty into a problem solving exercise because of their age and maturity.

The second issue related to teacher productivity and technology integration is illustrated in Bonnie's comment on her first attempt to use the computers in her kindergarten class:

One of the first things I wanted to do with my computer was put on a show for the parents. I wanted to entice them during open house. So I made a little slide show loop and I took pictures of all of the children. I took the little pictures and then put each of them on a little page in the electronic storybook in Hyperstudio. On each page it had your name on the page and then recorded their voice saying "hello" and little clips about what part of the day they liked-- recess, lunch whatever, and which center they liked. I typed out a few little stories about fun things they had done in the classroom and then this was put with a little bit of background music and was going to flip the pages of our book throughout the open house time so parents could see their child's page come up. I was so excited and it took such effort. Hours and hours after school. Tweaking and wondering, "Why doesn't the music work?" and "Why doesn't this work and that"? But I was having fun because this is what I love. So I had a grand time doing this and only two parents showed up for the open house. Okay, so I said to myself, "The hours I put in and the time I spent!" but the kids loved it. They wanted to get to see it everyday just to see their little face pop up. I was really hurt, so I said, "OK, maybe that won't be the plan for next year". So then I thought, "What can I do about this?". Maybe I can capture it by playing it on the television, projecting it through the television and capturing it on videotape and I know they all have VCRs because they all tell me about the movies they watch. Maybe I could just loan the

little show out on videotape to the parents, but you know for the life of me I couldn't get the right cording to do the right capture, so the glitch stopped me and it never happened.

Residing within the theme of teacher productivity is the issue of fear of failure. The teachers have so little available free planning time, so loosing a large portion of this valuable time to a technical project is an unattractive and risky option. For most of the participants, the most effective way they experience using technology in their classroom is as a supplement to the existing plan.

On the positive side of teacher productivity, the computer related technology available at Blue Hills Elementary offer the teachers option for reducing some of the tedious aspects of their jobs, like making name cards, keeping their grades and maintaining general student records:

I said to myself, the next step here is to make life easy for me, because there is a teacher productivity issue. I thought I could sell this [using computers in the classroom], but I couldn't sell it to other teachers. If they saw me do four hours of preparation to make one slide show that nobody saw, that wasn't a selling issue. That was something I wanted to hide from everybody because they would say "What? Are you crazy? I don't want to do this." But I thought well if I show some teacher productivity then that will be a good reason for doing this. Then maybe I could sell it in that way. Get them enthused with how easy this is making my life and then sneaking around to the bells and whistles (Bonnie).

Summary

With the theme of teacher productivity, the teacher participants know the potential benefits for using their computers and related resources as part of their teaching, but also worry about the balance between the time required to prepare for

using the technology effectively in the classroom and the point at which they are no longer using their planning and preparation time productively. They are sometimes inhibited by their fear of failure and they have little available free planning time, so losing a large portion of this valuable time to a technical project is risky. To counterbalance the potentially negative issues related to teaching with technology on teacher productivity, the teacher participants utilize the computer-related technology to reduce some of the tedious aspects of their jobs, like making name cards, keeping their grades and maintaining general student records.

Timing

Threaded through all of the teachers' comments and all of the themes is the issue of time. The most often used words by the teachers in their interviews involved time, and included many varieties of the term: timing, occasion, break, moment, space and opportunity. It is apparent that the initial impact of working with technology in the classroom on these teachers could be characterized by the term timing. They spoke of everything whether it was resources, scheduling, support, or productivity as being a matter of having the time, making the time, giving the children time, being provided with the opportunity, or being given the time to work with the technology.

Integration of grounded theory

For the teachers at Blue Hills Elementary, the computer is part of their classroom environment. The school system has the objective of having technology access in every classroom. Computer-related technology is used for non-teaching tasks such as creating name-tags, calculating grades, and communicating with other teachers and staff, with the computer becoming a tool used as part of the teacher's daily work habits. Computer-related technology is used as part of classroom instruction to enhance whole group presentation, locate information on the Internet, and for practicing individual skills.

Each of the teachers that participated in this study are at different phases in their integration of technology into their classroom. In addition, they are personally at a variety of skill levels with technology. They are spurred on by what they perceive to be their responsibility to help the children get more familiar with computer-related technology.

I try to give them experiences. I try to get them familiar in third grade with using the keyboard and knowing different things of how to use the keyboard and how to make their capital letters and different things like that to be able to type something out because they are going to have to be able to do that all through their life and all through their educational careers and as part of their future jobs (Amy).

