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Teachers and Telecomputing: A Matter of Decision

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Teachers and Telecomputing: A Matter of Decision

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Dissertation

Presented to the Faculty of the Graduate School of

The University of Texas, Austin

in Partial Fulfillment

of the Requirements

for the Degree of

Doctor of Philosophy

The University of Texas at Austin

May, 2006

Dedication

This dissertation is dedicated to my family and friends who have been very patient with me during this process and to the classroom teachers who so graciously accepted the invitation to participate in this study.

Acknowledgements

The teachers who participated in this study gave of their time and spoke candidly of the day-to-day routine in their classrooms. I extend my deepest gratitude to them for allowing me to visit their classrooms and for sharing their reflections about their use of telecomputing tools and resources. I also thank the principals for their warm welcome and providing me the opportunity to visit with their teachers. This study could not have been written without them.

My greatest supporter, Dr. Min Liu, is also my chair and my teacher. I will always be grateful that she agreed to be my chair even when her plate was full. She provided the wisdom, clarity, and the encouragement I needed to get through this research process. Thank you, Dr. Liu.

I cannot express enough my appreciation to my committee members who have stood by me and to those who joined my committee when I needed them the most. Dr. Candace Figg, my good friend, who was a member of my study group and peer debriefing group provided me with words of wisdom and light-hearted moments. Dr. Patricia McGee, who commutes from Austin to San Antonio, has offered encouragement throughout this journey. Dr. Mary Lee Webeck and Dr. Sherry Field joined my committee when unforeseen circumstances opened up two vacancies and they stepped in. I am forever grateful for their support and encouragement. In memoriam to Dr. Oscar Mink, though his time on my committee was short, his kindness and support were very much appreciated. Dr. Judi Harris, my first chair, who accepted a faculty position at another college, imparted her indelible enthusiasm for scholarly work and to Dr. Paul Resta for his knowledge and support.

Muchísimas gracias to my peer debriefing groups who understood this journey and who not only provided academic support but also the camaraderie that kept me going. The first group saw me through the proposal defense—Dr. Cody Brady, Dr. Carolyn Awalt, Dr. Mark Christal, Dr. Archie Wortham, and Dr. Lynda Abbott. Their on-going support was invaluable with goal setting and feedback. A special thanks to Lynda Abbott who shared unselfishly her expertise and experience in all areas of the research process. I sincerely appreciated the group's consideration in setting our meeting times to accommodate my commuting time. Archie continued in my second group with Sharla Jones, who carpooled with me at times. We moved our meetings to San Antonio since we were all commuting to Austin. Archie and Sharla continued to provide feedback, make suggestions, and set timelines for completing the study.

My family, friends, and co-workers were never short on understanding and encouragement, even when I skipped a few functions to work on this study. My sister Lucy, also a teacher, provided a reality check and invaluable support.

Teachers and Telecomputing: A Matter of Decision

Publication No. ___________

Tracey Victoria de la Garza, Ph.D.

The University of Texas at Austin, 2006

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This interpretive study examines six teachers—two high school, one middle school, and three elementary—who use telecomputing tools in curriculum-based learning. The teachers were interviewed and observed in the context of their classrooms. The data were analyzed with emergent themes providing the foundation for the findings of this study.

The six informants in this study made decisions about how, when, and why they use telecomputing tools in curriculum-based learning. The decisions these informants made remained within the parameters of the state and district mandated Texas Essential Knowledge and Skills (TEKS). Their use of telecomputing tools was heavily influenced by several factors: time, student ability, grade level or content, and safety concerns. Hardware, software, and the infrastructure for online

connectivity were not mentioned by the informants as barriers in their use of telecomputing tools. Though major problems of a technical nature were experienced by the informants, these problems occurred at the beginning of the school year but were rectified with little impact on the rest of the school year.

The use of telecomputing tools required informants to plan beyond what they would have without the use of telecomputing tools. The lack of time to fully integrate the use of telecomputing tools into their teaching practice limited the informants from using these tools more in curriculum-based learning. Student ability and grade level were deciding factors. Informants with younger students in kindergarten tailored the use of telecomputing tools to their students' ability. Similarly, informants with intermediate, middle, and high school age students used their students' computer literacy skills to group students for collaborative learning using telecomputing tools and resources. Safety concerns were a big issue for each of the informants. The overwhelming task of supervising each student's use of the Internet and e-mail made the informant's hesitate or more cautious in using telecomputing tools especially e-mail. The Professional Instruction Model is discussed with implications for designing lessons.

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Chapter One: Introduction

TEACHERS' INSTRUCTIONAL DECISION MAKING

One of the problems facing schools with online connectivity is the low number of teachers integrating the use of telecomputing tools and resources into PK-12 curricula as a routine practice (Keller, & Bichelmeyer, 2004; Marra, Howland, Wedman, & Diggs, 2003; Zhao, Pugh, Sheldon, & Byers, 2002). Since teachers are the primary decision-makers about what occurs day-to-day in K-12 classrooms (Mitchem, Wells, & Wells, 2003), the low incidence of curriculum-based telecomputing should be considered to be a result of teachers' instructional decisions, and the reasons for these decisions need to be uncovered. This study will examine how classroom teachers make decisions about how, why, and when they use telecomputing tools and resources to support curriculum-based learning.

Steps in Technology Integration

My interest in teachers' decision making about their use of telecomputing tools and resources in curriculum-based learning stems from a pilot study in 2001 investigating the specific point in their teaching practice when teachers move from using technology for skill and practice to integrating technology into their classroom teaching. In my interviews with six elementary teachers to find out at what point they had made this transition, references to professional development emerged as an important factor in their moving from drill and practice to integration. More importantly, teachers made different decisions concerning professional development and these decisions varied with each teacher. For example, one teacher decided to practice the skills that she expected would be presented in an upcoming professional development workshop prior to attending the workshop so that she would not feel intimidated by other participants whose computer skills were more advanced. Another teacher attended the workshops so that she would be prepared to troubleshoot technical problems before attempting to use the computer in her classroom. A teacher who had gained more computer skills shared what she had learned at the workshops by supplying her colleagues with a disk of lessons she had prepared. Another teacher took advantage of her family members' technical skills to provide assistance when she needed help following the workshops. Other teachers adapted what they had learned to suit their students' grade level curriculum or for a specific population such as the talented and gifted or special education students. Although these teachers took the same workshops, each made different decisions about how, why, and when they used the concepts and skills they had learned about integrating technology.

The findings from the pilot study, coupled with my awareness that schools in my district with online connectivity were experiencing low numbers of teachers who were integrating the use of telecomputing tools and resources into their curricula as a routine practice, prompted me to examine teacher decision making about the use of telecomputing tools and resources in curriculum-based learning.

Adopting New Technology Tools

As the technology teacher for a pre kinder through fifth grade public school, I have witnessed the long, slow-paced process of wiring the schools for Internet access, as well as the gradual acquisition of computers for every teacher and every classroom. Before E-rate and before the President's Technology Goals (U.S. Dept. of Education, 1998), the decisions I made as a classroom teacher about how, why, or when I would use computers in my classroom were totally mine to make. No one made inquiries about whether I was using computers with my students.

Students today are growing up in an environment different from the one most of their teachers experienced. Teachers tend to teach the way they were taught, for veteran teachers it was without the use of telecomputing tools. Today's students are expected to function not only competitively but also to be able to work collaboratively in a global society. Business use of technology, the rapid changes in technology, and national and state educational technology standards have changed the face of education. Students benefit when their teachers have developed knowledge and skills in integrating the use of telecomputing tools into their teaching practice.

Employed as the campus technology literacy teacher, I have the task of providing professional development for technology integration to meet the technology application

TEKS and benchmarks the district had set for its campuses. I was faced with teachers at various stages of adopting technology, including the use of telecomputing tools for curriculum-based learning. Moving from the initial use of computers for drill and practice to integrating technology into curriculum-based learning is not an easy undertaking. Adoption of new ideas, according to Rogers (1995), is a difficult process. The use of computers in the classroom was not an entirely new idea, since some drill-and-practice types of instructional units had already been used for a number of years (Bagley & Hunter, 1992; Dockstader, 1999; Norris, Soloway, & Sullivan, 2002). However, with the recent installation of the infrastructure for Internet and e-mail capability, the use of telecomputing tools was relatively new. Most teachers were at the non-adoption stage of Rogers' model of the innovation-decision process (Rogers, 1965).

Although the majority of teachers currently teaching were not required to become technology proficient when they completed their teacher certification program, the teachers at my school had the technology and infrastructure in place, professional development was available to them with stipends provided, and on-going support was available to them throughout the school day. Why, then, were teachers deciding not to follow through with implementing the use of telecomputing tools into their teaching practice? If students are expected to be technology proficient, why are teachers not jumping on the bandwagon to provide instruction and role modeling?

EXAMINING THE TECHNOLOGY-ADOPTION PROCESS

I decided to further explore why some teachers have been successful at using telecomputing tools in curriculum-based learning by examining the types of decisions teachers make in their efforts to integrate technology into their daily practice. I expected that teachers with appropriate professional development and instant access to online resources would be integrating technology as a routine practice. When this did not happen, I began to think about the type of decisions teachers were making when they decided to use technology.

The process of getting an e-mail account and using it provides an example of how teachers make technology-adoption decisions. District employees on campus applied for and received an e-mail account. They were then sent form letters in distinctive yellow envelopes that gave them their passwords. Having an e-mail account, having the hardware to access their e-mail, training in how to use it, and having a vice principal who did all his correspondence by e-mail had little or no impact on teacher use. In fact, because of the lack of response to his e-mail messages, the vice principal asked whether everyone was connected. By the end of three months, most teachers and tutors had lost or misplaced their passwords and could not remember how to log on—even though each had received a step-by-step procedure.

Avoiding Change

The few teachers who were accessing their e-mail shared the contents with the rest of the teachers, so there was no need for others to log on. In addition, the principal continued distributing hard copies of messages, updates, and any directives she deemed important, feeling that teachers might miss them if she sent them by e-mail. This served to reinforce the behavior of teachers who were not accessing their e-mail. The handful of teachers who chose to log on and access their e-mail became the “unofficial” team leaders for their grade levels. At this point, I realized that the teachers had maintained the status quo (Little, 1990) by learning of events from others who had retrieved their e-mail, printed hard copies, and shared the information with their colleagues through lunchroom conversation or grade level meetings.

Needs-Based Adoption of New Technology

No progress was made in increasing the teachers’ use of e-mail until the vice principal used e-mail to send forms that the teachers were required to complete for student discipline, the Professional Development and Appraisal System (PDAS), information on emergency contingencies, and schedule changes. Because teachers had to complete these forms and send these to the vice principal via e-mail, they were forced to start reading their e-mail, lest they miss his imposed deadlines. The principal, in turn, began requiring teachers to e-mail their PDAS forms to her and posted a deadline. There was then a rush for teachers to get their e-mail passwords, which became a priority for them. Getting teachers to learn to use e-mail in corresponding with their colleagues and administrators was facilitated by making the use of e-mail a vital link and sole source of information about important issues about which teachers needed to know and to act on in a timely manner. The effort to get everyone to use his or her e-mail on a regular basis took approximately a year and a half. This example illustrates a specific instance in which teachers made decisions about their use of technology as a regular part of their practice.

Critical Step: Deciding to Change

The experiences described above, with teachers' choices in integrating e-mail into their routine practice demonstrated to me how critical to the technology integration process it was for teachers to decide to participate. Just as the teachers in my school decided not to use e-mail until it became essential for them to do so, it seemed that perhaps teachers viewed the incorporation of other telecomputing tools in classroom instruction as non-essential or as a task beyond their knowledge and skills (Ellis, 1992; Pastore, 2001; U.S. Department of Education, 2000). In addition, teachers might not feel comfortable about using telecomputing resources and might lack the support and professional development to do so (USDE, 2000).

Teaching with Technology

For teachers, integrating technology into the curriculum is a more difficult task to tackle than their use of e-mail for professional communication. Integrating technology into the curriculum includes the requirement for teachers to use telecomputing tools and resources. In order to understand teacher decision making about their use of telecomputing, it is thus important to understand technology integration.

Findings from the Study of Education Resources and Federal Funding (U.S. Department of Education, Planning and Evaluation Service, 2000) found that teachers and principals identified teachers' lack of understanding about how to integrate technology into the curriculum as a barrier to using technology effectively. I found that teachers at each grade level at my school used technology to support the type of learning environment that was already in place. For example, the primary grade teachers used their computers as centers to reinforce basic reading and math skills. First and second grade teachers used their classroom computers for student story writing and illustrating using KidPix®. Third grade teachers focused more on math content software programs than the lower grade teachers. Fourth grade teachers did not use computers with students with any regularity because of the pressure to prepare their students for the Texas Assessment of Academic Skills (TAAS) writing subtest. The fifth grade classrooms each received five new computers wired to the local area network, and teachers began almost immediately teaching their students to search the Internet for information related to their research topics. Student use of computers and the Internet increased dramatically for these fifth grade students and their teachers but not in any of the other grade levels at my school.

Computer Infrastructure Provided

As each grade level classroom acquired more computers, it became evident that not all teachers would make full use of online connectivity. It was not for lack of hardware or technical support (Waxman & Huang, 1995). Of the teachers who did use online resources extensively, the choices they made about how they were using these tools varied. Physical placement of computers in classrooms and setting up the hardware are clearly visible and teachers' behaviors resulting from their following administrative directives or mandates to use the equipment for specific tasks are also easily observable, but teachers' decisions that come from within—which may determine the extent to which networked resources are actually used in classroom teaching—are not as discernible.

As schools continue to invest in hardware and software, the push for teachers to integrate technology into their curricula is evident at the highest level of government (Brown, 2000). The increasing presence of computers in the classrooms with online connectivity has prompted policy makers, administrators, and the community to demand more accountability about how teachers make use of this global connectivity (Keller & Bichelmeyer, 2004; Norris, Soloway, & Sullivan, 2002; U. S. Department of Education, 2000).

Changes in Teaching

Along with the influx of technology into classrooms, education is undergoing a paradigm shift from the traditional skill and practice approach to one which focuses on the students' learning of critical thinking and problem solving skills (Cavanaugh, 2003; Howland & Wedman, 2004; Roman, 2004). Early research noted that teachers' use of technology in the classroom maintained the status quo, helping them use a traditional skill and practice. The shift in emphasis to teaching students critical thinking and decision making skills—along with advances in technology—have given teachers a double challenge, but has also provided them with tools that can help them better meet the challenge of providing for the needs of the student. Unfortunately, the low incidence of teachers who are integrating telecomputing tools into curriculum-based learning suggests this double challenge may be a difficult adjustment for most teachers.

How Teachers Decide

Chapter 2 of this study describes current research and what has already been learned about teacher decision making and planning in the context of the traditional classroom. This study seeks to expand the body of knowledge of teacher decision making in the context of the wired classroom and in a classroom environment that goes beyond the skill and practice approach to teaching and learning. Because planning is an integral part of what goes on in the classroom and a gateway to teachers' thinking, it is discussed with some detail. The complexities technology introduces into the classroom environment are discussed briefly.

Since teachers have direct contact with students and are the primary determinants of what happens in the classroom, exploring how, why, and when teachers make decisions in their use of telecomputing tools in the classroom may shed light in understanding the low incidence of curriculum-based telecomputing.

The purpose of this study is to discover why more teachers are not using telecomputing tools by examining the decisions made by teachers who are using telecomputing tools in curriculum-based learning.

Chapter Two: Literature Review

This chapter provides the framework for this research study. It is situated, first, in decision theory because “any teaching act is the result of a decision, either conscious or unconscious” (Shavelson, 1973, p. *iii*) and situated, second, in instructional planning because instructional planning is reflective of teachers’ thinking and consequent classroom behaviors. These topics are discussed in the following sections. Technology integration and barriers to technology integration are also discussed, with emphasis on telecomputing in the classroom, which is defined and described, along with examples of different types of electronic networking in the classroom.

DECISION MAKING

One of the challenges of studying decision making is that thoughts cannot be observed. Instead, researchers look at behavior that occurs because of specific decisions being made (Clark & Peterson, 1985; Shavelson, 1973). However, in observing only behavior, then the intent of the decision that resulted in that behavior may not be fully revealed. In order to address this issue, several decision-making processes will be examined to better understand teachers’ thought processes as they make decisions.

A number of studies have explores teachers' decision making and how they plan for instruction in a non-connected classroom environment (Bullough, 1987; Clark & Yinger, 1987; Shavelson, 1973). Current research about teacher decision making focuses on lesson planning for developing student decision making skills, on models for making group decisions, and on projects and activities using telecomputing tools (Ingram, Louis, & Schroeder, 2004). This study places the focus on teachers' decision making in a school climate different from the earlier studies—an educational climate in which teachers are experiencing a paradigm shift hastened by evolving technology and educational reform. If teachers approached professional development in different ways in the pilot study, perhaps teachers also approach decision making in various ways.

Understanding various theories and concepts about decision making may shed light in understanding the decisions teachers make concerning their use of telecomputing tools and resources. Decision theory, according to the *Web Dictionary of Cybernetics and Systems* (Heylighen, 2000), is a "body of knowledge and related analytical techniques of different degrees of formality designed to help a decision maker choose among a set of alternatives in light of their possible consequences." Individuals choose the best alternative according to the information available to them at the time (Simon, 1979). At times, not all alternatives are considered and an individual may decide on an alternative that is "good enough," referred to as the satisficing principle (Tedeschi &

Felson, 1994). Deciding whether one teaching approach, as compared to another is "good enough" is a key issue in the decision making process which is explored next.

The Decision Making Processes

Decision making (Tedeschi & Felson, 1994) is the result of two processes: creating an array of alternatives and evaluating these alternatives before acting. In generating alternatives, an individual develops expectations or beliefs about the consequences which may follow an action. Thus, foresight is needed to choose among possible choices of behaviors before taking action. Evaluating alternatives involves a more complex process. Whether an individual is making a split-second decision or has time to process information and think before acting, elements of the decision making process operate in the same way.

"The immediacy of some teaching situations calls for prompt responses, giving teachers less than optimal conditions in which to process information to make a reflective and informed decision" (Shavelson & Stern, 1981, p. 456). Shavelson has argued that decision making is the basic teaching skill, and that teachers' decision making is guided by their experience and expectations of the many complexities of the classroom. In order to respond to the immediacy of the classroom situation, teachers may need to react quickly, without the benefit of having time to processing information. The teachers' decision making process may thus be reduced to a simplified model of reality. The limitations imposed by simplifying complex situations render teachers' information processing capabilities and decisions made within these constraints to be considered reasonable. In light of this, Shavelson and Stern consider teachers' decision making and judgments to be rational. Although within the given circumstances these decisions are considered reasonable, they may not be sufficient to meet the goals set by the teachers or others (p. 457).

For teachers, the decision making process, according to Tedeschi and Felson (1994), is comprised of four main elements: (1) perceived value of the outcome, (2) the probability of success, (3) considerations of the costs of an action, and (4) the probability that costs are likely to occur in a given situation. When the perceived value is high, the behavior is more likely to occur. Conversely, if the cost is too great, then the likelihood the behavior will occur lessens. Because of the multitude of possible choices and teachers' varying capabilities for making effective decisions, the success or failure of an outcome can differ to some degree. For example, when teachers are deciding whether to use technology in the classroom, teachers need to decide whether the use of technology is likely to be of value to student learning, whether its use will likely meet with success, and if the cost of using telecomputing is worth the time and effort to plan for lessons including it. A different approach to making decisions is a trial and error approach. However, using a trail and error approach to problem solving would not be efficient (Simon, 1986) in the classroom because of the extensive number of possibilities. Teachers need to make split decisions and trial and error approach would take too long.

In decision making through problem solving (Simon, 1986), an individual begins the process by sorting through a large number of possibilities, typically by using a means-ends analysis as being the most common procedure. In means-ends analysis, the individual "compares the present situation with the goal, detects a difference between them, and then searches memory for actions that are likely to reduce the difference" (p. 6). Lack of an extensive store of experiential knowledge often results in a slower process of analysis, since non-experts are often new to determining goals in the unfamiliar context and new to evaluating the current situation and estimating the likelihood of reaching the goal through the planned course of action. One of the challenges of understanding decision making through problem solving lies in understanding how individuals analyze complex situations in terms manageable alternatives—breaking down the problem into smaller parts and working on each of these parts, bringing together a sense of smaller solutions to solve the bigger problem.

In addition to Tedeschi and Felson's (1994) decision making process and Simon's (1986) problem solving approach, other approaches to decision making include Mintzberg's (Mintzberg, Raisinghani, & Theoret, 1976) three phases of the decision making process, and Cyert and March's (1963) approach to decision making as it relates to well-structured and ill-structured problems. These approaches will be described briefly.

Mintzberg, Raisinghani, and Theoret (1976) describe a decision making process in terms with three phases: identification, development, and selection. In the identification phase, the need to make a decision is realized and a diagnosis is made to clarify the issues. The second phase is the development phase, in which a search for familiar or ready-made solutions is undertaken. If a solution is not readily at hand, then a ready-made or known solution is modified or a new solution is designed to fit the situation. The third phase is the selection of a course of action. This final phase, involves three routines: screening, evaluation-choice, and authorization. Screening is done when several alternatives have been generated and the decision maker must make judgments and evaluate the possibilities before choosing a preferred path for taking action. If the decision maker feels he or she is not sufficiently authorized, the final decision may need to be approved by someone in authority. In the case of classroom teachers, most feel that they are authorized to develop and implement a broad range of activities in their own classrooms, including use of computers. Authorization is not generally cited as a barrier to technology use.

Cyert and March (1963) described various approaches to decision making based on the type of problem to be solved, classified as well-structured or ill-structured. A standard operating procedure can be used for well-structured problems because they tend to be routine and repetitive and existing procedures to arrive at a solution are usually already established (Simon, 1973). For example, for well-structured problems, which are typically simple and linear, programmed decisions can be used since they are already established, tested, and approved. One of the problems in decision making is that not all problems can be solved using the same approach. Ill-structured problems require looking at alternative ways of meeting goals and expectations, which usually involve the use of non-programmed decisions (Cheung & Hew, 2004).

Non-programmed decisions (Simon, 1973) are out of the ordinary and are usually made by administrators. Non-programmed decisions for ill-structured problems require the decision-maker to make judgments and to be creative. Routine procedures for arriving at solutions to non-programmed types of problems do not exist.

Unfortunately, teachers are not generally given the flexibility of making decisions that are not routine. Teachers, therefore, often have little experience in making non-programmed decisions. Teachers faced with problems or situations outside the realm of their usual decision-making habits may be reluctant to make decisions not in concert with what they already know, which may place them outside their comfort zones (Ohsawa & McBurney, 2003). Teachers tend to stay within their comfort zones, as may be shown since they tend to use technology to support routine practice, as discussed previously. The complexity of ill-structured problems supports individuals' decision to choose more routine or more short-term approaches to solve problems (Simon, 1973).

Rogers' (1995) decision making process is based on making decisions about an innovation and its uncertainties. It differs from other schema of decision making because it is a model of decision making within a social network. This model may apply to this study because teachers operate in a social environment and they are usually not making decisions in isolation. Additionally, although the use of technology in the classroom is not new, some teachers may feel that the use of online tools and resources places them in a novel situation. Berliner (1994), in his study of exemplary teachers, noted that teachers facing a new teaching assignment not within their domain-specific knowledge found that their skills were not "interchangeable" with their new assignment. A teacher, for instance, exemplary in the teaching of social studies, might not also be exemplary in the teaching of mathematics. The knowledge and skills required to be exemplary in teaching one subject area may not transfer to another subject area, such as technology. In the pilot study, a participant, who was a veteran teacher possessing a wealth of classroom experience was learning technology at the level of a novel learner (Atkins & Vasu, 2000). For a group of teachers for whom technology is new, or for schools encouraging their teachers to use telecomputing tools and resources for the first time, the process of change would thus tend to be slow and uncomfortable.

In Roger's model an individual proceeds through five stages of the decision making process: knowledge, persuasion, decision, implementation, and confirmation

(Rogers, 1995). In the following section, each stage of Rogers' decision making process will be described in terms of teachers' use of telecomputing tools and resources.

First, at the knowledge stage, teachers would have an awareness or knowledge that telecomputing resources such as the Internet and e-mail exist, and they would also be able to understand basic information about how they function. Second, the persuasion stage is characterized by teachers forming attitudes about whether they like the innovation or not. At this stage, the individual begins to form an opinion. Third, the decision stage is appropriately named because at this point, teachers must decide whether to adopt or reject the innovation, meaning the use of telecomputing resources. Teachers might choose to try out one of the telecomputing resources before deciding to adopt its use or they might choose not to try it out at all. Rogers calls this "active rejection," when an innovation is being considered for adoption, but then rejected. By contrast, "passive rejection" results when the innovation is never even considered for adoption. The fourth stage is when implementation occurs. Teachers at the implementation stage demonstrate behavioral changes in putting the innovation to use. They are no longer thinking solely about telecomputing as a separate resource but rather think of it in terms of how they plan to use it. It is also at this stage when teachers would change or modify the way they use the innovation. At the confirmation stage, the teacher has usually made the decision to adopt the innovation, but they may seek reinforcement of the decision made and may reverse their decision to incorporate the technology if conflicting messages are received about its use (Rogers, 1995).

Not all teachers jump on the bandwagon to adopt an innovation a school system may wish to integrate. "The organizational context—such as the schools' hierarchy, rewards, and regulations—may play a role in encouraging or discouraging adoption of a new idea" (Rogers, 1995, p. 326). Teachers may be at various stages of the decision making process and make decisions typical of the stage they are in. Other factors, which may influence teachers' decision making, are discussed in the following section.

Factors Influencing Teachers' Decision Making

A number of factors that may influence teachers' decision making may include: the curricula, teacher characteristics—including knowledge, goals, and beliefs—professional development, and adults as learners.

Curricula

"'Teachers are the curriculum.' The daily decision and action of teachers forges a kind of unwritten policy that greatly influences the lives of students whether it is formally recognized as policy or not" (Schubert, 1986, p. 157).

Curriculum is "an organized framework that delineates the content children are to learn, the processes through which children achieve the identified curricular goals, what teachers do to help children achieve these goals, and the context in which teaching and learning occur" (National Association for the Education of Young Children, 1990, p. 1).

Cuban (1995) described four curricular types: official, taught, learned, and tested curriculum. The official curriculum is what is expected to be taught and learned as delineated in state or district frameworks and course work. The taught curriculum is teachers' choice of what is taught in the classroom drawing from their subject knowledge, experience in teaching the specific content, interests, and attitude toward their students. The learned curriculum may be assessed through testing, but may also be what students learn from their environment. For example, students may learn respect or acquire the attitudes modeled by their teachers. The tested curriculum may or may not reflect what the student has learned. Teacher-made tests come closer to reflecting what students have learned as compared to standardized testing. The decisions teachers make about telecomputing tools and resources are also subject to the influences of the official, taught, learned, and tested curricula.

In addition to having various types of curricula, the adopted curricula presents other challenges. The complexity of teachers' decision making is reflected in the adoption or choice of the curricula used. Teachers make decisions when they cast their votes for a particular textbook that may also include technology adoption. They also decide how they will use the new curriculum in their classrooms. "Technology teachers have had to adapt more than in any other curriculum area to new ways of teaching" (Jones, Harlow, & Cowie, 2003, p. 24)

The Content Determinants group (Brophy, 1982) referred to adopted curricula as the "'intended' curricula" (p. 3). The intended curriculum is "planned in advance of classroom use and is designed to help students learn some content, acquire some skills, develop some beliefs, or have some valued type of experience" (Eisner, 1985, p. 48). These intended curricula became only a small part of what was initially to be taught, that is, what was planned to be taught. Content that is briefly covered may limit student practice and application resulting in lack of integration into students' existing knowledge and may subsequently fail to be retained in students' long-term memory. The consequence of teaching content in a manner that does not help students to retain knowledge is akin to students not being taught at all, which illustrates the point that not all teaching results in student learning (Brophy, 1982). Time restraints, student learning problems, and topics dropped add to the modification and reduction of the intended curricula. The curriculum that is finally taught is further hampered—often unknowingly—by the teaching of incorrect or incomplete material (Ball, 2000). Adding to this situation are students' erroneous perceptions of what they have learned. The multitude of decisions made from the point at which the official curriculum has been adopted precipitates radical changes in what was initially intended to be learned compared to what was presented to the students and what the students actually learned.

This example further illustrates how teachers' decision making occurs throughout the teaching process, not only during the time of teaching in front of the classroom.

What teachers do and why they do it may be affected by characteristic of their goals, beliefs, and knowledge (Borko & Putnam, 1996; Calderhead, 1996; Clark & Yinger, 1979a). By examining teachers' goals, beliefs, and knowledge—along with a moment-to-moment detailed description of teachers engaging in the teaching process—researchers help to shed light on teachers' thinking about their teaching decisions.

Characteristics of Teacher Thinking Processes

Clark and Peterson (1985) point out that researchers consider teachers' thoughts that occur before and after classroom interactions with students as part of teacher planning. Teachers' thought processes differ before, during, and after the teacher engages in classroom interaction. These thought processes—before (preactive), during (interactive), and after (postactive) classroom interaction — affect their future classroom interactions and shape teachers' thoughts and beliefs.

Preactive thought processes or teachers' expectations form what Schoenfeld (1998) refers to as a "lesson image," a term coined by Morine-Dershimer (p. 17). The lesson image includes teachers' knowledge of their students, their reaction to the planned lesson, their expectations regarding any troublesome spots that may be encountered during presentation or activities during the lesson, and how to deal with these challenges. Lesson imaging is important because it reveals in part the ways that teachers form images about their lessons, and it plays a major role in shaping what teachers do in the classroom. Teachers' actions in the classroom are cyclical in nature because these actions affect student behavior and student achievement, which and in turn affect teacher behavior (Clark & Peterson, 1985; Wittrock, 1985).

Schoenfeld (1996) describes a model that accounts for how and why teachers do what they do when they are engaged in the act of teaching. The development of a theory of teaching-in-context was begun in the 1990s by the Teacher Model Group at Berkeley and was drawn from previous research (see, e.g., Berliner & Calfee, 1996; Borko & Putnam, 1996; Calderhead, 1996; Clark & Peterson, 1986; Thompson, 1992) describing teachers' knowledge, behavior, and decision-making. Three major components of the teaching-in-context model include knowledge base, goals, and beliefs. These three components may be activated at a specific moment in time with none of them having priority over the others but with all of them affecting each other (Schoenfeld, 1996, p. 15). Although goals will be described first in the following section, beliefs may actually shape a teacher's goals, or knowledge may shape a teacher's beliefs or determine the goals a teacher sets. The order of the major components presented here should not suggest a linear progression, because there is more often an interaction among these three elements.

Goals

Goals underlie what teachers do at a specific moment (Schoenfeld, 1996). The range of teachers' goals may be long-term, medium-term, or short-term. A teacher's goal may be met by selecting from various action plans. A teacher may give a goal priority the highest priority or a lower-level emphasis. A goal may also be activated for different amounts of time, with certain goals activated throughout a lesson such as overarching goals, which may fluctuate periodically to high activation status as needed (p. 23). An example of this type of overarching goal is wanting the class to participate as a collaborative intellectual community, with the highest priority goal being for students to engage effectively in a problem solving activity. Though the overarching goal of having students work collaboratively may be the high priority goal at the beginning of the lesson, during the actual classroom activities in conjunction with teaching the lesson, it may take a backseat to students learning to problem solve or how to use online resources. In this case the goal of students working collaboratively is an ongoing concern but it comes to the forefront when needed. Overarching goals may remain in the background if a more specific goal will address the situation.

A teacher's goals may be predetermined or they may emerge or if existing goals have been met or if what the teacher had planned did not proceed according to the teacher's intent and a new set of prioritized goals need to be set in motion. When goals are satisfied because a plan has been executed effectively, new goals are initiated. For example, an instructor who has completed a lecture may shift goals to attend to small group activity and monitoring of students during independent practice of content learned. If things do not go as planned, then the teacher may implement newly prioritized goals.

Teachers usually have a number of active goals at any one time most of which may be at different levels of activation. The actions teachers take are shaped by consideration of whether the higher priority goals are satisfied. The correspondence between goals and actions taken to accomplish them is neither simple nor common, and can rarely be prescribed in a manner such as “If the teacher wants to achieve X, the teacher does Y” (Schoenfeld, 1996, p. 24). The immediacy of the classroom situation, which often requires teachers to make quick responses, may not always satisfy teachers' pre-existing goals. In addition, the goals a teacher professes to want to achieve may not be evident in the teacher's classroom behavior.

In order to attribute goals to an individual, the individual's behavior must be consistent with having those goals. However, not all goals are explicit. Goals may be tacit and unarticulated, shaped by a person’s beliefs, or influenced and interpreted by prior beliefs as well as new information (O’Loughlin & Campbell, 1988; Schoenfeld, 1996). When the plan to meet specific goals operates as expected, the goals often lose their priority status, as described previously, and new goals are given priority, along with activation of the knowledge and beliefs that are needed to engage in a new action plan. If the action plan does not proceed as expected, changes may be made by initiating formerly low activation beliefs that are given newer and higher priority.

Beliefs

Beliefs are activated in clusters with the strongest belief dominant over other related but less emphasized beliefs. Professed beliefs may not always be compatible with actual behavior. In particular, what a teacher professes to believe may not always be what the teacher actually does. Schoenfeld (1998), for example, makes the distinction between teachers' professed and attributed beliefs. Actual behavior, on the other hand, maybe ascribed to an individual's beliefs: “People *behave* their way into new visions and ideas, not just think their way into them” (Fullan, 1993, p. 13).

Understanding teachers’ attitudes and beliefs is important as part of an assumption that teachers’ behavior is a manifestation of their beliefs (Clark & Yinger, 1987; Rokeach, 1975) and that these beliefs shape what teachers do in the classroom (Clark & Peterson, 1985). Teachers' beliefs are related to how teachers think about various issues concerning learning and teaching, including their students, the subject-matter content they teach, classroom management and the classroom environment, or the perceived importance of what their students are supposed to learn (Peterson, Fennema, Carpenter, & Loef, 1989; Schoenfeld, 1996). According to Becker (2000), “broadening teachers’ use of computers with students derives from teachers’ personal philosophical beliefs about the basic nature of student learning and what type of instruction is optimal given their own implicit theory of learning” (p. 7).

According to Richards and Lockhart (1996), “teachers’ belief systems are founded on the goals, values, and beliefs teachers hold in relation to the content and process of teaching, and their understanding of the systems in which they work and their roles within it” (p. 30).

Teachers' beliefs may be on a conscious or unconscious level. In either case they play an important role in determining which of a teacher's goals have the highest priority. In effect, teachers' beliefs determine their sense of what is appropriate and what is possible in a particular situation. The teacher's estimation of what is possible in a particular situation is also determined by the teacher's knowledge base.

Knowledge

The intellectual resources that teachers bring to the classroom are their own knowledge bases. Teachers’ knowledge may be general or very specific and may include knowledge about students, context, and content. Ball (2000) differentiates between having knowledge about the subject matter and knowing how to use that knowledge in teaching. She provides the example of a math teacher who understood the mathematical concept of rate but found it difficult to simplify his language sufficiently for his students to understand the concept. Teachers have certain expectations of what their lessons will be like (Boaler, 2002) which are derived from engaging in prioritized action plans aligned with their goals and beliefs (Schoenfeld, 1996).

An action plan “forms the backbone of the decision process by providing organization and direction” and “is developed to apply the steps in the decision process” (U. S. Department of the Interior, 1999, p. 1).

Action plans are the decisions and steps taken in a particular order to achieve the current high-priority goals. Different levels of action are often required when completing a task, including skill based, rule-based, and knowledge-based levels of action (Frese & Sabini, 1985; Frese & Zapf, 1994; Hacker, 1994). Actions at the skill-based level are almost automated, much like the physical and mechanical skills needed for keyboarding. Rule-based level actions require conscious engagement, such as following a set of procedures that may have been learned through training or experience. Surfing the Web using hyperlinks is considered a rule-based level action (Akdemir, 2002). At the knowledge-based level, individuals use problem solving skills to arrive at a solution. Several stages characterize this level: goals are set, plans are developed to accomplish the goals, the plans are executed, and results are evaluated. The knowledge gained from individuals' experiences at the knowledge level is then incorporated into their skill bank for dealing with future problem solving situations.

In the classroom, teachers' action plans may vary from use of interactive routines, such as engaging students in dialogue, to the standardized routine of collecting homework (Schoenfeld, 1996). Other routine patterns of behavior may include beginning the day with a review, answering questions, and board work. Action plans can also take the form of scripts, mini-lectures, or simple talk. Scripts are “content-specific, imagined scenarios for the ways in which discussions will play out” and may be flexible and interactive (p. 30). Mini-lectures are similar to scripts but with "packaged" responses. Simple talk is a type of on-the-spot brief explanation.

Action plans and individual’s beliefs are inseparable. If individuals perceive that they have some control over their choices and behaviors, then they may decide to take action (Ajzen & Fishybein, 1999). For example, if an individual believes a particular behavior to be difficult with a high degree of having unsuccessful consequences, then the behavior will likely not be performed (Ajzen & Fishbein, 1999). Teachers’ beliefs thus affect teachers’ goals (Schoenfeld, 1996). Integrating telecomputing tools and resources in curriculum-based learning requires teacher to acquire new knowledge and skills, to change their belief system about using technology in innovative ways, and to set new goals to encompass these changes.

While providing teachers with professional development sessions aimed at encouraging them to incorporate technology into their teaching, researchers at the Apple Classrooms of Tomorrow (Sandholtz, Ringstaff, & Dwyer, 1997) project found teachers’ beliefs to be well ingrained and difficult to change. Teachers did not give up their old habits of teaching readily. Replacing their old habits occurred over a period of time and after many successes. The successes in the ACOT study came in the form of changing from teacher-directed to student-centered instruction, which required teachers to teach using much more small group, collaborative, and individualized instruction. This change process takes time—the ACOT project took ten years.

The ACOT researchers described teachers' change process as beginning with their beliefs, taking exploratory, then engaging action conversation and reflection about their teaching practices and the use of technology could enhance students' learning. Acknowledging teachers' goals and helping teachers strategize about how they would accomplish them led to teachers' willingness to take new actions and recognize steps of accomplishment, which in turn led teachers to be willing to attempt loftier goal setting, reflection, and further action. The ACOT researchers found that each teacher experienced change differently and went through predictable stages in integrating the use of computers into their teaching practice. Teacher decision making, as a process involves a constant interplay and reevaluation of the teacher's knowledge, beliefs, and goals in order for the teacher to select from among available options and imitate the action the teacher deems the best possible, relevant to the given circumstances (Shoenfeld, 1996).

Professional development plays a crucial role in developing teachers' knowledge and skills and in changing teachers' beliefs and teaching practices (Garet, Birman, Porter, Yoon, & Desimone, 2002; Howland & Wedman, 2004). However, professional development is not the focus of this study and will be discussed briefly in the following section describing the results of the Apple Classrooms of Tomorrow (ACOT) study in terms of its findings about what factors helped encourage teachers to adopt technology into their teaching practice.

Professional Development

The Apple Classrooms of Tomorrow project (Sandholtz et al., 1997) discovered that teachers' beliefs—and their willingness to try ever more innovative ways of teaching—can be changed through continued professional development sessions. The Apple Classrooms of Tomorrow project investigated how classroom teaching and learning were affected by the routine use of technology and how professional development affects teachers in encouraging them to adopt newer improved ways of teaching.

The ACOT model can aid the design of staff development to meet individual teachers' needs because it provides background knowledge in understanding the way teachers think and the decisions they make. "In this model, text-based curriculum delivered in a lecture-recitation-seat work mode is first strengthened through the use of technology and then gradually replaced by far more dynamic learning experiences for students" (Sandholtz et al., 1997, p. 37). The ACOT model consists of five stages of instructional evolution: entry, adoption, adaptation, appropriation, and invention.