In Everett Rogers' classic diffusion of innovations theory, the innovation is defined as an "an idea, practice, or object that is perceived as new by an individual or other unit of adoption" (Rogers, 1995, p.11). West and Farr augment this definition by including concepts of intent and beneficial outcomes: innovation involves "the

intentional introduction and application within a role, group or organization of ideas, processes, products or procedures, new to the relevant unit of adoption, designed to significantly benefit the individual, the group, organization or wider society (West and Farr, 1990, p. 9). These definitions aptly fit the innovation of technology integration in the classroom. This innovation is new to principals, teachers, and librarians and it is also new for school boards, parents, and students. Its deployment is intentional, and expected to have beneficial outcomes on learning and preparation for life outside school. The innovation is diffused through a social system such as the school system, over time, as its merits are communicated via many channels.

CHAPTER V

DISCUSSION, RECOMMENDATIONS, IMPLICATIONS, AND CONCLUSIONS

Introduction

"A teacher affects eternity; he can never tell where his influence stops."

(Henry Adams, 1999)

Technology is a fact of American life. Computers, video, television, telephones, radio, and telecommunications networks exert an incalculable influence on how we live, work, and play. It is an influence likely to expand as hardware and software become more powerful, affordable and pervasive. New technologies are already essential tools for doing business and are quickly becoming a primary means for people to acquire information. For example, in 1994 an estimated 27 million-plus Americans regularly used electronic mail and related online information services, by 2000, the number of users of online services and email was estimated to be more than 157 million (NUA, 2000).

For students, the ability to use technology has come to be recognized as an indispensable skill. The Commission on Achieving Necessary Skills (2000) stated this in the starkest terms, "Those unable to use . . . [technology] face a lifetime of menial

work" (p.1). Recognizing their responsibility to prepare students to work and live in a technological society, the teachers who participated in the study work to teach students with and about technology. The question now is how can schools like Blue Hills Elementary use technology more effectively? Most policy discussions and technology initiatives have tended to focus on hardware and software acquisition, and student access to technology. However, in the enthusiasm to get technology to students, and in the context of limited resources, teacher issues have been shortchanged. When teacher needs are discussed, the emphasis is often on providing short-term training to familiarize teachers with a specific application or encourage general computer literacy. Seldom have policy discussions or initiatives centered on the relationship between technology and the teacher's role. Seldom have they articulated a vision of how technology can empower teachers to carry out all parts of their jobs.

Summary of findings

The study investigated how five teachers constructed their understanding of teaching with computer-related technology in the classroom and how they experience the integration process. The research questions were developed to explore the standpoints and experiences of the teacher participants using technology in their classrooms.

The researcher finds the lack of attention in educational research paid to teachers ironic, for at the center of effective use of instructional technologies are those

who oversee the daily activities of the classroom-- the teachers. To use new technologies well, teachers not only need access to them, but they also need opportunities to discover what the technologies can do, learn how to operate them, and experiment with ways to apply them. For teachers to make informed choices and wise uses of technology, they must be literate and comfortable with a range of educational technologies.

However, the use of technology in teaching, like any other change to the status quo, should be considered in light of the unique characteristics of the teaching profession. Indeed, teaching has been called many things: an art, a science, a calling, a way of life. Throughout history, teachers have taken up the tools at hand to help them teach--whether marking on clay with a stylus, or writing on a blackboard with chalk. As new technologies have emerged-- photography, filmstrips, radio and television-- teachers have used them to extend the range of what they could teach, illustrate ideas in different ways, bring new materials to students, and motivate learners.

The process of adopting new technologies has never been quick or effortless, however. Like all professionals, teachers have instructional methods, teaching styles, and working procedures that have served well in the past and that often reflect how they themselves were prepared. And like other large institutions, schools have organizational characteristics that make change difficult. Moreover, the unique culture of schools and changing public expectations for them create conditions substantially different from those of other workplaces.

Although teachers want to enlist all available tools to help their students learn, as new technologies have become more sophisticated, the transition has become even harder, requiring more training before teachers can use them effectively. Teachers, like many in society, can find themselves bewildered by the changing landscape of computer, video, and telecommunications technologies. Many are made skeptical by predictions promising that new technologies will reform education and change schools.

Making the connection between technology and teachers-- helping the teachers at schools like Blue Hills Elementary effectively incorporate technology into the teaching and learning process--is one of the most important steps the nation can take to make the most of past and continuing investments in educational technology. It is central to the ultimate goal fostered by these investments: not just helping students become competent users of technology, but helping them become more accomplished learners overall.

Discussion

Teaching and technology: The potential

You wouldn't want a doctor to remove your gall bladder without the latest technology and the skill to use that technology, would you? It's the same with teaching. It's a profession (Bonnie).

The teachers at Blue Hills Elementary have seen the promise of technology come to light in their community and throughout the country, where many teachers are using technology to teach their students. Some have found it to be a catalyst to stimulate new teaching methods and even redefine the role of teachers. But it is not only in the realm of direct student contact that technology has benefited these teachers. Many other aspects of a teacher's job--preparing materials, developing lessons, assessing student progress, enlisting parent participation, keeping up with advances in pedagogy and content, and participating in the professional community--can be accomplished with technology, often more easily and efficiently. When teachers discover ways that technology can strengthen their teaching, help them carry out administrative tasks, and enrich their professional growth, technology starts to make sense to them. It can be a resource for improving the preparation of new teachers as well. However, there are also many teachers who have not seen this potential, teachers whose use of technology is marginal, limited, and unenthusiastic. The stories and experiences of both these groups suggest lessons for policymakers.