Teachers are accustomed to using the blackboard, overhead projector, textbooks, and ditto sheets as their "technology" tools. At ACOT's entry level, teachers use computers in a limited way and infrequently, if at all. At this stage teachers begin to learn the basics of computer technology. Teachers can move through the entry and adoption levels in half a school year (McKinsey & Co., 2000). As the focus shifts from gaining information about technical aspects of the computer to learning how to use the computer in classroom instruction, teachers move into the next stage, adoption.

At the adoption level, teachers use computers to reinforce or support traditional instruction—usually in a lab setting or as a reward for students or activity or students can do in isolation. Teachers at this level attempt to blend technology into direct instruction, with technology supporting teachers' use of traditional, text-based, drill-and-practice instruction. Thirty hours of professional development are needed for teachers to function at the adoption stage. Once the technology becomes familiar—supporting traditional classroom practice—the teachers move into the adaptation stage.

At the adaptation stage, teachers begin to use technology as part of their existing classroom activities, such as writing letters to parents, making handouts, skill-and-drill activities, completing final drafts of compositions, and using CD-ROMs and the Internet as resources for research. Computer use at this stage offers the teacher a more efficient way to do the types of activities with which they are already comfortable and competent without use of computers. Productivity was key at this stage, with students not only producing more but also doing it faster. For example, students were writing with greater fluency because of their increase in keyboarding skills, which resulted in their writing longer and better compositions. High school chemistry students worked more accurate and quickly in balancing chemical equations after using a graphics program that aided them in learning about chemical reactions. The adaptation stage requires forty-five or more hours of professional development and three months experience with just-in-time support. Teachers also perform basic troubleshooting at this stage.

By the time they enter the appropriations stage, teachers have usually changed their personal attitudes about technology. They use technology effortlessly and believe in its usefulness. New habits are formed by teachers as they use technology to replace their previous use of computers as simply another way to support traditional practice. Teachers begin to identify computer projects that will support a planned unit of study or select software that relates to their particular subject matter. Teachers begin to get excited about using technology and may seek partnerships with experts in the research and analysis of students' data. Sixty or more hours of professional development are suggested to help teachers reach the appropriations stage, with approximately two years of experience and just-in-time support.

In the invention stage, teachers use of technology to meet standards, goals, and objectives that promote students' creativity, collaboration, and entrepreneurship. By this stage, teachers' technology use encompasses their improvements in a range of capabilities, including group process, technology skills, and content knowledge. Teachers become more reflective about their teaching practices and try out new instructional patterns. Students become more involved in their own learning and engage in more collaborative types of learning activities. The suggested professional development at the invention stage is eighty hours or more and includes four to five years of experience, with continuous just-in-time support.

Teachers make numerous decisions within the context of each stage in this process to integrate technology into their curriculum-based teaching. In order for teachers to change their teaching practices, they must have a purpose for using technology in their classroom (Daugherty, 2003; Dockstader, 1999). Teachers do not abandon practices that have worked well enough for them in the past to adopt a technology-integrated curriculum that requires them to make changes for which they do not perceive a need. However, when teachers view an innovation as providing a significant benefit to their students' learning, they are more likely to adopt the change (Rogers, 1995).

Adults as Learners

In a learning situation, if they are confronting a topic for the first time, adults tend to take a more dependent approach, relying more on the instructor and less on their own self-directed learning (Knowles, 1990). They need to be aided in becoming self-directed learners. In fact, Knowles recommends the use of the pedagogical model if the learner is learning something new and has no previous experience, cannot make connections to a related real-life situation, needs additional subject matter knowledge to accomplish a task or performance, or feels there is no need to learn the content (p. 64).

Pedagogy is “the art and science of teaching children” (Knowles, 1990, p. 28). Instructional designers and trainers, for many years, have used the pedagogical model of education to design for professional development. In the pedagogical model, the teacher determines the content that will be learned, how it will be learned, when it will be learned, and how to assess if it has been learned. In this model the subject matter drives what is learned. Students have little or no input in to the ways they are expected to learn. This pedagogical model fits well for teachers' first learning to use technology or learning to use telecomputing tools and resources with their teaching for the first time. However, as learners, adults differ from their students in that they are more experienced learners, are willing to learn in response to their own interests and needs, have developed specific learning habits, and want to see results.

Adults invest a considerable amount of time and effort in learning what is of interest to them. Adults simply have more experience than children or young teens and, because of their wealth of experience, adults can usually bring more to a learning situation. A drawback to teachers’ having more experience is that they may resist adopting new ideas or changing their previously acquired beliefs or practices (Sandholtz et al., 1997).

Teachers who teach a specific content area—math or business teachers, for example—may resist change in their teaching methods to a greater degree especially if they are accustomed to teaching their subject-matter content in a particular "tried and true" manner that they feel represents "best practice" in teaching their content area. However, technology—which cuts across all discipline boundaries—may provide opportunities for teachers to see value in adopting new methods if they feel the change will be beneficial. Adults, as learners, are ready to adopt things they will need in real-life situations. For example, a teacher who will soon be teaching about the solar system for an observation and evaluation by her principal and needs to learn how to create a dynamic PowerPoint® presentation on that topic is more likely to be willing to seek our and incorporate new information about the solar system as well as to learn how to create a PowerPoint® presentation than a teacher who will soon teach a routine unit about the underground railroad or one who teaches only math.

In learning to use technology tools as part of curriculum-based instruction, teachers may feel ambivalent about trying something new. One of the reasons teachers plan is to satisfy a psychological need, such as building self-confidence (Clark & Yinger, 1979b).

Lesson plans have traditionally been the blueprint for teaching subject matter content. The importance of understanding teachers' instructional planning lies in its connection to curriculum and instruction (Clark & Yinger, 1987) and it is described in the next section.

TEACHER PLANNING

When teachers integrate technology into the curriculum, it becomes an aspect of their instructional planning. "When technology becomes an integral part of the curriculum and learning activities, learning with the computer becomes meaningful and purposeful" (Chisholm & Wetzel, 1997, p. 299). It takes decision making and planning to integrate technology into the curriculum.

"Planning is both art and science. It is a road map and a journey, with the destination left up to you [the teacher] and your students" (Karges-Bone, 2000, p. x). The art of planning considers the students' individuality, personality, culture, gender, interests, and abilities (Baylor, Kitsantas, & Hu, 2003). The teachers' experiences, creativity, and skills come together to create a plan for their classroom teaching based on their own intuition and know-how.

The science of planning is the deliberate design of plans, using outlines, data, assessment, and other elements of planning derived from rules and scientific research (Karges-Bone, 2000; Schubert, 1986). The science part of planning, according to Karges-Bones, is the accountability measure, the pacing, progress, timelines, and other issues which may include student learning styles, gender differences, and students with special needs.

Teachers plan for various reasons: to meet personal needs, to reduce uncertainty and anxiety, to set goals for the outcome of instruction, to organize, and to aid memory. Primarily, though, teachers plan “to transform and modify curriculum to fit the unique circumstances of each teaching situation” (Clark & Yinger, 1987, p. 347).

There are numerous decisions teachers make in planning and teaching a lesson. Teachers need information to decide what will be emphasized in making their choices. Not all decisions lead to the most effective student learning; however, planning helps teachers organize their ideas and thoughts and increases the likelihood that a lesson will be successful.

Instructional planning is a process that challenges teachers to plan, implement, monitor, adjust, and evaluate student learning and their own teaching practices. Teachers’ instructional planning must manifest what and how they are going to teach, how they will address the diverse needs of their students and still be able to reflect the pedagogy, combining the art and science of teaching. The challenge of instructional planning lies in teachers need to counterbalance a number of competing demands such as the complexities of the classroom environment, the school's culture, the teachers' knowledge of their subject-matter content, and their knowledge about how to present the content to students with varied abilities and needs. Several different planning models have been introduced over the years in teacher education courses and professional development to aid teachers in planning.

Planning and Instruction Models

Tyler's (1950) basic principles of curriculum and instruction—considered a linear model—laid the foundation for subsequent instructional planning. Tyler looked at three elements of curriculum: students, society, and subject matter. In Tyler's model, teachers developed behavioral objectives—based on general expectations of society for the content that should be taught—selected activities, organized the classroom activities, and evaluated students' learning. The assumption was that teachers moved sequentially through each of the four steps in planning for instruction.

Goodlad (1979) elaborated on Tyler's model and described nine factors to be considered in planning for instruction: goals/objectives, content, materials, learning activities, teaching strategies, evaluation, grouping of students, time, and space.

A more popular model, according to Brown (1993), was the Hunter model, which included seven steps to instructional planning: establishing focus, stating objectives, providing instructional input, modeling, monitoring and adjusting instruction, guided practice, and independent practice. The Hunter model is typical of what teachers today are taught to do. Other models of instructional planning do not follow the linear progression of Tyler's, Goodlad's, and Hunter's instructional models.

A different type of planning-and-instruction model is the Yinger model (Clark & Yinger, 1979b), which views planning as a three-stage problem solving approach. Teachers consider the instructional worth of an activity once they have reviewed their own goals, knowledge and experience, and the materials available for instruction. In the second stage, problem formulation and solution, plans are elaborated over time through investigation and adaptation. The third stage is characterized by implementation of the plan, evaluation, and incorporation into the teachers' repertoire of experiences and knowledge.

Planning models aid teachers in selecting and organizing data for presentation and provide a partial insight into common concepts used to model teachers' thinking about how, what, and why they make certain decisions. Administrators and teachers rely on these models of different types of teacher planning to meet specific curriculum goals. By examining the types of planning teachers engage in, insight into teachers' thinking can be further explored.

Types of Planning

Teachers rely on instructional routines as a way to predict classroom activity and to simplify the complexity of the classroom environment (Clark & Yinger, 1987). Clark and Elmore (cited in Clark & Yinger, 1987) found that teachers' planning at the start of the school year typically involves setting up the physical classroom environment, evaluating the students' abilities, and creating a social system. The necessary schedules and routines are usually established by the end of the fourth week of school. These factors influence teachers' thinking and behavior and remain stable throughout the school year. The challenge of setting up the classroom environment and establishing schedules to insure the access to computers when needed is essential when planning for "new forms of classroom activity" and is "critical to both the initial success and long-term sustainability of school-based technological enterprises" (Fishman & Pinkard, 2001, p. 64).

Teachers may find planning for technology integrated curriculum-based learning difficult and may instead find themselves planning only for a specific instructional discipline (Fishman & Pinkard, 2001). The importance of understanding how teachers plan thus becomes a factor in understanding how they decide to use technology in their practice.

Clark and Yinger (1987) remind us that, "planning does not end when instruction begins, but continues in the form of interactive decision making and adjustment of the plan to fit the unpredictable circumstances of classroom interaction" (p. 354). This is accomplished through written and mental planning.

Written Instructional Plans

Teachers' written plans for instruction—typically called lesson plans—are considered by Glatthorn (1993) as playing a minor role in teachers' decision making. The written plans teachers submit to their principals are relegated to the function of jogging teachers' memory during instruction or are not referred to at all. During a lesson, teachers make interactive decisions based on student responses and the interactivity within the specific classroom situation. These "on the fly" decisions are immediate and are based on what teachers perceive as they teach, and often vary from what they have written in their lesson plans. Experienced teachers make the least use of lesson plans (Clark & Yinger, 1987).

When planning, teachers generally think of activities first, followed by content, and then objectives (Clark, 1978; Glatthorn, 1993). For example, teachers of preschool-aged children began their planning in different ways, as was observed in a research study by Hill, Yinger, and Robbins (1983). At times, teachers developed their plans around materials that the children were to use. The availability of materials was central to whether they thought they would be able to carry out an activity in the classroom. Also, teachers viewed different materials as suggestive of specific uses, and subsequently tied these materials to a variety of curriculum objectives. For example, unit blocks were tied to spatial relationships and concepts of shape and size. Focus on a particular child's needs or interests also provided a way that teachers might begin lesson planning, which was then expanded to include other children. This process is akin to a common procedure whereby teachers plan activities according to the software or online resources available.

Glatthorn (1993), in his study of teacher planning, identified three levels of planning that teachers undertake: yearly plans, used for making long-term decisions; unit plans, which support curriculum integration and serve as a planning vehicle for problem solving and critical thinking; and lesson plans, which include detailed information specific to the daily lessons.

Yearly planning requires making long-term decisions to set priorities and implement curriculum. In yearly planning, units of study are structured, integrated, and sequenced. Yearly plans do not lend themselves to making adjustments readily and are often circumvented when changes in the school schedule occur. McCutcheon (1980) reports that teachers typically allot 75 minutes to 8 hours to write their yearly plans and do very little long-range planning due to factors that tend to intervene, such as frequent interruptions of daily classroom instruction for assemblies and other activities. Principals, curriculum specialists, and team leaders usually assist teachers in setting their instructional goals for the year (Glatthorn, 1993).

Unit planning involves designing well-organized units of study, that meet curricular objectives and integrate content. The unit plan is the level of instructional planning most preferred by teachers. Unit planning supports students use of critical thinking and problem solving by providing the context in which students are expected to learn these skills. Unit plans usually include activities that are expected to enhance or facilitate student learning, such as the use of enrichment and remediation activities. The focus of a unit plan is on in-depth mastery of learning. Formative and summative assessments are also a major part of unit planning and are of important to teachers and students alike because of the close connection of these assessments to the students' grades. By contrast, lesson planning deals with meeting specific instructional objectives through daily instruction. This day-to-day type of planning is usually very detailed and is considered to be of most use to novice teachers (Glatthorn, 1993). Although teachers written planning is important, most teachers' classroom practice consists of more than their written instructional plans; mental planning is part of an ongoing process.

Mental Planning

Teachers also do mental planning, which may actually take more time than the time they allot to writing plans (Glatthorn, 1993; McCutcheon, 1980). Through reflective thinking, teachers develop mental scenarios, and evaluate a variety of alternatives in response to their perceptions of student needs, objectives, materials, and possible problems that may arise. Their past experiences while teaching the same lesson content provides teachers with rich information for reflection. This type of mental, evaluation, reflection, and planning is not represented in teachers' written plans. The written plans that are submitted to administrators are believed by teachers to be for administrator use. Teachers tend to make two sets of plans. The plans teachers turn in to administrators represent busywork for students while the unsubmitted plans such as mental, lists, or notes are used as guides by the teachers for decision making. Teachers do not rely on their written plans as much as they do on their mental plans in making critical decisions about assessing student learning and in responding interactively with students (Glatthorn, 1993). Novice teachers, though, tend to rely on lesson objectives more than they do on mental planning (Westerman, 1991).

Mental planning is an ongoing activity for most teachers. Anecdotes involving teachers' mental thinking include tales of the mental dialogues teachers have with themselves while driving, watching television, showering, or occurring during the summer months when teachers are away from school. McCutcheon (1980) believes that this type of mental dialogue can serve to connect theoretical knowledge to specific situations teachers encounter in their classrooms. For expert teachers, mental planning serves to connect instructional planning and classroom management, allowing teachers to avoid anticipated problems by use of preventive measures (Cushing, Sabers, & Berliner, 1992).

Does the type of planning that teachers engage in influence their decision making about use of telecomputing tools and resources? For example, if teachers' yearly plans are not flexible, they may find it difficult to schedule lab time. Or if unit plans are of most use to experienced teachers, then this type of planning may serve as a springboard to teachers' mental decision making and planning about how, when, and why they incorporate telecomputing tools and resources into their teaching.

Influences on Planning

Teachers make decisions on a daily basis and in every aspect of teaching (Shavelson & Stern, 1981). Or do they? According to Duffy (1994), what and how teachers teach may not simply be a matter of teachers' decisions.

Duffy (1994) visited with his former college students in their assignments as classroom teachers. He observed his former students' teaching reading and writing and judged their instruction to be superficial with "little evidence of teachers making substantive judgments regarding what to teach and how to teach it" (p. 4). Duffy observed that new ideas were often taught as '"add-ons"' (p. 4). Although his former students continued to espouse the philosophy of teaching that they had been taught, their ideals had not transferred to their teaching. These experiences prompted Duffy to investigate why teachers were not practicing critical and interpretive literacy in their teaching, as he had taught them to do.

Duffy (1994) considers that teachers are in the hands of "directors" who write the instructional materials, make policy, and mandate practices (p. 4). These directors include the researchers who describe best practices. They are also the administrators who enforce instructional practices through evaluation. They involve the staff developers who promote specific programs and procedures. According to Duffy, it is the curriculum—as set forth in the textbook's and accompanying worksheets and other teaching materials—which provide fertile ground for "followers" because these materials inform teachers about how and what to teach. Strictly following state-provided textbook materials hinders teachers in developing critical thinking or problem solving skills and encourages them to teach in a traditional plodding and dreary march page by page, through the textbook materials (Davis, 2004). By contrast, when teachers focus on teaching the students rather than the content and integrate technology into the curriculum, the goals of the curriculum and of teaching students to use the technology effectively can be organized "into a coordinated harmonious whole" (Dockstader, 1999, p. 2). Integrating technology takes more and better planning. For some teachers, this is a daunting challenge.

TECHNOLOGY INTEGRATION INTO THE CURRICULUM

Schools have operated for decades in an environment that has required little to no change in curriculum and teaching methods. The introduction of technology into the classroom has occurred at the same time as call for a major shift in the goals of education (Solomon, 2004). Since teachers are the primary decision makers in the classroom, understanding what has been learned about technology integration may help set the stage for understanding how, when, and why teachers make decisions about the current technological environment as it relates to their teaching.

Technology Integration Defined

Integration, in terms of teachers' classroom use of technology, is described by Sheingold and Hadley (1990) as a change in the practices of teachers, making their classrooms more student-centered, engaging students in carrying out projects and creating products, giving students more individualized attention, encouraging them to think and interpret more, and to work more independently. “Integration requires that teachers readily and flexibly incorporate technologies into their everyday teaching practice in relation to the subject matter they teach” (Hadley & Sheingold, 1993, p. 265).

Jolene Dockstader (1999), a sixth grade teacher, further defines integration by explaining what it is not. In her view, technology integration is not substituting 30 minutes of skills development for 30 minutes of reading. Integration is not the use of spreadsheets and databases without a purpose and it is not “teacher-created programs that cover special interests and/or technical expertise but do not fit content-area curriculum” (p. 1).

Greenhalgh (1996) explains what it means to "weave" technology into the curriculum (p. 96). Teachers regularly use filmstrips and overhead projectors, television, and VCRs when they serve a specific purpose. In making the decision use specific equipment items, teachers look at students’ learning styles, their own teaching styles, and the subject-matter content to select tools that they think would accomplish their educational objectives. Similarly, in integrating technology, teachers often match the software to the task. For example, teachers who teach composition see value in having students use word processors to revise and edit their work, or they may see value in having students use a CD-ROM or Web-based search engine to find information resources to help them do research. Over a period of time, teachers often continue to add to their repertoire of software with which they are instructionally comfortable. This is in line with an observation Sheingold and Hadley (1990) made about experienced teachers: The more experienced the teacher, the more software applications he or she typically uses.

When technology is integrated into the daily school curriculum, frequency in the use of drill and practice activities tends to diminish replaced by an increase in tool-based application use that encourages students to use critical thinking to synthesize, apply, and evaluate (Bagley & Hunter, 1992; Dockstader, 1999). The integrated use of technology in the classroom also tends to redefine teachers' and students' roles and their relationships, with teachers becoming guides to help students learn effectively themselves rather than being the sole source of instruction and information. When schools want this kind of transformation to occur, they can encourage and nurture these kinds of changes.

Administrative Presence

Too often the success or failure of technology integration in the classroom rests with the school's leadership—specifically, the principal. Teachers' decision making about the use of online tools may be highly influenced by the decisions made by their administrators.

For example, administrators may play an instrumental role in technology use in their schools by supporting teachers' involvement in determining their own professional development activities. An administrator who supports classroom technology use as part of the instructional program may act as the catalyst for initiating teachers' use of technology (Byrom, 1998) and can be the determinant in the degree of teachers' technology integration. The strength of administrative technology initiatives may disappear when the driving force is withdrawn. Rather than being the catalyst for integration, principals may actually undermine success in the effective use of technology at their schools (Wu, 1988). Years of experience among the teaching staff and their willingness to change, the socio-economics and expectations of the community, and the amount of curricular input from the faculty—even when these factors all favor technology integration, they may not be enough to lead to implementation of a successful technology program if the principal does not support the program or initiatives. Conversely, principals may also cause teachers to balk if they are seen as deciding to make changes just for the sake of change. Unless those affected by the change buy into the program, the change is not likely to be long lasting (McLaughlin, 1991). Infrastructures to support technology adoption can be in place in schools with in a short amount of time, but changing the schools' culture and teachers' instructional pedagogy requires rethinking the purpose of teaching, the goals of the curriculum, and the desired outcomes for students' learning (McClintock, 2001).

A according to a survey conducted by NetDay, although 77% of teachers agreed that having access to the Internet provided an instructional advantage (Pastore, 2001). However, 67% of teachers in this survey were not integrating the use of the Internet into their teaching practice, while 26% reported being pressured by an administrator to use the Internet as part of their instruction. Pressure of this kind by those in authority may help to determine whether teachers will add an item to their already crowded curriculum. According to Brophy (1982), in his review of research on how teachers determine the content to be studied, pressure exerted by more than one source increases the likelihood that teachers will incorporate or adapt their curriculum to address the demand especially if they perceive tat the change fits their students' needs. Various models for technology integration have been developed to assist teachers in integrating technology. These are described in the following section.

Models for Technology Integration

The presentation of the following models, should not suggest that teachers should teach according to a linear progression. Rather, they are included here to showcase the complexity teachers face in making decisions for instructional planning, professional development, and technology integration—specifically, in using telecomputing tools.

Fishman and Pinkard (2001) developed a model that supports the integration of technology in teaching and learning called Planning for Technology, or the PfT model. This model has three stages: Phase one establishes a vision of teaching and learning, phase two addresses the staff's technological skills, and phase three redesigns the curriculum in order to integrate technology into the curriculum.

Phase one of the PfT model brings teachers and administrators together to establish and share a common vision and vocabulary in order to help teachers make informed decisions in the way they plan to use technology in their classrooms. Teachers are given a self-assessment tool to compare their current teaching practices using technology to their future goals. A planning for technology committee is then formed to facilitate the change process and support using technology in the classroom.

In phase two, teachers complete a technology skill inventory in order to assess their technological capabilities. Technology workshops are then provided, first, to develop teachers' technology skills and, second, to develop their expertise in using technology in their classroom curricular activities.

In phase three, teachers connect pedagogy with technology. Not every learning opportunity requires the use of technology, and teachers need to select carefully the parts of the curriculum that would be most effectively enhanced by use of technology. Models for technology integration are selected which fit the school's vision of teaching and learning and demonstrate effective use of technology in specific parts of the curriculum.

At this stage, units for classroom use are developed and benchmarks to evaluate progress are created. Benchmark measurement reflects how technology is used in the classroom, how technology fits into the curriculum, and the impact of technology-embedded curriculum on the school's instructional goals. Even after the technology-embedded curriculum units are adopted, the process of planning for technology use should continue as an on-going process due to the evolving nature of technology (i.e., emergence of newer software versions, operating systems, and programs), the changing curriculum (i.e., development of new standards, different objectives, interpretation of curriculum goals), and varying degrees of teachers' self-efficacy.

A model for a curriculum-based planning process in the context of technology adoption is described by Bowman, Newman, and Masterson (2001). The diffusion process at the district level has implications for teachers at the classroom level for becoming more deeply involved in technology planning and in implementation of the technology-supported curriculum. Similar to the Fishman and Pinkard (2001) Planning for Technology Model (PfT), Bowman et al. identified a six-stage cycle of intervention: planning, applications training and learning styles, product development, implementation, assessment, and redesign (p. 81). Teachers at stage one of the PfT cycle gather to plan technology integration through discussions and organization of their materials, including lesson plans and curricula. At stage two, teachers decide what applications to use and if additional technical training is needed. At stage three, after having had an opportunity to practice and redesign parts of the curriculum, teachers create lessons. At stage four, teachers integrate technology into their classrooms using the lessons they created. At stage five, the assessment stage, teachers check to see if their goals have been attained. Teachers then redesign or modify the curriculum and their lesson plans, as needed, at stage six.

Although this PfT model can be helpful in a school-wide technology integration plan, other issues may arise that complicate teacher decision making and present challenges for teachers in schools making changes in integrating technology. Teachers are not always in the same stages or phases of integrating technology, and each teacher makes decisions according to his or her own knowledge and experience. Even among the barriers teachers face, they have choices and make decisions according to the situations in which they find themselves. These barriers, and teachers' possible choices in facing them, are discussed in the following section.

Barriers to Technology Integration

Although schools have increased their inventories of computers, "students spend most of their school day as if these tools and information resources had never been invented" (Becker, 1998, p. 3). Becker estimated that students used computers in the schools about 40 minutes a week—less time than reported by teachers. This imperceptible change of technology use in the classroom is reflected in the way teachers use computers. Teachers' most commonly reported classroom activity use of computers was for basic skill and drill and education-related software. Application programs such as word processing were used most often for the purpose of learning computer skills in keyboarding and software use.

In a more recent study that examined 25 years of technology in primary and secondary education levels in the U.S., Norris, Soloway, and Sullivan (2002) reported similar findings showing that the potential for technology use in the schools is not being realized. This recent study found that having computing technology in the schools had had no lasting effect on educational practice. Schools and classrooms remain unreceptive to the changes in technology occurring in business, science, manufacturing, music, and art. Positive effects on teaching and student learning were demonstrated by the results garnered in a small number of schools and classrooms that have integrated technology successfully. Several conditions need to be met in order for this kind of innovation to be successful in schools: access to technology, adequate teacher preparation, effective curriculum, and relevant assessment, as well as support from administrators, families, and the community (p. 15). The benefits of technology integration included higher student test scores, increased time on task, and increased motivation (Pardon & Waxman, 1996; Wenglinsky, 1998). The integration of technology into the curriculum goes far beyond providing computers in the classroom. They must be used effectively as well.

Brickner (1995), in his study on barriers to change, noted that teachers often experience various obstacles to integrating technology into their classrooms. He classified these barriers to change into two categories—first-order and second-order barriers.

First-Order Barriers to Change

As defined by Brickner (1995), first-order barriers to change are external or extrinsic in nature and are basically out of the teachers' control. These types of barriers may include: lack of access to computers, overly large class size, lack of time to plan, lack of adequate technical support, or lack of administrative support.

Lack of Access to Computers

Teachers may plan use of computers differently, depending on whether they use the computer lab or have access to classroom computers (Becker, 2000). Even though a lab setting may provide a cost-effective way to provide technology to greater numbers of students, in order to maximize effective use of a computer lab, teachers often need to plan weeks ahead in order to schedule lab time. Because of these time constraints, students may be limited in using computers in an impromptu way for problem-solving or higher-order thinking projects (Pruett, Morrison, Dietrick, & Smith, 1993). Time constraints may result in teachers feeling that they must plan for activities that are more predictable or time-constrained, such as "skill and drill" activities, when using the lab.

Teachers may also use their computer lab time as if it were a planning period if a computer teacher is on site to work with students, making classroom instruction and computer activities into completely separate entities (Fishman & Pinkard, 2001).

Remotely located computer labs do not facilitate the integration of technology into instruction because they do not allow students frequent access to computers for the kinds of everyday work that are needed in order for teachers to develop greater fluency and to build their technological competence and confidence (Becker, 1998; Milken Family Foundation, 2002; Smerdon, Cronen, Lanahan, Anderson, Iannotti, & Angeles, 2000). Secondary school teachers, according to Pratt (2000), use computers in labs to meet their instructional needs in specific content areas more frequently than teachers of younger children. Secondary math teachers, for example, might find the lab setting more appropriate for use with their students while the classroom computers, because of their limited numbers, may be deemed more suitable for doing individual or paired projects. Teachers with a student-to-computer ratio of four students to a computer, at most, seem to make use of computers more frequently than do teachers in classrooms with fewer computers or who use the computer lab (Becker, Ravitz, & Wong, 1999; McCannon & Crews, 2000; Smerdon et al, 2000). If they have fewer computers, teachers may design lessons for their one-computer classrooms. Some teachers do, but most find this situation very difficult.

Class Size and Scheduling

Another issue that may serve as a barrier to teachers' technology integration that may be outside teachers' control is class size (Becker, 1998). Teachers rarely get to decide how many students make up their daily class enrollment, but they must decide how they will design or plan their instructional program to meet all of their students' needs. Large class sizes or large school populations may dictate the types of decisions teachers make about how their students will use computers and for what lengths of time. The number of computer users may be too great for the limited number of computers and software programs schools may have purchased to accommodate scheduling at flexible times (Becker, 1998; 2000). Schedule flexibility plays a large role in how teachers use computers. When teachers have control over scheduling their computer time, they are more apt to use computers because they have the choice of using them when they are most needed (David, 1994).

Time to Plan

According to the U.S. Department of Education (2000), by connecting classrooms to the Internet, educators are afforded an opportunity to minimize the isolation that is experienced by many teachers. One of the factors that exacerbate teachers' feelings of isolation is the lack of time for teachers to congregate and plan together. Even when Internet connectivity allows teachers the flexibility of asynchronous time to communicate with their colleagues on their own campuses as well as with teachers world-wide, the problem of actually integrating technology into their teaching practice remains daunting (Ali, 2003).

Administrative Support

The importance of administrative and technical support, discussed in earlier sections remains crucial in moving technology integration forward. Administrative support can mean the difference between successful integration of technology or it can become a barrier. The barrier need not be insurmountable, however, since, as observed by Henry Becker (1999), "if leaders among teachers can be encouraged to share their enthusiasm and knowledge of the Internet with other teachers, this will also have an effect of diffusing use more broadly within the profession" (p. 24).

Second-Order Barriers to Change

Though teacher decision making may be limited by the kinds of first order barriers discussing in the preceding sections, second order barriers can provide teachers with greater decision making opportunities. Second-order barriers pertain to the internal or intrinsic nature of the teacher; they include lack of instructional models, teachers' fear of computers, their beliefs about teaching and technology, the organizational context, and their resistance to change. Faced with these types of challenges, the teacher may feel unprepared or inadequate to face the struggle of integrating technology into the curricula (Jenson, Lewis, & Smith, 2002).

Lack of Instructional Models

Although several models for integration of technology are available for teacher use, teachers seldom have opportunities to observe their colleagues modeling curriculum-based technology integration (Solomon & Solomon, 1995). Teachers typically have a large degree of autonomy in their classrooms with few visits from principals, other teachers, or consultants. Although this autonomy can encourage teachers to sometimes take risks in trying out new instructional ideas, it ca be a problem when teachers have few opportunities to observe, evaluate, or adopt other teachers' successful practices.

Teachers' Fear of Computers

Since the act of teaching is seldom observed or evaluated, teaching practices remain largely unchanged. Teachers tend to stick with what they believe works for them in the classroom, regardless of other alternatives presented to them by the school, other teachers, and even their sub-group. Teachers' self-efficacy is preserved by this situation but the process of change is slowed if not halted.

Teachers fear the failure of not being able to troubleshoot technical problems while using computers with students, and this has given some teachers reason not to try integrating technology into the curriculum (Solomon & Solomon, 1995). Teachers may feel they will "look foolish and lose the class' attention" (p. 38).

Teachers tend to shy away from asking one another questions about their classroom teaching practices, at least in part because of their fear that such questioning may imply that the teacher asking the questions lacks or is unsure of his or her classroom skills and needs help from other, more experienced teachers. New teachers are given more leeway, but even new teachers seem to catch on to the unspoken rule that teachers just do not ask one another about how or why they teach as they do in their own classrooms. Teachers may be asked to step outside their isolated classrooms occasionally to share what they have learned at workshops or during in-service sessions with their colleagues, who likewise have formed their own patterns of "don't ask, don't tell" independence. Teachers seem to feel that asking other teachers' opinions about their teaching practices would make them seem weak or lacking in skill. In a related vein, teachers often fell that to adopt others' suggestions and change their teaching methods indicates that they have previously been using flawed techniques to teach. Because of these misconceptions, it can be hard for teachers to open up and initiate true, open professional collaboration between themselves and their colleagues.

Little (1990) argues that routine sharing—when it is supported by a positive school culture—opens up discussion about curriculum and instruction and expands teachers ideas and resources for technology. The one drawback may be that teachers may then expend more time creating new resources to replace the ones that they have shared. To develop interdependence among teachers, Little recommends that each teacher's contribution to the group should be necessary for the group to succeed. Little calls this joint work (p. 519). Gonzales et al. (2002) suggests that teachers should train other teachers to provide each other with a mutually beneficial support network for new models of teaching with technology.

Beliefs About Teaching and Technology

Becker (1999) surveyed teachers regarding their beliefs on good teaching and on their teaching practices, finding that teachers who were less traditional and more constructivist used the Internet more than traditional teachers. Becker identified five characteristics that are consistent with the constructivist approach. The first characteristic was the participants' disagreement with the traditional learning theory of teachers' need for having quiet classrooms, teaching basic skills first, the teachers having control over what is to be taught, having difficulty if not able to provide correct answers when asked, and relying for instruction on teachers' explanations based on the teachers' knowledge. The second characteristic showed constructivist teachers aligned with conceiving of the role of the teacher as a facilitator, different activities occurring in the classroom instead of one common activity, having student interest drive the curriculum, seeking student input in determining assessment criteria, and having students feel free to move about the classroom. The third factor showed constructivist teachers favoring use of demonstrations and student projects, with student having an audience for or with whom to demonstrate or share their projects; students completing projects that can be used by others and that may extend for longer periods of time, such as a week or more; students working collaboratively "doing 'hands-on' activities" (p. 15); and students not being engaged in seatwork and not working alone to answer questions. The fourth characteristic emphasized student responsibility, with students working in groups to decide what procedures to use to solve a problem and come up with a group solution, designing their own problems, and working on problems with no obvious solution. The fifth characteristic dealt with the frequency with which teachers made the following practices part of their teaching: students assessing their own work, students doing independent essay and journal writing, students holding debates, students being given open-ended assignments that do not have a specific correct answer, and students being involved in the planning of classroom activities.

Does this mean traditional classrooms cannot be technology-integrated? Becker (1999) suggests that teachers who follow a traditional pedagogy may find it difficult to make full use of the Internet if they continue using a primarily skills-based approach. Teachers are changing their teaching practices and beliefs with the use of the Internet. Giving teachers access to the Internet, however, does not change every teacher's beliefs and it is unlikely that teachers can be made "to be more constructivist simply by having them use computers in their teaching" (p. 24).

Resistance to Change

Teachers, readily, cite the lack of effective training (Farmer, 1998) as one of the primary reasons why more teachers do not use technology in the classroom. As a result, teachers frequently possess limited computer knowledge (McCannon & Crews, 2000). Knowledge in itself, according to Wu (1988), does not bring about change. Teachers with limited computer knowledge also tend to use computers in a limited way, which in turn tends to produce anxiety (Shick, 1996). However, Shick believes teachers can overcome their anxiety through proper training. Woodrow (1998) believes it is not the teachers' reluctance to change but rather "the need for a clear understanding of how current technology can be used to enhance significantly learning opportunities" (p. 5). Teachers need to be able to relate their learning to how they can use it in the near future (Wu, 1988). For example, teachers tend to use computers to help them with administrative tasks and not as an organic part of the student learning process (McCannon & Crews, 2000) because they can relate learning wordprocessing and the use of a database to accomplish their own immediate, required tasks. At this point, teachers do not easily conceive of the use of technology as useful as a part of the learning process for their students.

Barriers to change may also be classified as either extrinsic or intrinsic. For example, as in the use of software an external barrier involving software may be the lack of software for classroom use or the decision to use a specific software program may be made by someone other than the teacher like an administrator or technology coordinator. An intrinsic barrier involving the use of software might lie in the teacher's own ability to use it effectively or the teachers' decision about how the software or technology resource would be used.

Special Populations

Another factor teachers need to consider in making decisions about integration of technology is the way computers may be used for specific student populations. In less advantaged schools, about one third of teachers could be classified as beginners in their technology use (Oates & Oates, 2001). This finding supports those of an earlier study by Becker and Ravitz (1997), who reported that schools with limited funds tend to focus on "traditional content and methods," (p. 1) making innovations difficult for teachers to implement. In making decisions about how the Internet will be used with specific populations, for example, teachers in school with a high enrollment of low-income minority students tend to use the Internet to search for information as compared to students enrolled in a higher socio economic area schools who use computers in a manner that could be described as more tool-based (Smerdon et al., 2000). While some schools have lowered their ratio of students to computers to a level of five students for each computer (Culbertson, 1999), schools in high-poverty areas tend to have a higher ratio meaning that there are more students to fewer computers.

Software Availability

Types of software and their availability to teachers may determine how teachers decide how they use computers for teaching and learning (Becker, 1998; Hill, 2004). Additional software and hardware are necessary according to Carlson (1991), “but it is not sufficient to cause significant changes in teachers’ use of computers” (p. 3). According to Becker (1999), teachers may need to master new skills in order to make use of more flexible software.

> Software may change classroom lessons if teachers identify "entry points" that will improve student performance. A spreadsheet may enhance the study of acid rain if the teacher can see where the tool fits into the gathering and analyzing of field data. On the other hand, if the teacher never asks students to interpret data, the tool will rust in a corner (McKenzie, 2000, p. 3).

Brennan (1991) found that teachers were reluctant to use software programs when they encountered difficulties: “Frequent failures of software to deliver what it claimed to caused teachers to decrease, discontinue or reject computer-based learning activities within the classroom or as potential extensions of curricula developed in more traditional frameworks” (p. 30).

Applications which provide incorporate skill and drill types of activities are easier to transfer from the computer lab setting to the classroom, which typically employs similar skill and drill practices rather than applications that require transforming classroom practice (Cognition and Technology Group at Vanderbilt, 1996).

Maddux, Johnson, and Willis (1997) grouped software applications into two categories, designated as Type I and Type II. Type I software applications "make it easier, quicker, or otherwise more efficient to continue to teach in traditional ways" (Maddox, 1994, p. 131). Teachers use these types of software applications are used to teach specific skills or concepts through drill and practice or Integrated Learning Systems (ILS). Type I applications do not require teachers to change their teaching practices and are, therefore, easier for teachers to implement.

Type II software applications "make new and better methods of teaching and learning available to us—ways that would not be available without technology" (Maddox, 1994, p. 131). "This type of software enables the user to create, produce, and to communicate with people who would be otherwise unavailable (Maddox, et al., 1997). Advancing technology has opened up a variety of options for teaching and learning and in doing so has increased decision making opportunities for teachers.

In considering the barriers to teachers making changes in deciding to integrate technology, the teacher continues to be the ultimate decision maker. Even when their access to computers is limited, teachers have the choice of implementing the one-computer classroom concept, using Type I or Type II software, using the lab or classroom computers, or of not using computers at all. Teachers also decide who uses the computers for how long and for what purpose. While the availability of software may not be entirely in the hands of teachers, in terms of the software available to them, teachers can decide which students have access to particular software programs (Chisholm & Wetzel, 1997) and how these programs will be used. Teachers still make the final decision about how, when, and why they use telecomputing tools and resources in spite of any barriers that may exist. The capability of computers to extend instruction to resources beyond the school walls increases teachers' need to make decisions and to rethink how they use computers in the classroom.

Educational Telecomputing

Some teachers are ready and eager to harness the potential of telecommunication to expand students access to information and communication resources beyond the classroom while other teachers are frustrated by the challenges and complexities of using telecommunication for instruction.

According to Rogers, Andres, Jacks, & Clauset (1990), the reluctance of teachers daunted by the use of telecomputing resources is reinforced by well-meaning presenters and articles touting the benefits of telecomputing. For this group of teachers, telecomputing means to

> plug the computer in, boot the word processor, and begin writing. Plug the printer in and begin printing. Plug the modem in and dial an information service. They expect to announce their presence on a network, request a “computer pal” and instantly have their students involved in meaningful exchanges. When, two weeks later, they have not received even one reply, they are understandably disappointed in the “promise” of this technology (Rogers, et al., 1990, p. 1).