Improving teaching with technology

The participants identified many examples of how technology can help teachers with all parts of their jobs. First and foremost, the teachers at Blue Hills Elementary want to ensure that their students are learning. If technology can be a resource to enhance student achievement and interest in learning, they are more likely to invest the time and energy to learn to use it in their teaching. However, the

relationship between technology and student learning is too often framed as a seemingly simple question: is teaching with computers and other technologies better than teaching without them?

Clearly, computers cannot change poor instruction and pedagogy into good, and there remain numerous questions about how, when, and how well alternative technologies contribute to student learning and achievement. Issues related to measuring the impact of various approaches to teaching, including the use of new technologies on student learning are complicated and beyond the scope of this study.

Many technology-using teachers find that technology can help them improve student learning and motivation, address students with different learning styles or special needs, expose students to a wider world of information and experts, and implement new teaching techniques. There are many examples of how technology has enhanced teaching:

- Students engaged in a group problem-solving project based on a software or video simulation are learning to work as a team, develop expertise in specific areas, become more confident learners, and weigh the merits of several possible solutions (Linda).
- Students, as part of a class project, interview other students with camcorders and create daily news shows (Rebecca).
- After the teacher downloads the data from her classes' weather station, students compare their weather data with weather data reported by students around the country, analyzing trends and predicting likely conditions (Ellen).

- A newly born endangered panda in China has its life chronicled online so that researchers and school can learn more about the species (Amy).

These kinds of experiences, while far from the norm in schools like Blue Hills Elementary, can and do occur in the classrooms with access to technology and teachers who can skillfully guide its use. In most of the above examples, teachers find that their students are doing more than learning generic technology skills or subject-specific technology applications. Rather, they see them developing the kinds of skills and competencies that numerous reform panels have encouraged as essential for all high school graduates--problem-solving skills; broader scientific literacy and mathematical understanding; strong communication skills; personal responsibility, integrity, and initiative; and skills and competencies for the workplace. Although these skills can be developed without technology, technological tools can help teachers' structure, organize, or enhance the activities that facilitate the development of these skills.

The participants in this study, although they felt over-taxed and at times helpless, indicated that they believed using computers has changed their teaching. Even though they have a long way to go in their development of a technology-enhanced classroom, several of the teachers expressed a belief in what is possible:

I know I don't do everything I can with the computers in my classroom. There is just so much out there and I should be doing more. The children love it. They are going to need to know how to use and computer as adults so I feel responsible to use it more and in better ways (Amy).

Assisting with daily tasks of teaching

Teachers perform a wide variety of duties in addition to being instructional leaders, including preparing lesson plans and instructional materials, keeping and transmitting records of student progress, attending school meetings, meeting with parents, and staying abreast of the profession. Yet schools rarely consider the role of technology in assisting teachers with the many parts of the job that go on when the students are not present. Technology can assist teachers with daily activities in many ways:

- With electronic grade book software, teachers can keep and more easily update running grading histories and profiles for every student and counsel them about problems as soon as they occur.
- Teachers can plan meetings with other teachers online and save time in coordinating multiple schedules.

Enhancing professional development for today's teachers

The teachers who participated in this study are learners too. They take courses, workshops, and other forms of training to fulfill re-certification requirements, learn new instructional methods, or keep up with changes in their specialties. However, the current approach--typically a short in-service course on a specific topic in which a large group of teachers are gathered in one place for an "injection" of training--is limited and often disliked by teachers, administrators, and parents alike. For example,

the district may gather elementary school teachers from across the district to spend a morning learning about a new strategy for teaching reading. This "one-size-fits-all" model of training is rarely used in other professions, and, although it may be efficient for school districts, research like this study suggest it is not the most effective way to encourage teachers to learn new skills or teaching approaches. It appears to be a poor method for encouraging teachers to use technology, where hands-on training with the hardware and software, curriculum-specific applications, and follow-up support are all more appropriate options.

Teachers and technology: The barriers

While promising, the examples of what technology can do are far from the reality in many schools, in colleges of education, or in the daily teaching experience or professional development of the typical teacher. There are a number of common barriers to more widespread use of technology by teachers.

First, there is the question of access to appropriate technologies. The question of access is also tied to problems of costs. Although the participating teachers in this study see the value of students learning about computers and other technologies, they lack a clear understanding about what resources technology can offer them as they try to meet their instructional goals.

- As do most users of emerging technologies the participating teachers encounter technical and logistical problems they cannot solve themselves and often lack the training and support necessary to resolve the problems.

- Many of the participating teachers feel the need for more knowledge--not just about how to run the machines--but about what software to use, how to integrate it into the curriculum, and how to organize classroom activities using technology.
- The current assessment system, if it relies heavily on standardized achievement tests, can also be a barrier to experimentation with new technologies because teachers are not sure whether the results they are seeking will be reflected in improved student test scores.
- In addition, issues created by technology itself are also factors to be dealt with, including those related to copyright and intellectual property rights, privacy of student records, and control of student access to objectionable materials.

A vision of goals and rationale for technology use

There is also a gap between having technology and using it effectively. Equipment is often placed in locations where it is inconvenient for regular classroom use. Furthermore, schools and teachers have received conflicting advice over the years about the best ways to use their technology. As the technology has evolved, so has the prevailing wisdom on how teachers should use technologies in schools--from teaching programming, to encouraging individualized drill and practice, to building computer literacy, to participating in electronic communities. Conventional thinking also has shifted about how to organize technology resources, from self-contained labs, to one computer per classroom for teacher demonstrations or single student tutorials, to a few computers per classroom on which students can work in small groups, to one

computer per student and on the teacher's desktop. It is small wonder that teachers have become confused, and administrators frustrated, with many educators unclear where they should be headed in directing technology use.

Support and training

Other barriers hamper more effective use of technology by teachers. These include lack of time, inconvenient scheduling, attitudinal barriers, and barriers of school organization, curriculum, testing, and other policies. In general, teachers have little in the way of technology support or training available at their schools, although many teachers seek training on their own. Currently schools spend much more on hardware and software than they do on training.

Furthermore, the kind of training, not just availability, is important. Much of today's educational technology training tends to focus on the mechanics of operating new machinery, with little about integrating technology into specific subjects, how to choose software, and how to organize. Regular, on-site support for technology use is an even more daunting problem.

Probably the greatest barrier to technology use, however, is simply lack of teacher time--time to attend training or workshops, to experiment with machines and explore software, to talk to other teachers about what works and what doesn't, and to plan lessons using new materials or methods. The diverse jobs teachers are asked to do and roles they are asked to play also affect their ability to take on another challenge. Teachers are given very little compensated staff development time and

there are multiple competing demands for this time. Unless there are significant changes to the rhythm of the school day or changed incentives for giving teachers more time to learn and experiment with new technologies, this barrier to technology use will remain immense.

Promising approaches to technology implementation

The challenge of integrating technology into schools and classrooms is much more human than it is technological. What's more, it is not fundamentally about helping people to operate machines. Rather, it is about helping people, primarily teachers, integrate these technologies into their teaching as tools of a profession that is being redefined through the process.

Some schools and colleges of education are developing approaches to technology implementation from which others can benefit. The approaches differ, depending upon the existing resources (human and technological) at a site, the visions the sites have developed for how technologies are to be used and what problems they can address, and the leadership and support marshaled to meet those goals.

Preparing new teachers with technology

In colleges of education where technology is an integral part of the teacher education pre-service program, technology has been used not just to train prospective teachers about technology, but also as a resource to enhance the overall teacher preparation experience. For example, live broadcasts, tapes, video networks, CD-

ROMs or computer-enhanced simulations can provide teacher education students with case studies or models of effective teaching. Furthermore, technology via networks can create closer connections among student teachers, college of education faculty, and mentor teachers in K-12 classrooms, whether in lab schools or professional development schools closely allied with colleges of education, or in more traditional student placement activities. Electronic networks can provide a safety net for communication, sharing knowledge, and experience for student teachers in the field, as well as for new teachers launching their careers. The loneliness and anxiety common to teachers' first teaching experiences can be mitigated through contact with professors and peers via electronic networks.

Federal policy issues and options

The appropriate federal role in education has always been debated. The extent to which there should be a federal role in assisting teachers to make the connection with technology is and will continue to be part of this debate. There is no question of whether technologies should be used in the nation's schools for purposes of instruction, administrative efficiency, and teacher professional development, as appropriate

The array of technology for education is diverse, changing, and flexible, and these characteristics enable development of hardware, software, and learning environments that can suit special needs, allow new approaches to teaching and learning, strengthen teaching, and create excitement in the classroom. The broad and

expanding range of educational technologies complements the diversity of the American education system. In the past, federal policy has often floundered on the enormous scale and differences that characterize American schools, compounded by the strong tradition of state and local control. In thinking about policy for technology, decisions can be made to allow for variation, change, experimentation and differing outcomes, and so strength can build upon strength.