Rogers et al. (1990) suggest that the source of this frustration lies in teachers' expectations and the way teachers think about telecomputing. The most difficult part of telecomputing is not in setting up the physical technological components, but in the social experience of interacting with others in an unpredictable environment. Telecommunications may mean different things to different people (Rogers et al., 1990). The terms *telecomputing* and *telecommunications* are sometimes used interchangeably; however, Tinker (1997) makes a clear distinction. In Tinker's view, the term telecommunications may include a variety of general forms of communication (e.g., television, radio, video, and the telephone), the term *telecomputing* refers specifically to computer-based communication. For the purposes of this study, the term *telecomputing* will be used to include network-connected computers with Internet and e-mail capabilities. Any other type of communication that is done directly through the use of the computer (e.g., video) will also be considered as a type of telecomputing.

Electronic Networks

How do teachers use the Internet and online resources? According to Becker and Ravitz (1997), Internet use is a concept with many meanings. For example, a teacher might use the Internet to find teaching resources, but not really involve his or her students. Or, in another instance, students might use the Internet occasionally to search the Web for information for a term paper. By contrast, Internet use to other teachers may involve regularly incorporating a wide range of Internet-based activities into their teaching, including students publishing on the Web, collaborating with students or teachers at other school sites, or participating in live events by means of the Internet.

Educators today are faced with mounting pressures to show that their students are achieving academically, employing their technological skills creatively and seamlessly while solving real-world problems, and communicating their learned knowledge through various forms such as multimedia presentations and Web-based projects (Cuban, Kirkpatrick, & Peck, 2001; McClintock, 2001).

Educational emphasis on having students use the Internet to find and regurgitate basic facts has shifted toward emphasis on helping students gain a deeper understanding of concepts and exploring and using new ideas. This shift has prompted teachers and curriculum specialists to develop a type of curriculum that weaves technology into the various content areas rather than, as with previous practice, writing curriculum that treats technology as a separate subject. Several Web sites offer educators a variety of opportunities to engage in more in-depth learning through the use of electronic networks. Multitudes of Web sites are available that invite teachers to participate in various types of Internet activities. Although project-based instruction is not the only option for use of the Internet, many states have written curriculum goals that ask teachers to accomplish just that (Louisiana Department of Education, 2002; Texas State Technology Standards, 2002). For example, technology integration into the math and science curriculum areas has been influenced by national standards developed by organizations focused on that content area. Examples of various online projects and activities available for teachers to use include project-based learning, event-based projects, and standards-based projects.

According to Stuhlmann and Taylor (1998), project-based learning involves exchanging, gathering, and collaborating on projects by students. Teachers and students engage in investigations over long periods of time to solve complex problems (Johnston & Cooley, 2001).

The event-based approach begins with an event that is real, current, and provides context for projects that students may engage in. For example, the Event-Based Science Program was created to teach middle school science students the relevance of various science topics in an authentic way. Students learn more about the topics selected through online interviews and Web searches. Examples of topics include changes as a result of environmental pressures, volcanoes, toxic leaks, and first flight (Wright, 2002).

Standards-based instruction begins with a particular curriculum standard situated in a specific content area. The online component, according to Schrum and Berenfeld (1997) is only one part of the curriculum. What happens off-line is what identifies the activity as interdisciplinary. Schrum and Berenfeld use the example of a project that investigates locations students might want to visit. The table below illustrates the questions and extensions that may be used to extend this type of lesson.

Table 1. Off-line Activities for an Internet-Based Geography Project	
Typical Questions	Expansions for the Project
A. Where is the place of your visit located?	1. Create data charts or data bases to organize new information.
B. What are the geological characteristics of this place?	2. Create a graph showing costs, timing, statistics, or hours of operation for sightseeing.
C. How much does it cost to fly there?	3. Write letters to the local chamber of commerce for information.
D. How can you get around?	4. Draw pictures or maps of the region.
E. What is there to do and see in your location?	5. Write a creative story or newspaper about the history.

Electronic networks provide students with opportunities to work collaboratively on projects. The use of electronic networks for instruction, at first glance, appears to be akin to organizing instruction in the traditional classroom environment (Waugh, Levin, & Smith, 1994). In a study of many network related projects, Waugh, et al. found that the dynamic nature of electronic networks requires specific strategies to organize network-based activities. The approaches to project organization were observed and compared in three network projects: the FrEdMail Network, the National Geographic Kids' Network, and the AT&T Learning Network.

Each of these network projects differed in their management and organization. In the FrEdMail Network, a project is initiated by an individual who brings to public notice an idea for collaboration from other network participants. Communication between the collaborators includes discussions about project details and the roles each member will take. One benefit of this type of project is that ideas become known to and discussed among a wider audience of possible participants. However, the success of this type of project organization and management approach depends on the determination of all the participants to work together without any one individual issuing directives. Unfortunately, most projects remain incomplete because of the failure individuals to fulfill their responsibilities. Other reasons cited for failure of projects included lack of participants, inopportune timing of the project, lack of topic appeal, distraction among interested participants who are busy with other projects, and inadequate advertisement of the topic. Additionally, the researchers found that beginners to networking came away with negative experiences stemming from their misplaced feelings of rejection if their topics were not selected by others. In spite of the fact that the lack of success of the proposed project could be attributed to other factors unrelated to the proposed topic, these beginning network users did not elect to continue with their network project.

Contrary to the loosely organized FrEdMail Network, the National Geographic Kids' Network is characterized by a more structured approach. Curriculum experts develop project activities and require participants to subscribe to participate in collaborative activities. Specific timelines and sequenced activities are provided by the experts and staff members. After data collection and information interchange, the staff analyzes the information and returns summaries to the participants. Creative exchanges and data analysis for students are not highly supported with this type of structured approach, but the specific timelines are helpful in moving the project along.

The AT&T Learning Network provides an example of an electronic network project that is neither too loosely organized nor too highly structured. Participants join an assigned learning circle of four to seven members, grouped into cycles according to project themes and participants' grade levels. Each learning circle activity cycle is guided by a mentor-coordinator for an entire semester's duration. Every participant organizes and manages a learning activity, with everyone in the group required to participate. A summary is written and shared on the network. The major limitation of this type of network project is that the small number of participants in each group limits the number of interchanges with participants of other groups.

These electronic network projects illustrate the intricacies and kinds of problems that may be encountered by teachers who are managing or whose students are participating or in network projects. Network projects also vary in the way participants organize their instructional activities. The three projects previously cited represent the variability that exists among the types of network projects available to teachers and students. Novice and experienced teachers have a choice among the types of networking environment as to which of them best suits their specific needs and also according to how well they develop expertise working with networking projects as well as in their teaching practice.

Internet Use

The Internet is replete with ideas and suggestions for Internet-based curriculum projects. Use of the Internet for collecting or gathering information is what Schrum and Berenfeld (1997) refer to as tele-access, meaning that students and teachers have unlimited access to images, databases, electronic maps, online books, and other information which can be downloaded quickly and easily from online resources. Other computer-mediated communication functionalities include virtual publishing, tele-presence, tele-mentoring, tele-sharing, and tele-collaboration. Classroom online activities may include an activity as simple as sending keypal messages to students in other schools. This type of online activity is considered to be a step one implementation and is characterized by its use as an extracurricular activity. No curricular changes or changes in teaching practices are needed at this level of implementation. Teachers may have students download images to enhance a science lesson.

In step two, teachers proceed from lesson enhancement to computer-mediated communication modules. Once teachers have been successful in using online resources to augment their curriculum as in a step one implementation, the next step is to incorporate specially designed modules into their curriculum. The Global Lab Project (http://www.terc.edu/handsonIssues/f94/patterns.html) is an example of a module designed to provide an authentic and collaborative learning environment for students to study science. This transitional step supports teachers' "lack of training, experience, or confidence to abandon conventional teaching practices in favor of new and unfamiliar ones" (Schrum & Berenfeld, 1997, p. 53).

Step three signifies that telecommunication is fully integrated into the curriculum. At this stage, curricular changes are made, teachers' roles change, training and support for teachers are needed, and the tools for data collection need to be made available to students and teachers. This step goes beyond downloading images and files into creating "real-world oriented student communities of practice" (Schrum & Berenfeld, 1997, p. 54).

Designing Internet-Based Curriculum Projects

An approach to designing Internet-based curriculum projects, that may facilitate teachers' lesson planning as well as their implementation of online curricular activities, is the use of a flexible framework described by Harris (1998). This framework is made up of activity structures. These 18 activity structures aid teachers in designing telecomputing projects and are grouped into three major categories: (1) interpersonal exchanges, in which e-mail, newsgroups, chats, interactive video connections, and bulletin boards are used to communicate electronically from individuals to individuals, individuals to groups, or groups to groups; (2) information collection and analysis, used not only for gathering information but also for its analysis; (3) and problem solving.

Interpersonal Exchanges

Interpersonal exchanges are characterized by activities such as keypals, global classrooms, electronic appearances, question-and-answer activities, impersonations, and telementoring. Keypals, in which students correspond with other students via e-mail, is the most frequently used activity structure. Even kindergarten students can learn to use e-mail. Yost (2000) describes the use of e-mail as a tool to support emergent writers. For example, one class of kindergarten students corresponded with selected family members or friends with e-mail capabilities either at work or at home. Students were encouraged to ask for the type of assistance they needed which ranged from students doing their own typing and asking for help with spelling, to teachers writing words down for the student to type, to the teacher taking dictation while typing the child's message. In one instance, as students typed, the teacher listened to the child talking about his writing and sent follow-up e-mail messages, translating what the child had written. As emergent writers, children in early childhood produce writing that may have no sound/letter connection.

The global classroom is similar to keypals but involves interaction among groups. For electronic appearances, guest speakers are made available to students. These may include "appearances" via ordinary e-mail, in chat rooms, via videoconferences, and in messages on electronic bulletin boards. Question-and-answer activities are ideal to help students obtain answers from experts. These are generally short-term projects. Students can also access Web sites or e-mail individuals who are posing as historical figures.

A more complex type of activity involving students asking questions of experts, telementoring connects subject-matter experts (or SMEs) to discuss specific topics or projects. Telementoring is also defined as mentoring online using the Internet (Bennett, Hupert, Tsikalas, Meade, & Honey, 1998) e-mail, or videoconferencing that supports the mentoring relationship (Gomez, Fishman, & Pea, 1998). One of the difficulties of being a telementor is not being able to meet with the mentee because of time or distance. Telementoring provides a flexible way for teachers to offer students a real world experience without leaving the classroom. In telementoring, the mentors are subject matter experts and not classroom teachers and, therefore, can offer students a perspective outside the classroom in a more authentic setting. Keypals or whole-class interchange with a subject matter expert is not considered a mentoring partnership.

Three types of telementoring projects according to Riel (1999), are those involving mentor experts, who answer students' questions; pair mentoring, which includes one-to-one interactions; and group mentoring, which involves the entire class of students.

The abundance of resources available on the Internet may be overwhelming for teachers who are new to teaching or who are involved in honing their technology skills. Several online resources are available to assist teachers in making connections with experts in various disciplines.

Information Collection and Analysis

Five activity structures that concern information collection and analysis include information exchanges, database creation, electronic publishing, telefieldtrips, and pooled data analysis. Each activity structure involves collecting and analyzing data, publishing, and sharing.

In information exchanges, students and teachers collect a variety of types of information. One project might collect jokes, another might collect science-related data, or another might collect personal health information. This type of activity structure provides students with the opportunity to become users and creators of the data that is exchanged.

Database creation is the organization of data by students that is then made available for use by other students. In electronic publishing, electronically shared information from sites located in schools from different cities, states, and countries are published in an electronic magazine or journal-type format. Telefieldtrips make communication about field trips possible among teachers and students. Teachers' and students' visits to and observations about places like museums and historical parks around the country to provide information for teachers or classes scheduled to undertake a similar trip or whose curriculum covers the related topics. Telefieldtrips also provide an avenue for students to share information about where they live with other students from different locations. Experts offer another source of information and interactivity to students by providing accounts of their expeditions or journeys.

Another type of information exchange is pooled data analysis. Students survey multiple sites and collect data and then combine the data to be analyzed and reported. Teachers do not need to design or coordinate these types of projects on their own, and several online projects are available for student or class participation.

Problem Solving

Harris (1998) has placed six activity structures under the umbrella category of problem solving activities, including information searches, peer feedback activities, parallel problem solving, sequential creations, telepresent problem solving, and simulations. Each activity structure requires gathering and analyzing information or deciphering clues to solve a problem. For example, information searches provide students with online activities for problem solving by having students decipher given clues using reference sources such as atlases and maps to identify a mystery school's location. Problem solving is reported to be the least used of these activity structures.

An example of peer feedback activities involves students posting poems to a newsgroup and receiving critical feedback from other students, based on their writing process.

In parallel problem solving, students engage in solving a problem similar to one being solved by students at other sites. Students then share their problem solving procedures online. Sequential creations are similar to parallel problem solving except that students work on the same piece and expand the work done by students and posted on a previous site. For example, students at one site may begin a poem and pass it on to students at another site to add a stanza and so on.

Telepresent problem solving offers students an opportunity to exchange ideas through virtual gatherings, either in real time or for participation by students doing similar activities off-line.

Simulations provide students with role playing or mockups, which offer realistic learning opportunities via telecommunication with sites around the world and in the classroom. Simulations allow students to exchange ideas and to respond to and interact with the simulated events when real life situations are impractical. An example is a mock-up and simulation of a space shuttle launch, The Educational Space Simulations

Project, which is a simulated activity available to students, who can access data from various off-campus sites.

Social action projects promote social awareness and a call to action in which students learn about and become proactive in social issues (e.g., hunger, pollution, and disease) by petitioning and fundraising to support activities or organizations that address these issues.

Telecollaboration is using a computer to collaborate at a distance with others who are similarly connected to a telecommunications network, such as the Internet (Harris, 1998).

The activity structures described by Harris (1998) can also be recognized in a case study by McGee (2000) that demonstrates ways teachers may make use of one or more activity structures in a lesson or unit. McGee's study of a middle school science teacher looked at how a new teacher, called Mary in McGee's study, made the decision to use technology in a specific teaching context when other novice teachers did not. Mary, an eighth grade science teacher, implemented several science-oriented technology projects with her students, studying topics such as climate, geology, and space. The climate project involved the gathering of lunar and weather information from specific sites on the Internet. In addition, the class also participated in the GLOBE program, a NASA, NSF, EPA, and NOAA sponsored project in partnership with universities, colleges, and educational entities in 95 other countries. Students were able to collect and send scientists data via the Internet to use in their research. Students also made inquiries to solve problems that arose as they participated in this project. The class used Internet resources to learn about Earth science.

Resources for Mary's space unit included CD-ROM programs such as *Our Solar System* and *The Ocean Planet* by NASA along with Web sites for accessing pictures of space and other celestial bodies and sounds.

According to Riel (2001), in our information age, factual knowledge is plentiful. What is scarce is the intellectual work of giving value to information, of transforming information into useful knowledge systems. This is the work of learning communities. Educators need to help students understand that communities work together to connect information into meaningful interpretations. Riel points out that using a communication technology such as a listserv, a Web page, or a conference does not a community make. Rather, the interactions and partnerships that are formed among participants define communities that support social exchange, strengthen relationships, and "have real consequences" (Riel, 2000).

A community of practice is more than just a gathering place. It involves a searching for ideas, strategies, or practices that stimulate new ideas and thoughts. Diversity among individuals who have different languages, perspectives, cultures, and experiences offers participants a richer experience from which to learn.

The size of an online group is related to the purpose that the group's members want to be accomplished. The task to be accomplished is affected by the number of participants. Certain projects require small group work, while other activities work well within a larger organization. Failure of the project may result from a lack of planning to accommodate a group's size.

Telecomputing projects may seem overwhelming to teachers who are just beginning to use the Internet. The use of WebQuests provides a model for creating online projects. “A WebQuest is an inquiry-oriented activity in which some or all of the information that learners interact with comes from resources on the Internet” (Dodge, 1997, p. 1). Time constraints limiting student access to computers necessitated a deliberate design to make WebQuests efficient. WebQuest projects require clarity of purpose in their design. To this end, WebQuests contain an introduction providing background information, a task that can be accomplished by and is intended to be of interest to students, information sources to complete the task contained in the WebQuest or with links to appropriate Web sites, a process to accomplish the task with a sequence of steps to follow, guidance in organizing information, a conclusion to include reflection among students about what was learned, and encouragement for students to extend the lesson. Although WebQuests can be designed by students, teachers may find that they need to provide the scaffolding needed to help students design a WebQuest page and facilitate the navigation of the Internet.

Summary

The high price of furnishing schools with computer technology and the expectations that students are prepared for the twenty-first century have placed pressure on states, districts, and schools to take a closer look at technology integration in the context of real-world situations and increased communication beyond the classroom.

The low incidence of teachers using Internet resources suggests that telecomputing has not been fully integrated into the curriculum. Since teachers have the final say about what transpires in their classroom, the researcher must understand how the teacher makes instructional decisions and the models of instruction a teacher uses in the delivery of instruction, as well as the knowledge about a multitude of Internet projects and resources in order to investigate how, why, and when a teacher uses telecomputing resources

In the process of teaching and learning, in an environment that supports autonomy, teachers have made numerous decisions to satisfy their needs and those required by their profession. Teachers have formed their own classroom routines according to the decision they have made. How, when, and why teachers make decisions about telecomputing tools and resources may be decided during their mental planning process and perhaps manifested in their written plans.

Teachers are key in the use of telecomputing tools and resources and make decisions about the use of these tools in the context of their planning for instruction and learning in their classrooms. By closely examining the decision making process in which technology-using teachers engage, in the context in which they make their decisions about use of technology in their classrooms, we can discover why there is such a low incidence of teachers who are use telecomputing tools and resources.

Teachers make countless planning and implementation decisions in their daily classroom practice. These decisions are based on knowledge, goals, and beliefs teachers bring with them to the classroom and the ones they form during their teaching practice

By exploring teachers' mental planning process, we get a glimpse into their thinking about how, when, and why they decide to integrate curriculum-based telecommuting tools and resources into their plans for their classroom practice.

The use of telecomputing tools introduces teachers to new tools, resources, ideas, and new ways of thinking to integrate into their daily teaching practice. Not only do teachers have to deal with knowing what online resources are available, they must have the necessary skills to design and manage these tools and resources as an integrated part of their students' curriculum-based learning. Teachers' decisions to adopt technology require them to seamlessly integrate the use of online tools with the art and science of teaching. How are they making these decisions in light of their knowledge, goals, and beliefs? How are teachers making decisions about how, why, and when they use telecomputing tools and resources to support their students' curriculum-based learning?

Chapter Three: Research Methods

"Discourse-in-practice provides the footing for answering why discursive practice proceeds in the direction it does, toward what end, in pursuit of what goals, in relation to what meanings" (Denzin & Lincoln, 2000, p. 503). To this end, the paradigm and methods were chosen.

The paradigm I have chosen is compatible with the purpose of this research as defined by my ontological and epistemological beliefs—that multiple realities exist dependent on time and context and that one comes to know reality through an interactive process. This chapter will describe the paradigm and methods used for this inquiry.

THEORETICAL FRAMEWORK

This study draws upon theories in decision making and research on teacher instructional planning. The research framework selected is interpretive because the purpose of the research study is to explore, interpret, and understand how teachers make decisions in their use of telecomputing tools and resources. The interpretive stance lends itself to a focus on understanding how the participants understand their decision-making process and make sense of the events and settings that are the subject of this study.

Research Paradigm

"Interpretivism was conceived in reaction to the effort to develop a natural science of the social. Its foil was largely logical empiricist methodology and the bid to apply that framework to human inquiry" (Schwandt, 1997, p. 125). Interpretivists contend that human inquiry in the social sciences is unique (Mertens, 1998; Schwandt, 1997). Phenomenology, hermeneutics, and *Verstehen* along with other philosophies in language, sociology and the social sciences inform qualitative research.