Federal policy over the past decade has too often focused solely on generating funds for capital investment in hardware. Insufficient attention has been given to teacher preparation, development and support of learning tools and techniques, issues of connectivity, and the constantly growing demands on teachers' time. While direct funding or other financial incentives are, of course, effective ways to demonstrate leadership and commitment, if the federal government wants to support the expansion and appropriate use of technologies in K-12 schools and colleges of education, federal policy must go beyond funding. Leadership; a commitment to research, development, and dissemination; and most significantly, an increased focus on teachers are all central issues that need attention

Implications

Support for educational research, development, and the dissemination of research results has traditionally been viewed as an area of national concern, supported by federal funds. This is also true of such activities as they are related to

educational technologies. First, more and better information is needed on the effectiveness of various technology tools, and applications, including whether and how technologies work for teachers. Are some types of training or support more effective than others? Are they more effective for some type of teachers (by field) or by level (elementary versus secondary)? Some literature suggests that educational technology "takes off" when there is a critical mass of teachers committed to using it. Can this be substantiated?

Experience has shown that teachers must be given time to learn and prepare, adequate technical and content support, and a supportive attitude from the principal's office, but surely there is more to be learned about teachers and effectiveness. Although some recent studies are beginning to investigate how the teacher's work life is changed by technologies, there has been little research on teachers as members of work groups, or on the breadth of activities teachers undertake. All these are fertile areas for research.

Alternatively, the federal government, states, school districts, and schools could leave the topic of effectiveness research to private sector product developers or form research partnerships with local university-based, research-oriented colleges of education. One disadvantage of a private sector approach is that product developers may use research as an opportunity for marketing. Publicly funded research may be more likely to point out both the positives and negatives of a new technology. Clearly, the education community needs additional exploration of research strategies that will

lead to providing both accurate and timely results for use by adopters of new educational technologies.

A goal for states and localities that want their schools to function more effectively is to find ways to give teachers time for lesson preparation and learning, and support for continuing work. Exposure to new materials and resources, training in use of actual technologies, and development of new classroom patterns take time. They also require strong organizational support from principals, administrators, and colleagues. There is little point in acquiring hardware but making no provision for teacher development and support. Fortunately, technology itself offers some inherent solutions, if teachers can have equipment to use when they have time, and can be rewarded for learning. The use of telecommunications linkages to provide resources and opportunities for training is one of the most promising aspects of technology, but it cannot be a substitute for adequate time.

The importance of teachers for the effective use of technology, the need for expanding the population of teachers in the next decade, and the inclusion of teacher professional development in the national education goals suggest that the time is ripe to consider whether the nation wishes to make a more direct and coordinated commitment of federal attention and resources for teacher preparation and professional growth.

Conclusions

Bringing about change in the diversified US school system is a formidable task. With over 2.8 million teachers in the United States, and 3.3 million estimated to be needed by 2003, any attempt to "retool" or provide the entire existing teacher work force with new skills or knowledge will need to be done on a very large scale (SCANS, 2000). Most teachers have many years of teaching experience (the median is 15 years) and, at a median age of 42, most attended school before computers were used in the classroom (SCANS, 2000).

Teachers are an incredibly diverse group. Some already have experience with technology--computers at home, for example-- while others have never even been shown how to "boot one up." And some teachers are eager to experiment with new ideas even at the risk of failure, while others have little interest, energy, or time for experimentation. The great majority of teachers lie somewhere in between.

Technology has been viewed by a few as a frill, by some as a distraction, and by others as an intriguing but peripheral component of education. This study finds, however, that from the teachers' perspective, technologies offer the ability to do many traditional things efficiently and quickly, and is a way to encourage entirely new educational opportunities that may be of vital importance to the next generation of learners. If these learners are to make the most of the investments made in educational technologies, support must be given to the teachers who guide and encourage its use.

The vision is enticing. Computer technologies become the norm in schools that are equipped with multimedia, graphics and animation, access to Internet and hand-held and remote devices. There is seamlessness of learning activities among home, school and community settings. Students use technologies like they use pencils, books and manipulatives to learn content in all of the subject areas. Learning goes beyond skills and facts, and students develop thinking and problem solving skills. The world is their classroom. In this vision, technologies help students gain mastery of content areas and perform well above the standards. Computer technologies are the norm rather than the exception, and they become enablers rather than another subject taught in school.

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APPENDICES

APPENDIX A

INTERVIEW PROTOCOL

In Research Interviewing: Context and Narrative, Mishler (1986) describes an interview “as a discourse between speakers on the ways that the meanings of questions and responses are contextually grounded and jointly constructed by interviewer and respondent” (pp. 33-34). He also states: “In sum, in interviewing practices that empower respondents also produce narrative accounts. There is however, an additional implication of empowerment. Through their narratives people may be moved beyond the text to the possibilities of action. That is, to be empowered is not only to speak in one’s own voice and to tell one’s own story, but to apply the understanding arrived at to action in accord with one’s own interests” (p. 119).

The method for this project is grounded in the above propositions. The topics selected focus on how these teachers’ constructs meaning about their experiences through narrative. These topics serve as guides during the interview process, ideally resulting in similar areas being discussed in each interview.

This interview protocol will investigate the teachers’ personal background, their various teaching experiences, their feelings about instructional technology in the classroom and their personal experiences teaching with technology and integrating it into the curriculum.

Research Question #1: What are the experiences of teachers teaching with technology in their classrooms?

- Tell me about your career so far. Where and what grades have you taught?
- Describe for me in some detail (so I can picture it in my mind) your teaching situation before you started using technology in the classroom.
 - Tell me about the children.
 - Tell me about the classroom
 - How would you characterize the support you received from the principal, other teachers and parents?
- What sorts of experiences did you have in your life that informed you about using instructional technology in the classroom?
- Describe for me how you decided to start using technology in your classroom.
- How did you prepare?

Research Question #2: How do these teachers respond to this experience? **AND**

Research Question #3: What are the factors that shape and give meaning to their experience?

- Take me back to the first time you used computer-related technology in the classroom. What was your impression?

- Tell me in any way you wish to, about the first year of using technology in your classroom. What stands out for you?
- As you approached your second year using technology in your classroom, did you feel differently?
- Think of some time when you felt really good as a teacher using technology in your classroom and describe them to me.
- Think of some time when you felt frustrated as a teacher using technology in your classroom and describe them to me.
- What are the kinds of things that assist you as a teacher with technology in the classroom?
- What are the kinds of things that make teaching with technology difficult?
- If we could move back the hands of time, back to the time before you used technology in the classroom, what would you have done differently from then on?
- In what ways has this experience been positive for you?
- In what ways has this experience been negative for you?
- How do you feel about your teaching situation now?
- Tell me what ideas you have for how things could be changed to help other teachers like you who are trying to integrate technology in their classroom?

APPENDIX B

STATEMENT OF INFORMED CONSENT

"Teaching With Technology: A Qualitative Study Exploring The Experiences Of Teachers"

This research project focuses on the absence of the teacher's perspective in the literature by focusing on the experiences of teachers involved in teaching with technology and integrating it into the curriculum. The purpose of the study is to gain an understanding of how the teachers negotiate the challenges inherent in teaching with this new medium of technology. This study will examine the attitudes, knowledge, skills, dispositions, barriers and events that construct, shape, and give meaning to the experience of teaching with technology. With your permission, the information needed to learn about your experience will be gathered in a qualitative interview study.

If you choose to participate, you will be interviewed once, with the interview lasting approximately two hours. You may end the interview at any time and withdraw from the project at any time without penalty. We ask that you do not discuss your interview or the topics discussed with other participants in the study.

These interviews will be audio taped so that there will be an accurate account of your story. The audio-tapes will be stored in a locked filing cabinet in the office of the project advisor, Dr. E. Dale Doak, at the University of Tennessee, Knoxville. Only the project advisor and I will have access to the tapes. As soon as the audio-tapes are

transcribed, they will be erased and participants will be identified with pseudonyms in the transcripts.

After the study is complete, your transcript identified by pseudonym will be destroyed and you will be provided with a copy of the data analysis. This consent form will be maintained and stored for three years after completion of the study at a UT location. These measures are to ensure that your information will remain confidential.

There are no anticipated risks to you beyond those experienced in the course of everyday life. Although there are no direct benefits, there is a possibility for an increased understanding of the experience of teaching with technology. Your participation is completely voluntary. You may end the interview at any time and withdraw from the project at any time. There will be no compensation or incentives for participation and no penalty for withdrawal from the study.

You may direct any questions you may have about this project and your rights as a participant to me: Ashley Montgomery, at 400 Dunford Hall, the University of Tennessee, Knoxville, TN 37996 or to my project advisor, Dr. E. Dale Doak, in the Instructional Technology, Curriculum and Evaluation Department, at (865) 974-8140.

I _____, have read and understand the above description of the research to be conducted by Ashley Montgomery for her doctoral dissertation at the University of Tennessee College of Education. I agree to participate in this study with the understanding that I can withdraw from the study at any time without penalty. I agree to participate in the interview process and for the interview to be audio-taped. I understand that you will provide me with a copy of the finished product.

Name

Date

Signature of Participant

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I. IDENTIFICATION OF PROJECT

1. Principal Investigator

Joella Ashley Montgomery
College of Education
Department of Instructional Technology, Curriculum & Evaluation
2711 Muscadine Drive
Maryville, TN 37803
(865) 983-5122
montgome@utk.edu

Faculty Advisor

Dr. E. Dale Doak
College of Education
Department of Instructional Technology, Curriculum & Evaluation
307 Claxton Addition,
Knoxville, TN 37996
(865) 974-8140
ddoak@utk.edu

2. Project Classification: Dissertation
3. Title of Project: Exploring Teachers' Experiences Integration Technology into Their Classroom Practice
4. Starting Date: "Upon IRB Approval"
5. Estimated Completion Date: July 1, 2000
6. External Funding: Not applicable