From phenomenology comes the idea that people interpret the goings-on in their daily lives in terms of the meaning that situations, events, and their understanding of their meaning have for them (Merriam, 2002). "People act on what they believe" (Fetterman, 1988, p. 18).

Interpretivist research is thus influenced by hermeneutics—"the study of interpretive understanding or meaning" (Mertens, 1998, p. 11). The concept of hermeneutics had its origins with the study of scripture or interpretations of the Bible (Schubert & Schubert, 1990). At the most conservative end of hermeneutics, interpretation of text is based on an understanding about what the author originally intended, prompting the researcher or reader to learn more about the context in which the text was written in order to better understand the text's meaning. In a more general sense, especially in the case of interview-based research, the researcher aims to accurately interpret the meaning that the study participants ascribe to their own situations, thus representing their decision-making experience from the "point of view of those who live it" (Schwandt, 1994, p. 118).

Verstehen is the German term for understanding, and specifically refers to the ways humans understand their actions and understandings methods (Schwandt, 1997). In contrast to the natural sciences, which developed general laws to explain particular, replicatable phenomenae, the social science construct of *Verstehen* refers to the process of understanding meaning from the informant's point of view. "Interpretivists in general focus on the processes by which these meanings are created, negotiated, sustained and modified within a specific context of human action" (p. 120).

In the following section, the basic ontological, epistemological, and methodological beliefs that define the interpretivist paradigm are further elaborated.

Ontology refers to beliefs about the nature of being or reality (Denzin & Lincoln, 1994). For example, in the natural sciences, positivists believe that there is only one reality and the researcher's job is to discover that reality (Guba & Lincoln, 1994). For interpretivists, however, the ontological assumption is a belief in the existence of multiple realities that are time and context dependent. The "interpretivist believes that to understand this world of meaning one must interpret it" (Schwandt, 1994, p. 118). Any claims made are contextually based. According to Lincoln and Guba (cited in Schwandt, 1997), interpretivist researchers should provide a report of participants' understanding in sufficient detail so that "readers can engage in reasonable but modest speculation about whether findings are applicable to other cases with similar circumstances" (pp. 58-59). Understanding one setting thoroughly thus enables the researcher to make informed judgments and suggestions about the similarities and differences that may relate to another setting (Erlandson, Harris, Skipper, & Allen, 1993).

By revealing the context of these teachers' classroom settings, the researcher offers the reader an opportunity to better understand the complexities and diversity of the relationships and classroom climate specific to each informant. The classroom setting, teachers' experiences in it, and understanding of their roles in it provide a unique context for each of the participants. Classroom settings offer the researcher an opportunity to illuminate the context to better understand the complexities and diversity of the relationships and classroom climate specific to each informants' particular experience (Erlandson et al., 1993). The use of rich description conveys the context to help the reader understand the informant's natural environment. Though the focus of this study is to gain insight about how teachers make decisions about use of telecomputing technologies, the context in which teachers make these decisions provides further insight in understanding the low incidence of curriculum-based telecomputing.

Epistemology looks at how one knows reality, the method for knowing the nature of reality, or how one comes to know reality (Denzin & Lincoln, 1994). It deals with the relationship between the knower and the known, since "the inquirer and the inquired-into are interlocked in an interactive process; each influences the other" (Mertens, 1998, p. 13). Data collection was an interactive activity between the researcher and respondents. The interviews began with open-ended questioning and continued with related questions that emerged and evolved as the interviews progressed (Lincoln & Guba, 1985). To gain a deep understanding of the meanings and actions of the participants, I, as the researcher, must be aware of my own convictions and understandings so that the process of data gathering and analysis is an interactive process and not one sided (Miles & Huberman, 1994).

Methodology is the "theory of how a study should proceed" (Schwandt, 1997, p. 93). Eichelberger (cited in Mertens, 1998) describes methodological work as "constructing the 'reality' on the basis of the interpretations of data with the help of the participants who provided the data in the study" (p. 14). Methods used in interpretive research are unlike methods used in empirical research, which apply strictly prescribed rules and procedures. Interpretative research requires the researcher to make decisions or draw inferences that cannot be scientifically reproduced or tested (Schwandt, 1994), which represents the traditional meaning of the terms *reliability* and *validity* in empirical research. Instead, in interpretive research, a more appropriate approach in judging the quality of the research is accomplished through use of criteria established by Guba & Lincoln (1994). Trustworthiness criteria used in this inquiry are provided in detail on pages 122-123.

Ensuring Quality of Findings

The methods used to generate data included interactive interviews, classroom observations, and thorough review of documents. These procedures make possible social construction of reality that requires the interaction between the researcher and the participants (Guba & Lincoln, 1994). Because the researcher looks at a phenomenon from the inside out, the researcher's values, beliefs, and perspectives are made explicit in the narrative.

Perspective

How teachers make decisions and plan about their use of telecomputing tools can be best understood by studying in the specific contexts where teachers spend most of their day—the classroom. Being a teacher gives me an advantage, allowing me to observe as an insider and to understand the jargon typical of the school environment. Understanding the language of the school culture aids in identifying not only the more obvious meaning but also the underlying meaning inherent within the culture (Erlandson et al., 1993).

The findings of this study were generated through the process of inquiry into participant understandings and my constructions and interpretations of those understandings. As I gained experience as a teacher, the meanings and understandings I formed provided a baseline perspective of the decisions I now make and the biases and beliefs I have developed. These shape the way I view technology integration and may also color my interpretation of the participating teachers' perspectives. My perspective is further described in my Researcher as Instrument Statement located in Appendix A. The researcher as instrument statement is an acknowledgment of researcher's own biases and beliefs that "documents the researcher's own feelings, attitudes, learnings, and insights, and chronicles the researcher's growth over time" (Erlandson et al., 1993, p. 108). The importance of sharing my perspective is that, as the researcher, I am the primary instrument for collecting, generating, analyzing, and interpreting data, and it is therefore appropriate that I be as intellectually honest as I possibly can about my personal biases or beliefs that might—despite my best efforts—affect my representation of my participants' perspectives and understandings (Lincoln & Guba, 1985).

The Human Instrument

The advantage of the human instrument lies in the person-as-researcher's ability to adapt to multiple realities, understand their meanings, and to recognize the influence of biases that may occur (Lincoln & Guba, 1985). The interpretive stance embraces the human instrument because of people's adaptability to respond to personal and environmental cues, to make sense of the parts of a whole, to process information immediately, to summarize and make clarifications on the spot, and to explore responses in order to achieve a higher level of understanding (Lincoln & Guba, 1985, pp. 193-194).

The human instrument, consciously or unconsciously, is influenced by tacit knowledge that people have gained from their experiences. Tacit knowledge is "the set of understandings…that cannot be defined" (Moore, as cited in Lincoln & Guba, 1985, p. 195). Tacit knowledge is used to "build new understandings" (p. 196) and is an "indispensable part of the research process" (p. 198). The human instrument also plays a role in directing purposive sampling, which is essential to selecting informants rich in information central to the inquiry (Erlandson et al., 1993).

Purposive Sampling

Purposive sampling is the process of selecting informants who can best contribute to the understanding of the phenomenon being studied (Erlandson et al., 1993). Selection of participants was limited to those teachers who had computer and Internet access at public or private schools, either in their classrooms or in the computer lab and used the Internet or e-mail as part of their classroom curriculum. To identify teachers who might have these experiences, I distributed fliers for an online survey at a technology conference sponsored by an educational service center. In addition, I had conversations with attendees who were technology teachers or coordinators at their schools or districts who offered names of possible participants from their schools. In addition, I sent e-mail messages to technology teachers and directors from various campuses and districts throughout central Texas. In response, I received two e-mails from teachers using Internet or e-mail in their classrooms with a recommendation to contact some of their colleagues. Of the three teachers recommended, only one was willing to participate.

I also e-mailed teachers who had participated in an online project and published their results to the Web. I received no responses when linking to these teachers' e-mail links on their Web site. Some of the e-mail addresses were no longer active because they bounced back with error messages. In addition to the survey, technology conference presenters and attendees, teacher trainers, and colleagues were asked to recommend names of possible participants. Six K-12 teachers were selected to participate.

In a traditional or quantitative study, the limited number of participants would probably represent a problem. However, in a qualitative study, a limited number of participants is not seen as a hindrance as long as all of the participants qualify as being persons whose experience with the situation being investigated gives them particular insight into that issue. Small numbers allow participants to take part in more in-depth discussions of their decision making process, and allows these informants to express their own ideas in their own terms (Marshall & Rossman, 1995; Mertens, 1998).

Participants in This Study

The participants included six teachers--three from elementary schools, one from a middle school, and two high school teachers—who were using telecomputing resources in various uniquely individual ways, such as in support of one or more specific curricular subject areas, as part of a thematic unit of study, or in other creative ways (see

Table 2, below). These participants were selected because they differed in the range and extent of their use of telecomputing resources and offered reflective and thoughtful opinions about their reasons for their decision to use computers and how they used them. The selection of informants who varied in the ways they used telecomputing technologies, for example, maximized the possibilities for obtaining a range of divergent data relevant to the study which also "gave the context its unique flavor" (Lincoln & Guba, 1985, p. 201).

Table 2. Participants and Teaching Assignments at Time of Interviews

Name	Years of Experience	Grade(s)	Assignment	Enrollment
Diane Sanders	23 years	3rd	classroom teacher	22 students
Sarah Jaramillo	9 years	4th	classroom teacher	22 students
Evelyn Allen	25 (retired)	5th	classroom teacher	28 students
Trisha Marley	7 years	6th-8th	special education teacher	18 resource 15 inclusion
Adam Herrera	3 years	9th -12th	social studies teacher	block schedule
Daniel Gonzales	30 years	9th-12th	technology teacher	school wide

The six teacher participants comprised a varied group of elementary, middle, and high school teachers from schools in central Texas. The teachers ranged in experience from three years to over twenty-five years of teaching. Teachers in an elementary setting face challenges different from teachers at the middle school or high school level. A conscious decision was made to include at least one teacher from each of these major grade levels. These teachers' experiences are not meant to represent a generalization of the experiences of technology-using elementary, middle, or high school teachers, but rather provide an in-depth look at the process and challenges involved in teachers' making decisions about using telecomputing tools in the classroom, as experienced by these particular participants in their specific contexts. These teachers who chose for various reasons to use telecomputing tools, and are briefly identified below. As explained in detail in the chapter describing the methods used in this research study, all of these participants' names are pseudonyms, as are the names of their schools.

One of the participants was a veteran teacher from a small rural town who had retired by the time of this research. Ms. Evelyn Allen taught 5th grade in a K-12 school district of 325 students. Enrollment at the elementary school totaled 292. A bare majority of the school's students are White 51%, 49% are Hispanic, and less than 1% are African American. Students who participated in free or reduced-price lunch programs comprise 47% of the student body. Ms. Allen was selected because she was recognized for her work with students in participating in a telecomputing project. Her participation offered this study insight into the adoption of new technology into the curriculum of a teacher who began using telecomputing tools at the end of her teaching career.

Ms. Sarah Jaramillo is a 4th grade teacher working in a low-income area located in a large city. The elementary school in which Ms. Jaramillo teaches serves approximately 850 students from PK to 5th grade. One hundred percent of the students participate in the free or reduced-price lunch program. The student body is 98.9% Hispanic with less than one percent White, African American, or Native American. Ms. Jaramillo was highly recommended as a teacher who uses telecomputing tools with her students.

At the time of this study, Mr. Adam Herrera is enjoying his third year of teaching at Stonehill Academy. The academy enrolls approximately 450 students from 8th grade to 12th grade and includes students interested in the fine arts, such as dancing, music, and visual arts while completing their middle and high school curricular requirements. The student population included 97% Hispanic, 1% African American, and 1% White. One hundred percent of the students participate in free or reduced-price lunch program. Mr. Herrera was selected because of his use of telecomputing tools in his teaching practice and because he is at the beginning of his teaching career.

Mr. Daniel Gonzalez is a technology teacher at a high school academy. Mr. Gonzales is a veteran teacher of 30 years and spent 27 years teaching in the same school district and three years doing administrative work for grades K-12. Included in his years of teaching were four years at the middle school level and twenty-three in high school. He was selected because he provides a high school perspective of using telecomputing tools in curriculum-based learning. The school's demographics are the same as Mr. Herrera's mentioned above as they teach at the same school.

Ms. Trisha Marley taught in an urban city in central Texas in a 6^{th} to 8^{th} grade in a fast growing middle school of approximately 1,041 students. The school's student ethnic distribution includes 74% White, 14% Hispanic, 6% African American, 5% Asian/Pacific Islander and Native American. Thirteen percent of students are identified as economically disadvantaged. Ms. Marley was selected for this study for her perspective of integrating technology with children with special needs and because she is a middle school teacher. Ms. Marley earned a master's degree in curriculum and instruction and holds a teaching certificate and a special education certificate.

Ms. Diane Sanders works in a small school district on the outskirts of a large city. The school district serves approximately 1,200 students from pre-kindergarten to high school. Twenty-one percent of the students participate in free or reduced-price lunch programs. The student population is diverse, including 59% who identify themselves as White, 24% African American, 13% Hispanic, and 4% as being of other ethnicity. Ms. Sanders is a veteran teacher of 23 years, with a few years of counseling experience at the junior high level. Ms. Sanders was selected because she was highly recommended by an education service center trainer as a teacher who uses telecomputing tools in her teaching practice.

The difficulty in the selection process arose because of the low number of teachers who were actually using the Internet for purposes other than the gathering of information (Becker, 1999). When possible participants were asked about their use of the Internet or e-mail, teachers replied that they were not using the Internet for anything other than information gathering or that they were using instructional software programs such as Microsoft® PowerPoint® but not using the Internet. One high school teacher noted for his accomplishments in using technology with his students declined to participate because the district required that he teach keyboarding to the exclusion of other programs. A district superintendent did not want his teachers to participate in this study because he wanted them to focus exclusively on preparation for the TAKS. A number of principals and technology directors declined to participate for the same reasons. Chapter 4 contains the profiles of the teachers who agreed to participate in this study with the full support of their principals and/or superintendents. Pseudonyms were used to maintain confidentiality.

METHODS OF DATA COLLECTION

Observation for the traditional researcher in the natural sciences, is usually from a position behind a one-way mirror, recording the phenomenon in a manner in which neither the researcher nor the object or phenomenon under study are supposedly influenced by the other (Denzin & Lincoln, 1994). In the realm of the social sciences, however, the qualitative researcher’s findings are usually created through more direct interaction between the inquirer and the inquired about participants. This interaction is actually required for developing and unfolding multiple interpretations existing within the context of the selected informants. The primary focus for the interpretivist is in the meaning of the participants' lived experiences, with the participants as active contributors to the construction of the researcher's understanding of that meaning. The methods of data collection selected for this inquiry are consistent with this goal.

Types of Data Sources

One source of data—previously discussed in the perspective section of this report—was what the researcher brought to the study, including the researcher's understanding of self, lived experiences, integrity, understanding of the participants’ perspectives, and the researcher's interpretations of what has been observed and heard in the context of this research (Johnson, 2002). Other data were generated and collected from three types of sources: (1) interviews, (2) observations, (3) and documents. Interviews were the primary method of data generation; however, the complexity of instructional planning and decision making in the context of using telecomputing resources was also revealed through the analysis of the observations and review of documents in combination with the interviews.

Interviews

Permission was obtained from the superintendent or the principal to conduct teacher interviews and visit with teachers within the context of their working environment or at a place suggested by the informant—for example, two interviews were conducted in classrooms, one in the computer lab and three interviews were conducted in restaurants after school hours as per the informants' requests because of time restraints during the school day. The participants had a choice of selecting one or a combination of interview formats that best addressed their preferences concerning comfort zone, time schedule, and location. The initial interviews and first member checking sessions were conducted face-to-face. So as not to disrupt any teaching schedules or the teachers' other duties, e-mail and phone conversations were used as the preferred modes of communication in later member checking sessions. Two of the informants lived and worked in towns that required the researcher to travel some distance. The e-mail option was convenient to both parties.

By providing informants the opportunity to schedule interviews at their convenience, the likelihood of the informants' continued participation in additional interviews increased. Specific times and dates for teacher interviews were scheduled individually with each participating teacher. Teachers rescheduled several times because of student testing, lessons that were off schedule, or family issues.

Interviews were audio taped, transcribed, and member checked. The purpose of member checking was to verify the data and interpretations obtained from the interviews with the informants (Mertens, 1998). These interviews are intended to aid in the understanding of the larger context in which teachers make decisions.

The interviews presented an opportunity to understand and gather descriptive data of the participants' perspectives—their own understandings and beliefs (Cantrell, n.d.) about their use of telecomputing tools and resources. In-depth interviewing involved social and interpersonal interaction more closely associated with talking among friends. This type of interview environment made possible the multiple perspectives that emerged as teachers discussed their decision making that occurred both cognitively and routinely in the contexts of telecomputing use as part of their daily routine. The interviews held outside of the classroom were more animated and lasted longer than the ones conducted in the classroom. The classroom schedule of daily activities and after school functions limited longer interview sessions.

Each interview began with an open-ended question that purposefully focused on the issue—how, when, and why teachers make decisions in their use of telecomputing tools and resources. As the researcher, I had the opportunity to construct and interpret meaning with the participant by accessing information from the informant's past, their reflections and understandings of the present, and any reflections they had of the future (Lincoln & Guba, 1985). The informants were eager to discuss the projects they had designed for their students and talked about their plans for future projects using telecomputing tools. The interviews were guided by dialogue with questions interjected as issues to be explored arose (Erlandson et al., 1993).

Open-ended questions such as, "Tell me about your experience using the Internet with your students," were used to open the dialogue. Possible issues or topics that were explored as a result from comments or insights by the participants (Erlandson et al., 1993) included the following:

1. How do you decide how you use telecomputing tools and resources to support curriculum-based learning?
2. Why do you use telecomputing tools?
3. Why did you select the telecomputing tools and resources you now use?
4. When do you use these tools and resources?

Additional questions were asked as they emerged from the dialogue. The focus of inquiry underwent changes as new information emerged—"…these changes signaled movement to a more sophisticated and insightful level of inquiry" (Lincoln & Guba, 1985, p. 229). Teachers described problems with the hardware or network. They talked about losing data they had collected of their students' work because of the technical problems they had encountered. They shared their trials of having to change their lessons because the network was down.

The number of interviews as well as the duration of the interviews were guided by the point at which the information became redundant. Data saturation occurred when no new information or new topics were provided by the informants (Bogdan & Biklen, 1982; Lincoln & Guba, 1985). Interruption to classroom schedules, preparation for upcoming tests, and other teacher concerns made it difficult to schedule more than two face-to-face interviews for each informant. Phone conversations and e-mail correspondence rounded out the interviews.

Observations

Interviews and observations are not independent of one another. “The interview provides leads for the researcher’s observation” and “observations suggest probes for interviews” (Erlandson et al., 1993, p. 99). Observations were fundamental in discovering the totality of surrounding conditions and circumstances in a given setting and gave the researcher first hand experience at that moment in time. Observing contextual factors such as the curricula, student interaction, and the social and physical classroom environment became important to the extent that it shaped the informants’ beliefs, goals, and knowledge. According to Erlandson et al. (1993), teachers are "observed in their daily activity so that the researcher can begin to see the operational meaning of what they have said" (p. 81).

Nonverbal cues such as facial gestures, body language, students’ reactions, and the social dynamics being played out in the classroom, which may not be evident using other methods, were best noted through the use of observations and face-to-face interviews (Lincoln & Guba, 1985). For example, in the pilot study, one of the informants rolled her eyes as she discussed how she was an unlikely candidate to participate in technology workshops. Her facial expressions exposed the contradiction in her words. We both laughed understanding she was referring to her age. The face-to-face interview helped me "pick up" on these nonverbal cues and enabled me to explore further. Similarly, teachers used nonverbal cues when talking about the decisions they made. A shrug of the shoulder, a raised eyebrow, or the intonation in their voices prompted further probing.