II. PROJECT OBJECTIVES

The purpose of the study is to gain an understanding of how teachers negotiate the challenges inherent in teaching with computer-related technology. This study will examine the attitudes, knowledge, skills, dispositions, barriers and events which construct, shape, and give meaning to their experience teaching with technology. Using the work of Calderhead (1996), Shulman (1987), Grossman (1990), Borko & Putnam (1995), and Schubert and Ayers (1992), this study focuses on the voice and experience of teachers working with and incorporating computer-related technology into their teaching practice. The voice of the teacher and their sharing of first-hand experience has gained strength and recognition in the area of educational research (Ben-Peretz, 1995; Clandinin & Connelly, 1994; Welker, 1992; Kagan, 1993). In

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addition, this study will address the absence of the teacher's perspective in the literature by focusing on the experiences of teachers involved in teaching with technology and integrating it into the curriculum.

III. DESCRIPTION AND SOURCE OF RESEARCH PARTICIPANTS

The research will be conducted at [REDACTED]. Participants in this study are ten teachers from [REDACTED] Elementary School who share the common experience of teaching with computer-related technology and integrating it into the curriculum. Their experience with the phenomena being studied (integrating and teaching with computer-related technology into their classroom) and their willingness to discuss their experience make them ideal participants in the study. The identification of subjects for this study will take place in a meeting with the principal and faculty of [REDACTED] Elementary. They will be selected for participation based on the recommendations of the school's principal and each teacher's willingness to participate in the study.

IV. METHODS AND PROCEDURES

In order to examine the experiences of teachers incorporating computer-related technology into their curriculum and teaching practice, in-depth personal narrative interviews (Weiss, 1994) and chronologies of life experience (Clandinin & Connelly, 1994) will be collected, analyzed, and interpreted from each teacher individually. No information will be collected from the teacher's students and their classroom will not be observed.

The teachers' participation in this study is voluntary. It will be explained to them that this research project focuses on the absence of the teacher's perspective in the literature by focusing on the experiences of teachers involved in teaching with computer-related technology and integrating it into the curriculum. The participants will be interviewed once, with the interview lasting approximately two hours. They will be asked to not discuss their interview or the topics discussed with other participants in the study. An interview guide (attached) will be utilized. Interview sessions will be audio-taped to facilitate transcription of the information. Each interview will be transcribed as soon as possible in preparation for data analysis. As soon as accurate transcriptions are completed the audio-tapes will be erased.

Data analysis will be conducted by the principal investigator throughout the interviewing and writing process. A qualitative interview method based on grounded

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theory will be utilized in order to facilitate pattern matching. As part of the analysis, each participant will be provided with the initial data interpretations and asked for feedback.

V. SPECIFIC RISKS AND PROTECTION MEASURES

Those participating in the study will be subjected to minimal risk. Procedures are non-invasive. Participation in the interview sessions will be strictly voluntary, and participants will be advised both verbally and via Informed Consent (attached) that they may terminate the interview at any time. The participants will be interviewed at times convenient to them, and in a quiet, unobtrusive place agreed upon by the participants and the principal investigator. Confidentiality will be maintained through the use of pseudonyms. Verbatim transcripts of the interviews are mandatory for content analysis. The only written identification of the subjects will be their signatures on the Informed Consent Statements, and these will be kept in a separate file in a locked file cabinet in the office of the project advisor, 307 Claxton Addition. Access to all data, with pseudonyms, will be limited to the principal investigator, the project advisor, and the transcriptionist. The transcriptionist will be privy only to the audio-tapes using pseudonyms. Once accuracy is checked and modifications made to ensure confidentiality, the audio-tapes will be erased. These precautions assure a minimal risk to confidentiality. Audio-tape recordings will be utilized for accuracy only and will be modified to ensure confidentiality. The tapes will be erased. Interview transcripts will be utilized for compilation and analysis of data. Access to the data will be limited to the principal investigator and the project advisor. Data analysis will be used solely for the principal investigator's doctoral dissertation. Transcripts will be destroyed after the study is completed. Consent forms will be maintained and stored for three years after completion of the study in the office of the project advisor, 307 Claxton Addition.

VI. BENEFITS

There are no anticipated risks to participants beyond those experienced in the course of everyday life. Although there are no direct benefits for the participants, there is a clear benefit with the possibility for an increased understanding of the experience of teaching with technology. The "telling of one's own story" often has positive effects, which can be anticipated for those who choose to participate in the research project. Their participation is completely voluntary and they may end the interview at any time and withdraw from the project at any time. There will be no compensation or incentives for participation and no penalty for withdrawal from the study.

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VII. METHODS FOR OBTAINING "INFORMED CONSENT" FROM PARTICIPANTS

The investigation will be explained to all persons involved and permission will be received. Reading and signing of an Informed Consent Statement (attached) will occur prior to interviewing. A copy of the statement, complete with name and address of the principal investigator and project advisor will be given to the participants. The consent statements will be kept in a locked cabinet in the office of the project investigator.

VIII. QUALIFICATIONS OF THE INVESTIGATOR(S) TO CONDUCT RESEARCH

The principal investigator is a doctoral student in the Department of Instructional Technology, Curriculum & Evaluation in the College of Education, the University of Tennessee, Knoxville. She has a master's degree in instructional technology. The principal investigator has been involved in qualitative research courses, (HTL695) Naturalistic Inquiry Methods and (PSY613) Existential Phenomenology.

The project advisor is a Professor in the Department of Instructional Technology, Curriculum and Evaluation in the College of Education and the Director of the Curriculum Laboratory. He holds an Ed. D in Instruction/Curriculum from the University of Colorado, a M.A. from Eastern New Mexico University in Administration and a B.S. in Secondary Education from Eastern New Mexico University.

IX. FACILITIES AND EQUIPMENT TO BE USED IN THE RESEARCH

The interviews will be conducted in a conference space at [REDACTED] Elementary School. The interviews will be audio-taped with a hand held tape recorder and transcribed with the assistance of a Dictaphone.

X. RESPONSIBILITY OF THE PRINCIPAL/CO-PRINCIPAL INVESTIGATOR(S)

By compliance with the policies established by the Institutional Review Board of The University of Tennessee, Knoxville, the principal investigator(s) subscribe to the principles stated in "The Belmont Report" and standards of professional ethics in all research, development, and related activities involving human subjects under the

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auspices of The University of Tennessee, Knoxville. The principal investigator(s) further agree that:

1. Approval will be obtained from the Institutional Review Board prior to instituting any change in this research project.
2. Development of any unexpected risks will be immediately reported to the Compliances Section.
3. An annual review and progress report (Form R) will be completed and submitted when requested by the Institutional Review Board.
4. Signed informed consent documents will be kept for the duration of the project and for at least three years thereafter at a location approved by the Institutional Review Board.

XI. SIGNATURES

ALL SIGNATURES MUST BE ORIGINAL. The Principal Investigator should keep the original copy of the Form B and submit a copy with original signatures for review. Type the name of each individual above the appropriate signature line. Add signature lines for all Co-Principal Investigators, collaborating and student investigators, faculty advisor(s), department head of the Principal Investigator, and the Chair of the Departmental Review Committee. The following information should be typed verbatim, with added categories where needed:

Principal Investigator _____

Signature _____ Date _____

Co-Principal Investigator _____

Signature _____ Date _____

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XII. DEPARTMENT REVIEW AND APPROVAL

The application described above has been reviewed by the IRB departmental review committee and has been approved. The DRC further recommends that this application be reviewed as:

☐ Expedited Review -- Category(ies): _____

OR

☐ Full IRB Review

Chair, DRC _____

Signature _____ Date _____

Department Head _____

Signature _____ Date _____

Protocol sent to Compliance Section for final approval on (Date) _____

Approved: Compliance Section
Office of Research
404 Andy Holt Tower

Signature _____ Date _____

For additional information on Form B, contact Brenda Lawson by email at blawson@utk.edu or by phone at 974-7697.

DATE: April 18, 2000

FROM:

TO: K-5 Classroom Teachers

RE: Research Project

CC:

Dear friends and colleagues, I am writing to let you know that one of our UTK doctoral students, Ashley Montgomery of Maryville TN, is interested in interviewing teachers for her doctoral dissertation and is wondering if any of you might be interested in participating. She wants to know about regular classroom teachers' experiences with using technology in teaching. My understanding is that she will be doing this during May and would be more than willing to schedule interviews at your convenience.

I can tell you from personal experience (I taught Ashley in two classes and she was our technology person in the College for several years) that she is a delightful person and one of my favorite things about her is that even though she knows almost everything about computers and what they can do, it always feels safe to ask my own questions, however simple they might be. Ashley is NOT one of those "techie" who makes you feel inadequate about what you know and don't know, and I value that about her. She is genuinely interested in knowing about teachers' experiences so that when she leaves UTK and goes into teacher education herself she can do the best job possible.

If you would be willing to let Ashley contact you about possibly participating in her study, you can let me know and I'll forward your names etc. to her, so that once she has her paperwork for UTK lined up she can just jump in and call or e-mail you to let you know more about it. You can either put a note in my box or email me at
, whichever is more convenient.

And of course let me know if you have any questions. Thanks for considering this!

VITA

Ashley Montgomery has earned a B.A in Art History, a M.S. in Instructional Technology, and will receive her Ph. D. in Education in December 2000. Her concentration was in Instructional Technology with a collateral in Early Childhood Education and a cognate in Information Sciences. She is currently the Director of Instructional Technology and Support Services at the University of Maine at Farmington.