Each teacher was observed at least once either in the classroom or computer lab except for the retired teacher who shared documents and examples of student worksheets. The time duration of the observations were dependent on the length of the lesson, the time allotted in the computer lab, and the teachers' schedule. Scheduling observations was the most difficult part of this study. The informants cancelled, rescheduled, and delayed the classroom observations because of technical problems, testing, or other classroom or personal issues. The informants were not using telecomputing tools as routinely as they taught reading or math. The teachers had to plan extensively when they used telecomputing tools and had to wait until they had time to do the planning and the they had time in their daily schedule to include a technology integrated lesson. The observations were not audio or videotaped.

Documents and Artifacts

The review of documents was another source for gathering data and provided a historical context for interpreting what teachers said and did (Erlandson, et al., 1993). Documents, according to Lincoln and Guba (1985), are "stable" sources of information both in the sense that they may accurately reflect situations that occurred at some time in the past and that they can be analyzed and reanalyzed without undergoing changes in the interim (p. 277). Unlike classroom observations, for example, which can never be repeated exactly in the same way unless they are videotaped, teacher lesson plan books can be reviewed time and again without any expected changes—with the exception of new entries—as the year progresses.

Documents examined in the study included written lesson plans, TEKS, district frameworks, teacher-made materials, commercially produced teacher activity sheets, samples of student work, and any other documents mentioned in the interviews by the informants or viewed by the researcher during observations. The informants shared samples of student work displayed on their classroom bulletin boards, notebooks, or activity sheets. Samples of student work were not included in this study. The analysis of these documents allowed the researcher to document patterns in an unobtrusive manner (Marshall & Rossman, 1995) and to clarify any inconsistent data or interpretation through further questioning during interviews. This evidence also allowed the researcher to make interpretations that may be different from those of the participants. One of the problems encountered with accessing and viewing documents is that the informants' data on computers were inaccessible because various reasons which included memory requirements, computer crashes requiring re-imaging resulting in loss of data, and the end-of-school routine included returning work to students and clearing out files. Examples of lesson plans and student activity sheets can be found in Appendices G through H.

An artifact can be almost any physical evidence that gives “insight into the culture’s technology, social interaction, and physical environment” (Erlandson et al., 1993, p. 100). The importance of including a description of the artifacts for this study is that without the hardware and network infrastructure the use of telecomputing resources would be impossible. The physical classroom environment and the availability of online connectivity in the classroom or computer lab played an important role in influencing teachers’ decision making about their use of telecomputing tools and resources. The informants shared and described the infrastructure in place and the equipment used to support the use of telecomputing tools in curriculum-based learning. One informant described the loss of half the laptops that were stolen. Another informant talked about having her laptops picked up by the technology department for servicing and had not been returned by the time of the initial interview. A review of the artifacts supplemented the data generated from the observations and interviews and provided a different or enhanced perspective. These data are also included in the ongoing analysis and are part of the data collected and generated from interviews and observations. The researcher's challenge is to "facilitate the continuing unfolding of the inquiry," which "lead to a maximal understanding...of the phenomenon being studied in its context" (Lincoln & Guba, 1985, p. 225).

The study began April 2005 and continued to April 2006. E-mail and phone calls occurred throughout this period, exchanging information to clarify, add, or correct information obtained from interviews and observations.

DATA ANALYSIS

"Data analysis is the process of bringing order, structure, and meaning to the mass of collected data" (Marshall & Rossman, 1995, p. 111). Data analysis is not done in isolation; rather, it is open-ended and developed as the inquiry proceeded (Lincoln & Guba, 1985). This iterative process of analysis guided the information collection and generation process until categories were defined and relationships among them were established (Marshall & Ross, 1995). The following practices were used to analyze data (Miles & Huberman, 1994; Schwandt, 1999). The analysis process included all data gathered from the interviews, observations, and review of documents and artifacts.

Processing Data

Lincoln and Guba (1985) describe four steps to processing data. These data processing activities which lead to defining categories includes unitizing, and categorizing.

Unitizing refers to data broken down to their smallest parts or units and placed into categories of ideas. Units of information were derived from getting “chunks of meaning which come out of the data itself” (Marshall, 1981, p. 396-397). Lincoln and Guba define a unit of information found in interview and observational notes, documents, and any other records by the following two characteristics. First, it should be heuristic, meaning aimed at some understanding or some action that the inquirer needs to have or to take. Unless it is heuristic, it is useless, however intrinsically interesting. Second, it must be the smallest piece of information about something that can stand by itself. That is, it must be interpretable in the absence of any additional information other than a broad understanding of the context in which the inquiry is carried out (p. 345).

Categorizing involves devising rules that describe category properties and justifies the placement of units of information (or incidents) within that category. This activity also becomes part of the audit trail, which is discussed further in a later section. Lincoln and Guba's (1985) ten steps to categorizing units of information were followed in analyzing data. I wrote the words emerging from the data on index cards and placed the them in piles. Cards with similar contents were placed in the same pile. This process continued until all the cards were placed. Each pile represented a category. Categories were redefined or subcategories created to better define the categories as needed (Glaser & Strauss, 1967). Earlier judgments about the properties describing the categories were tested on whether the tentative rules still held for new incidents. The analysis of data occurred throughout the processes of data collecting and data generation. Emergent themes were categorized and defined for each participant. Analysis was made between each participant's data and among the data generated from all of the participants.

As more data were processed, the need for modification lessened (Lincoln & Guba, 1985). Categories became better defined as category saturation was reached. By delimiting constructions, time and effort remained focused on the data relevant to the categories pertinent to the study (Glaser & Strauss, 1967). Themes emerged from the collapsing, merging and redefining of categories. The major themes that emerged included personal information, education, teaching experience and school of employment. Technology themes included technology experience, technology use in the classroom, computer lab, professional development, telecomputing tools, online projects, and limitations to using telecomputing tools. The decision making theme included how technology is used in the classroom. The major theme for lesson planning was planning for technology. Themes emerging from the review of documents and artifacts included materials created by the teacher. Though the technology equipment can also be listed in the artifact section, the theme was placed under technology in the classroom. A section titled Other Comments was created for categories that were difficult to code. Influence of technology on colleagues, the informants' future goals using telecomputing tools, and informants' concerns were themes that were placed in the Other Comments section (see Appendix D for sample of categories and themes).

Member checking provided an opportunity to determine if the participants' interactions had been reconstructed satisfactorily. The researcher sought the informants' feedback on the reconstruction. Member checking is discussed fully in a later section on credibility. The peer debriefing group critiqued and provided "a source of new ideas or perspectives" (Lincoln & Guba, 1985, p. 243).

The analysis of data is an ongoing process from the start to the completion of the inquiry. The quality of the research is also contingent upon several elements being in place to ensure the quality of findings. Though these elements are described in a linear fashion the ongoing process of assuring trustworthiness is by no means less of a priority than what has already been explicated (Lincoln & Guba, 1985).

ENSURING QUALITY OF FINDINGS

The quality of findings can be addressed by evaluating the trustworthiness of a study (Marshall & Rossman, 1995). Trustworthiness is " that quality of an investigation (and its findings) that made it noteworthy to audiences" (Schwandt, 1997, p. 164). A technique used throughout the process of this inquiry to ensure trustworthiness is the reflexive journal. The reflexive journal is introspective of the researcher's "mind processes, philosophical position, and bases of decisions about the inquiry" (Lincoln & Guba, 1985, p. 109). A reflexive journal was kept by the researcher to document the "methodological decisions made and the reasons for making them" (Lincoln & Guba, 1985, p. 327). A sample of the reflexive journal can be found in Appendix E. Entries in the reflexive journal were made as needed and reflects the researchers' thoughts and actions during the research process. The journal was used to establish confirmability, meaning that "data can be tracked to its source" (Lincoln & Guba, as cited in Erlandson et al., 1993, p. 34).

The reader must be able to communicate, apply, and verify the findings of the inquiry being made. This is accomplished through the use of four criteria: credibility, transferability, dependability, and confirmability. Each criterion is further described by the procedures used for judging the trustworthiness of this interpretive inquiry.

Credibility

Credibility seeks a "correspondence between the way the respondents actually perceive social constructs and the way the researcher portrays their viewpoints" (Mertens, 1998, p. 181). Multiple techniques were used to increase the probability that the findings are credible: prolonged engagement, persistent observation, triangulation, peer debriefing, referential adequacy, and member checking (Erlandson et. al, 1993).

Prolonged engagement is defined by Lincoln and Guba (1985) as spending enough time in the activities which support credible findings and interpretations by "learning the 'culture,' testing for misinformation introduced by distortions either of the self or of the respondents, and building trust" (p. 301). Mertens (1998) states that prolonged engagement is not definitive, and lasts as long as themes are no longer extended or repeated. During the span of a year, I visited with the informants at their campuses and at locations they designated to conduct interviews, made classroom observations, and member checked until no new themes emerged and salient issues on existing themes had been thoroughly explored.

Persistent observation provides depth by the researcher’s focus on the characteristics and elements relevant to the issue of inquiry (Lincoln & Guba, 1985). In selecting informants, teachers who use telecomputing tools and resources in varied ways were asked to participate in an effort to obtain data with meaningful differences. In my research, I was not involved in working with the students or teachers directly in the classroom. However, frequent interviews and observations served to establish rapport and trust (Lincoln & Guba, 1985), and to dissipate the newness of having a researcher in the classroom (Erlandson et al., 1993). The informants' awareness of my status as a classroom teacher and the persistent observations provided a context for understanding and interpreting any inconsistencies that may have occurred (Lincoln & Guba, 1985). Several noted irregularities were introduced by student testing, holidays, end-of-school and beginning-of-school routines, hardware problems, and family issues which were resolved by scheduling observations and interviews to avoid the time frames in which these events occurred.

Sharing the same profession established a base in understanding how teachers' make sense of their world and their experiences. However, as a teacher, I might overlook what has become commonplace in my day-to-day activities at school. My peer debriefing group were invaluable in looking at data with fresh eyes.

A limitation may be precipitated by my presence in the classroom which may elicit a response distorted by the teacher's own perception of what the researcher wants to hear or the views the administrator may wish to project. My intention was to take a more personal and interactive part in exploring, understanding, and interpreting the participants' understandings of their own lived experiences.

Triangulation strengthens the credibility of the study and is accomplished through the use of several different data types that can either support or discredit the data gathered (Erlandson et al., 1993). Gathering data from various sources and data types add meaning and provide a thicker description (Lincoln & Guba, 1985). For this study, data from the participants' interviews were compared to the data from classroom observations, and data from samples of student work, lessons plans, and Internet sites.

The process of *peer debriefing* allows the researcher to step away from the context being studied in order to avoid distortions that may occur as a result of prolonged engagement. The peer debriefing group was made up of two doctoral students, who have since completed their doctoral studies and who have an understanding of the interpretive design and the use of technology in education.

Throughout this study, the peer debriefing group met every two to three weeks to discuss the progress of the inquiry, to share ideas, to provide feedback about the researcher's values, findings, interpretations, and analysis, and to keep the researcher on track (Erlandson et al, 1993, p. 31; Lincoln & Guba, 1985, p. 308).

Referential adequacy refers to the "recorded materials [which] provide a kind of benchmark against which later data analyses and interpretations (the critiques) could be tested for adequacy" (Lincoln & Guba, 1985, p. 313). Recorded materials included audio-taped interviews, copies of documents such as lesson plans, e-mail or Web sites, and samples of student activity sheets.

The data generated were confirmed by the informants through a process called *member checking*. The process of member checking was ongoing and conducted after each interview with a summary of the data given to each informant so he or she would have the opportunity to review for accuracy, to amend and append as the informant saw fit (Lincoln & Guba, 1985, p. 236). In following this process, the data reflected the informants' perspectives as well as responded to the accuracy of the researcher's constructions and interpretations (Erlandson et al, 1993). Member checking was conducted either face-to-face, by telephone, e-mail, or by the participants' receiving a hardcopy of the summaries depending on the informants' preferences. Permission to use direct quotes was also obtained and quotes were member checked for accuracy.

A comprehensive member check at the end of the inquiry allowed the informants a "final opportunity to test the credibility of the inquiry report as a whole…not only to test for factual and interpretative accuracy but also to provide evidence of credibility—the trustworthiness criterion" (Lincoln & Guba, 1985, pp. 373-374). Another trustworthiness criterion is transferability. Through member checking, information rich data were verified as needed for transferability.

Transferability

Transferability provides sufficient information so the reader can find enough similarity in the situations described in the study to transfer findings to a similar situation (Schwandt, 1997). Transferability was achieved through thick description, purposive sampling, and the use of a reflexive journal (Erlandson et al., 1993).

Thick description "must specify everything that a reader may need to know in order to understand the findings (findings are *not* part of the thick description), although they must be interpreted in the terms of the factors thickly described" (Lincoln & Guba, 1985, p. 125). Rich details are provided so the reader has the thick description needed to find similarities–or lack of similarities–between the situation described in the report and other situations with which the reader has more familiarity.

Purposive sampling, described previously, is a procedure that guides the process in the search for rich detailed data (Erlandson et al., 1993). Purposive sampling assures the quality of the findings by providing a range of specific information in rich detail sufficient to provide a base of information so the reader can make a judgment on its transferability. Teachers at various grade levels, elementary, middle, and high school, with various teaching experiences, and different assignments were selected to participate.

The reflexive journal was another technique used to address transferability. The reflexive journal was described earlier and was used throughout the study.

The findings in this type of phenomenological inquiry are not generalizable in the manner characteristic of the natural sciences; it is left up to the reader to determine the extent of the transferability of the research findings to his or her own unique situation.

Dependability

Dependability assumes that a study undertaken with similar informants in similar context will yield similar results. However, because of the informants' multiple realities that are situated in specific contexts that are changing, replication of this study would not yield identical results. These changes may be a result of the informants having a change of opinion that may not reflect their initial perspectives, an error, or developing insights (Lincoln & Guba, 1985). One teacher explained how he is teaching differently because he has three years of experience under his belt. Another teacher described changes she has made in her teaching because of the hardware and online connectivity available to her now. Yet another expressed a desire to do increase her use of telecomputing tools as a result of participating in this study.

An audit trail ensures that changes can be explained through external checks of documents, journals, findings, interpretations, data and analysis notes, and other notes collected or generated from the study (Erlandson et al., 1993). The audit trail is further explained in the next section because it supports confirmability.

Confirmability

Confirmability is the degree to which the findings of an inquiry are judged to be determined by the informants in context and not because of the biases of the researcher (Lincoln & Guba, 1985). Confirmability links the conclusions, interpretations, and findings back to the data in detectable ways that can be traced through an audit trail (Erlandson et al., 1993). The audit trail is a "systematically maintained documentation system" (Schwandt, 1997, p. 6) which may be used by a third party to confirm the findings by examining the process undertaken and the product of the study (Lincoln & Guba, 1985; Marshall & Rossman, 1995).

Materials for the audit trail as described by Halpern and cited by Lincoln and Guba (1985) include six audit trail categories. The six categories listed include the records or documentation that was gathered from this inquiry. These records or documents include (1) raw data: tape recorded interviews, written notes of observations and interviews, samples of student activity sheets, copies of lesson plans, and Web sites;

(2) data reduction and analysis products: summaries and transcriptions of field notes; (3) data reconstruction and synthesis products: categories, themes, findings, interpretations, integration of concepts; (4) process notes: peer debriefing notes, e-mail messages, and member checking notes and summaries; (5) materials relating to intentions and dispositions: reflexive journal, researcher as instrument statement; and (6) instrument development information: teacher schedules, and observation forms. The observation field notes are highly descriptive in recording the details of the physical and social classroom environment, teacher-student interaction, and any documents or artifacts available for review. Teacher quotes are used to support the interpretations generated from the data. By bringing together these various data sources and methods, triangulation is accomplished.

Authenticity

Authenticity, according to Stainback and Stainback (cited in Mertens, 1998, p. 184), "refers to the presentation of a balanced view of all perspectives, values, and beliefs." Erlandson et al. (1993) identified four criteria to judge the authenticity of the investigations of an inquiry: fairness, ontological authenticity, catalytic authenticity, and tactical authenticity.

Fairness provided all stakeholders the opportunity to recommend changes and have open access about the process and direction of the study. For example, the researcher identified the informants, obtained full consent (Appendix B), explained confidentiality and the use of pseudonyms, and any conflicts in values were identified. The informants were made aware of the purpose of the inquiry and their role in the process, and how the information was to be used and processed (Lincoln & Guba, 1985). Other techniques used to address credibility—reflexive journal, prolonged engagement, persistent observation, member checking, and peer debriefing—were also be used to promote fairness and were described earlier.

Ontological authenticity is the second criterion for authenticity and refers to the "extent to which respondents' own constructions are enhanced or made more informed and sophisticated as a result of the having participated in the inquiry" (Schwandt, 1997, p. 7). Member checking was one way of determining if the informant had increased his or her understanding of the phenomenon under study. As I began my interviews for this study, the informants' first reaction was to explain that they did not have much to offer in the way of information on their use of telecomputing tools. By the culmination of the study, the informants were eagerly describing what they had done and how they had accomplished it. They came to the realization that they were using telecomputing tools and planned to increase their use of telecomputing tools in curriculum-based learning.

Educative authenticity is "concerned with the extent to which participants in an inquiry develop greater understanding and appreciation of the constructions of others" (Schwandt, 1997, p. 7). Again, member checking offered the researcher and the informants opportunities for informal discussions that extended the dialogue to include knowledge about others in relation to the topic. Teachers talked about their colleagues at their schools and how they were using technology. They offered thoughts about why their colleagues may or may not have chosen to use telecomputing tools.

Catalytic authenticity "refers to the extent to which action is stimulated and facilitated by the inquiry process" (Schwandt, 1997, p. 7). After hearing themselves talk about the ways they used the Internet and e-mail, teachers in the study were eager to discuss trying new projects in their classrooms.

Tactical authenticity is the "extent to which participants in the inquiry are empowered to act" (Schwandt, 1997, p. 7). Follow-up observations and member checking can help determine if empowerment has occurred. However, because of the tight teaching schedules for the current school year, any changes would become evident at the beginning of the following school year. Follow-up conversations with the informants would be needed to determine if changes have occurred as a result of this study.

Chapter Four: Participants and Their Experiences

This chapter describes the use of telecomputing tools in the classroom and the decisions six teachers made in integrating their use. A variety of aspects of technology integration were explored with the participating teachers, including teacher lesson planning, decision making, and their use of telecomputing tools, specifically Internet and e-mail.

Participants' Perspectives

The informants' perspectives on the process they underwent in making decisions about their use of technology illustrated the complexity of their individual path toward technology use in their classrooms. They described their use of the Internet and e-mail in their teaching practice, how their lesson plans reflected their decision making, and the type of telecomputing tools they chose in integrating technology into their curriculum-based teaching.

The teachers' narratives included in this study are snapshots of the long process for teachers of learning technology skills, learning how to integrate technology into curriculum-based learning, and overcoming obstacles found in the day-to-day routine of teaching and learning in the classroom. Each participant's narrative describes the teacher's early technology experience, how the teachers became aware of and learned to use the Internet and e-mail, the obstacles and problems encountered while using telecomputing tools, the support they received from various sources, and the decisions made to integrate technology into curriculum-based learning.

PARTICIPANTS AND THEIR TELECOMPUTING EXPERIENCES

The narratives are based on each participant's interviews and classroom observations except for Evelyn Allen who has since retired. Her narrative is based on her interviews and review of artifacts. The participants described their experiences in planning and making decisions about how, when, and why they used telecomputing tools in their classrooms.

Ms. Diane Sanders—3rd Grade Teacher

Ms. Diane Sanders is a 3rd grade teacher who took five years off to raise her children and then returned to teaching. She has taught 1st, 3rd, and 4th grade. Her last five years have been at Reynolds Elementary, where she had access to technology and technical support to a greater degree than at her previous schools. Because of this type of access and support, Ms. Sanders has had a change in attitude about use of technology in her classes, as she revealed by stating, "When you have that kind of technology, it's very different using textbooks for your instruction."

The technology program at Reynolds Elementary supplies Ms. Sanders with a ceiling-mounted multimedia projector and a TV monitor. She prefers to use the large screen in her classroom, which takes up the front wall. Her elementary students use laptops in her classroom. Although the high school students in Ms. Sanders' district were given computer laptop take-home privileges, elementary students may not take laptops home. Rather, the elementary students' parents are required to sign a form giving permission for their child to use the Internet at school. Each student has a login account, including kindergarteners, who take a long time to log in, according to Ms. Sanders. Students choose their own passwords and are expected to keep them confidential. She shared her experiences with teaching the young students to log in:

> They pick [a password] and half the time they pick something they can't spell. They spell it one way and then they change and spell it a different way so it is, you know, it's difficult and oftentimes you just have to work through that. It takes several attempts before everybody can actually log on. You'll get everybody up and going, and then if you don't log on for a few days they've forgotten their password, so you're back to the drawing board with them on that.

It takes younger students longer to familiarize themselves with computers, she added. Setting up computers also took time. She recalls having her computers up and running by the end of September last school year when she taught 2nd grade. She shared one classroom set of laptops with her grade level. One of the difficulties of sharing laptops, she recalls, was that students used different computers that did not have their accounts configured. When teachers have to share computers, Ms. Sanders believes teachers have less of an opportunity to integrate.

This school year her 3rd graders enjoy their own classroom cart of laptops. The teachers at Reynolds Elementary were offered a classroom set of laptops as part of a pilot study and each of the four third grade teachers agreed to participate. Ms. Sanders felt a sense of responsibility and felt like a pioneer because there was a lot of time spent figuring out how to use them. She described the experience as a whole new world with a great tool and wondered how she was going to use it.

Even with a classroom set, she finds technical glitches to be frustrating. "You have to be willing to just hang in there with it and work through it and it's like I tell the kids, you know, we're going to try and you're going to get really frustrated." According to Ms. Sanders, two things that keep teachers from embracing technology more are working through glitches and having access to a good program:

> I think teachers may shy away from technology, thinking they're not doing things the right way. I've kind of gotten past that now because I feel like maybe people don't even know the right way at this point. History is being written and you could be a part of that. You do it. You try to learn more and more. I remember when I started I said, hey, the kids were showing me more than I was showing them. But now I really feel like I'm the guide. I feel more competent at that. I think it takes just working with it and getting comfortable. It takes some time.

Ms. Sanders appreciates the accessibility and organization the network server provides in saving student work, file sharing with her colleagues, and being able to readily find documents she needs to turn in to the office. In addition to meeting her personal needs, the network has provided access to the Internet for classroom instruction. Ms. Sanders compared her previous 1st grade students with her current 3rd grade students' use of computers and the Internet. She said her 1st graders used the Internet more for searching for visual pictures, while her 3rd graders learned to use graphing programs for math concepts. She commented, "You spend so much time on learning to read instead of reading to learn" with 1st graders. Though they use the Internet, Ms. Sanders hesitates to publish online, due to the many district policies concerning security issues, even though the district uses Cyber Block to filter inappropriate material. Her hesitance is compounded by her limited understanding of copyright laws and influences her decision against publishing to the Web. She admits she needs to learn how to properly cite references, especially for published work, so that she can teach her students. She says she doesn't want her students to be plagiarists. She wonders what is expected of an eight-year old in citing references, as their general understanding of citing resources is "giving thanks."

Ms. Sanders talks about her school being in transition, not only with the influx of technology equipment, but evolving in the way teachers think about technology. She explains that teachers often ask the lab teachers for "more things in different ways." For example, she described teachers wanting their students to learn *Excel*® during computer lab time so they could create charts and graphs. She also notices a difference in the needs of teachers using computers online rather than just for instructional centers. She calls it a work in progress and adds, "It's been interesting, because any time there are changes in education, you have to work for change and be patient about it."

Ms. Sanders takes her class to the computer lab once a week for 45 minutes where the students receive instruction from the computer teacher in Microsoft® PowerPoint®, Excel®, Microsoft® Word, and a math software program in preparation for TAKS. She plans with the technology teacher not as often as she would like but does plan with her grade level on a daily basis. The technology teacher's main focus is the technology application of Texas Essential Knowledge and Skills and plans lessons to meet the TEKS technology objectives. Ms. Sanders sees merit in using computer-assisted instruction but feels students could better use computers as tools to create their own products. In her own words, "It's more like the computer is programming the child than the child programming what they want or need from the computer."

Ms. Sanders recalls her earliest experience with technology in the classroom—a one-computer classroom. Her students would gather around the small monitor. She wanted her students to create projects but was too limited by having only one computer and the computer-assisted instruction software used in the computer lab. At that time she did not know what to do with the computer.

She elicited help from a volunteer parent, who would enter spelling words into a software program so the students could unscramble and use them in sentences. Ms. Sanders learned from a 1st grade student computer tidbits the student had learned from his grandmother. Ms. Sanders was convinced of the computer's potential in simplifying her tasks. For example, she could type a letter to parents, edit her mistakes, save it, and use it again the following year by changing the date. She said she was glad that her "purple ditto days" were over. Learning technology was something she wanted. She attended technology training, but mostly she taught herself because she "wanted to know how to use things." She later saw the potential of computer use for her students. She said her current class of 1st graders was finding keyboarding an obstacle, describing their problems as follows:

> They have the hardest time with handwriting, and that is such an issue. They want to write. They want to produce. They want to make projects, but sometimes they do it and nobody gives it any value because it's pretty hard to read it. So we would go into computer lab, and we wordprocessed the things that we'd be working on in the classroom, and then we'd put them up. All of a sudden we'd noticed that everybody in the whole school was coming by to look at what we did, and the parents were really impressed with it. But really I think it was the ease of readability that was so powerful there. It was a new technology, but nobody was struggling. I mean, you're always proud of what your child does, but sometimes they look at it and they can't read the handwriting. So I began to really embrace it at that point.

Ms. Sanders does not remember her first experience with the Internet, but recalls searching with *Google*. She laments that many educational sites on the Internet are now charging to become a member of their club. Using the Internet has changed the way she views textbooks. She likes not being tied to a textbook saying, " I mean, texts are still important, but it's nice to have a resource so that you're not just locked in to somebody else's idea of what needed to be recorded." Her students use the Internet for information gathering and to access pictures and images. Students completed a project on natural resources using the Internet by designing a brochure for elementary students explaining exhaustible, inexhaustible, and renewable resources.

Ms. Sanders provides students with hotlinks she places on a page on a network folder made accessible to her students. She finds this easier than writing the URL on the board for 22 students to type and a good way to start kids using the Internet.

She participated in the Teacher Technology Competencies Certification program during the summer. The program requires the teacher to be technology competent before beginning the program. The program activities consumed all her summer and part of the school year to complete. She had attended other technology training sessions provided by the district where she learned Outlook Express® and PowerPoint®. She recalls attending 30-minute training sessions once a month. One of the training sessions involved how to use her new SmartBoard™. Other sessions included Publisher®, FireWorks™, and DreamWeaver® to aid in making Web pages. Her Web page is not yet accessible to parents but the posting of grades online is in the planning stages.

E-mail is used commonly to exchange ideas among teachers within the grade level. She shares her e-mail account with her students to communicate and send digital pictures to parents serving in the military overseas. In another activity, students accessed a Web site where they could e-mail a Benjamin Franklin impersonator. The students received a humorous e-mail reply. She tried to participate in the Flat Stanley Internet project by accessing the Web site but the project required the use of e-mail. Since the students do not have e-mail accounts, Ms. Sanders decided to do it by mail. Students mailed Flat Stanley, a two-dimensional drawing, to relatives and friends who then took pictures of Stanley at various locations and mailed Flat Stanley along with the pictures back to the students. Ms. Sanders has also made inquiries about electronic pen pals but encountered difficulties.

Another electronic tool used by Ms. Sanders is the videoconferencing equipment for electronic fieldtrips. She has been less than satisfied with the content of the efieldtrips. In one session about Westward movement, the props the presenter used were small models and did not grab the students' attention. In addition, the frequency of interactivity between the presenter and students was minimal.

The administration supports technology integration by providing the hardware and training. The implication, according to Ms. Sanders, is "you're gonna have the technology, don't let it sit there and be a dust bunny." A technology teacher from the district would help teachers integrate technology in accordance with what the teachers wanted to accomplish. Examples of the type of assistance they received from the technology teacher included the life cycle using Kidspiration®, Flat Stanley, and the Christmas culture unit. Unfortunately, this service is no longer provided. Instead, technical support comes in the form of technicians who take care of computer problems.

The decision to use technology in the classroom is "teacher driven," according to Ms. Sanders. "I haven't felt under a gun and this has been something that has been a tool for me to use and enjoy and embrace. If I had somebody telling me you will do this, it would take a lot of the fun out of it, I think. Ah…I have a big sense that it's a responsibility and that I need to utilize it the best way that I can. I think all the teachers have had that sense feel the same."

Teachers follow the technology applications of the TEKS required by the state. Additionally, the school participated in the TARGET Grant program. A mentor from an education service center trains teachers to work with their colleagues to use technology in their teaching practice.

Ms. Sanders is without her laptops at this time because they were picked up for maintenance. When she had her laptop, Ms. Sanders was experiencing difficulty opening some of her files. The district operates an Intranet system which Ms. Reynolds cannot access from home. She copies files to a disk to work at home. The network, she says, is down at this time.

Ms. Sarah Jaramillo—4th Grade Teacher

Ms. Jaramillo's students were familiar to her because they were also her students in 3rd grade. Ms. Jaramillo is enrolled in an online master's program, seeking a degree in integrating technology into the classroom. She believes in being prepared so that she can better prepare her students to meet the technology challenges of the future.

She began her technology experience in 1998. She recalls having one desktop computer in her classroom without Internet connection. Ms. Jaramillo had wordprocessing experience that she gained during her college days. She described her skills as "minimal" but just enough to create her own classroom materials. The addition of four iMacs in her classroom allowed Ms. Jaramillo to increase technology use with her students. Students used Accelerated Reader, a reading management software program. This gave Ms. Jaramillo an opportunity to monitor her 2nd graders' reading skills without personally having to listen to each of them read. Use of the computer software allowed students to publish their poems and use graphics. In addition, the computer provided adaptive technology for a visually impaired student.

Once the school had the infrastructure in place for online connectivity, Ms. Jaramillo's students began with basic Internet searches. However, she said she really became aware of the benefits of using technology in the classroom when she received a presentation station—a TV monitor connected to a computer. Ms. Jaramillo could address the whole class at one time. She shared an example, describing her students' use of a virtual tour of the White House.

> The Internet opened up a whole different world for the kids. Rather than just teaching about the White House, we could go to whitehouse.gov and they were able to take a virtual tour of the White House. They were able to see all of the rooms. So I could teach something and then go to the computer—go to my presentation station—and show them what I was talking about. It gave them a better understanding of what we were learning about in the classroom. Even though they didn't experience it themselves, they were able to see more detail and get a better understanding of a lot of things that we discussed.

The presentation station gave Ms. Jaramillo a tool that allowed her to demonstrate to her students how to use various software programs, including graphics programs. Students learned how to use Microsoft® PowerPoint® and KidPix®, among other programs, and they also contributed to the class' Web page. In addition, students learned to use a digital camera and a scanner.

Ms. Jaramillo attributes her success in using technology to district technology training. Ms. Jaramillo learned to use the Internet by attending training sessions at her school. Her school district requires teachers to complete four phases of training and assessments in the use of technology. Each of these phases requires six training sessions and assessments.

Ms. Jaramillo's students go to the computer lab once every five days. Additional lab time can be scheduled for 30 minutes daily when the class is working on a project. Once the project is in full swing, Ms. Jaramillo may allow the students an hour and a half of computer time in the lab. The eight classroom computers are used by groups of students, who can thus have Internet access for an additional hour. One example of a project of this kind was when Ms. Jaramillo's students worked on a project called Travel Texas. Ms. Jaramillo designed the project to give students experience in working collaboratively while learning more about Texas and about integrating technology. The students used the computer to conduct Internet research, to create a travel brochure, and to publish their final product in a PowerPoint® format.

The students worked in groups of four to create their own travel company offering tours of various Texas sites. Each group had to make several decisions for their travel company, involving their design of a logo and company name, their selection of places to include in their brochure, and their decision about which items of information to include in their brochure and presentation. Ms. Jaramillo shared her project with the teacher across the hall, who also taught 4th graders. Ms. Jaramillo persuaded her colleague to participate in this project. Since they both have gifted and talented students, they decided that this project would be motivating for their GT students and that it would also be of benefit for their whole class. The students and teachers used a rubric to evaluate each of the final PowerPoint® projects. The project, which included scanned student artwork, took about a month.

A previous project about biographies took Ms. Jaramillo's class almost an entire semester. The students were taught how to access Web sites, how to evaluate the Web site's information for accuracy, how to do research, and how to create a PowerPoint® slideshow. Ms. Jaramillo taught her students how to recognize Web site extensions such as .gov, .edu, and .com. The biography project and travel brochure were aligned with the language arts and social studies TEKS.

Ms. Jaramillo's students recommend Web sites they have browsed at home by bringing her a list of their recommended sites. If Ms. Jaramillo decides it is appropriate, she adds the Web site to an already approved list. When asked if she would be working on this project if she were not working on her master's degree, she replied that she would, because she could see the need when her students ask to use the computers. Her students' interest motivated her to learn more about technology so that she could better utilize the computers in her classroom. As a result of taking classes, Ms. Jaramillo feels that she delves more deeply into teaching and learning with technology than she would have prior to working on her masters. For example, she enjoys learning about how other teachers nationwide are using a single computer in their classrooms and "are able to do all these really neat things with just one computer in the classroom." She feels that she is especially fortunate and has better opportunities to use the technology in her teaching since she has eight computers in her classroom.

Ms. Jaramillo feels that administrative and technology support is available and makes use of the computer lab and teacher training offered. She also makes use of the LCD projector in her classroom. She would like to see teachers share ideas to a greater extent and how they manage their time and classroom using a digital camera. She subscribes to an online site that provides lesson plans. Ms. Jaramillo rates herself as a six or seven out of 10 as her level of computer proficiency. Her strongest skill is creating teacher-made materials tailored to meet her lesson objectives. Though Ms. Jaramillo does not use e-mail with her students, she uses e-mail to communicate with administrators, support staff, colleagues, and classmates.

When asked why her colleagues were not using computers in the classroom effectively, she said that they are probably scared and "set in their pen-and-pencil ways." Ms. Jaramillo said she made the leap to use technology because of the digital divide, explaining, " I don't want my kids to be victims of the digital divide. I want them to be prepared."

Ms. Evelyn Allen—5th Grade Teacher

Ms. Evelyn Allen began her teaching career 28 years ago, teaching physical education at a school in central Texas. Ms. Allen's experience includes teaching 4th and 5th grade at several schools in central Texas, Alabama, and Louisiana. Ms. Allen's technology experience began early in her teaching career when she purchased a home computer for her two children, who were then elementary-aged. She describes herself as always being "education minded" and says she saw the benefits of learning computer skills for her own children's future.

In her teaching, Ms. Allen made the decision to use telecomputing tools in her classroom in response to the principal's expectation that teachers in the school should include technology in the curriculum. She began to look online for possible curriculum-based activities for her classes. She eventually found an online brochure posted by an education service center that advertised the Kigluait Educational Adventures Project. The online description prompted Ms. Allen to enroll her class in this Alaskan adventure. Kigluait Educational Adventures offers standards-based programs customized to meet the school's curriculum by providing adventures that take students beyond the classroom walls through videoconferencing and Web-based projects. For example, a project Ms. Allen's class enrolled in, called Race the Iditarod Trail, offers students an opportunity to participate in a simulated dog-sled race and to experience, virtually, the life of a dog sledder. The students learn how to train, breed, and care for their sled dogs while working through seven stages to reach the finish line of a simulated Iditarod. During each stage of the race, students earn points and “mushing money” by completing assignments and exercises that familiarize them with dog sledding and racing. The points and mushing money earned can be used to purchase the equipment and supplies needed to take part in the sled-dog race across Alaska. Students learn inquiry and decision-making skills as they continue the two-week virtual journey. Ms. Allen says it took her students three to four weeks to complete this project.

Ms. Allen and her 5th grade students connected with the Kigluait Educational Adventures educational directors and students in an Alaska classroom through videoconferencing sessions. Ms. Allen described a videoconference session between the coordinators of the Kigluait project and her students:

> Everything was virtualistic, but they would tell us what was going on at the race. They would show us the actual cabins where the dog sledders stayed and all of that information was given to us by the videoconference and so that way the children could see where the actual mushers were staying. And it showed Alaska—just the snow and everything. They panned outside and the children could see what Alaska looked like.

Other nearby towns also participated in the teleconference session. Ms. Allen recalls having technical difficulties in connecting with Alaska, so her class was able to talk to the other schools that were also sharing the videoconference call.

Although she considers her technology skills to be less than proficient, Ms. Allen made good use of the support from an education service center member who visited her classroom once a week and taught her students how to use PowerPoint®. In addition, the school's lab assistant provided technology support when her class used the computer lab. The Kigluait Educational Adventures project provided Ms. Allen with lesson plans with various types of resource materials, including handouts, rubrics, scoring guides, and direct instruction through the use of QuickTime videos and online lessons. Ms. Allen described how she surrounded herself with people with "proficient technology skills" in order to become more proficient herself.

Ms. Allen would spend about two and a half hours a night evaluating student work and totaling points before e-mailing data to the Kigluait directors. She paired students and assigned them to teams of four students in each team. Ms. Allen noted that she would not have been able to do the project without pairing students. Pairing reduced the number of teams from 28 to 14. Ms. Allen provided samples of teaching materials the Kigluait Educational Adventures group provided, including a list of required equipment for the dog-sled racers, contour maps of the routes the racers took, and a timeline for the race. In addition, she provided samples of the activities students did, such as worksheets they did and data they collected [see Appendix G].

Ms. Allen's class won first place in the simulated Iditarod and celebrated via videoconferencing and chat rooms with student participants from an Alaska middle school and staff members from Kigluait Educational Adventures. Her class received a certificate and feasted on party snacks during the awards banquet, as did the Alaskan group.

Ms. Allen made the decision to use technology in her classroom, based on her need to fulfill her principal's expectation that teachers in the school should integrate technology into the curriculum. She was inspired by her interest in the Iditarod, Alaska's dog-sled races, She chose to do this online project to motivate her students by making learning fun. She supplemented her students' online activities by the use of novels about Alaska and dog-sledding to help students make connections within the curriculum.

Throughout her class's participation in the project, Ms. Allen made numerous decisions. She decided when her students would use the computer lab, how she would group students for collaboration, the amount of time she would allocate to work on the project each day. She also decided about the type of support to request and accept, and about evaluating student work and deciding what to send in as part of the project.

Ms. Trisha Marley—Middle School Teacher

Ms. Trisha Marley taught for a couple of years before embarking on a new journey with a human service agency that lasted for 22 years. She provided support for people with disabilities. As an administrator at the service agency, she acquired several grants that allowed her to focus on inclusion in the community and schools. She returned to public school teaching five years ago as a special education teacher at Oak Meadow Middle School. Ms. Marley has a masters degree in curriculum and instruction.

Ms. Marley brings practical experience in planning from her years at her previous job. She uses principles inherit self-determination and a student centered approach to plan for her classes at Oak Meadow. Using values-based and CQI methodology, Ms. Marley incorporates the students' interests, sets goals, and designs lessons to motivate and integrate lesson concepts with real world learning and technology. Her interests in photography and video production became evident in her lesson planning. She used video and digital photography in her lessons to motivate and as a tool for exploration. In an art related lesson during one of her first and early years of teaching, her students took pictures at a construction site of items that illustrated the textures they were studying. This activity helped the teacher and students form a trusting relationship and encouraged her bilingual students to increase their English vocabulary.

Though Ms. Marley plans for her groups, she is not required to turn in written lesson plans each week. She uses a method of mapping to plans to identify essential skills, outcomes and assessments to be used. She writes more formal lessons when she plans to integrate technology and includes several of these plans each year in her professional portfolio. In her own words,

> When using technology, I have fairly elaborate and thought out plans. If I'm creating a WebQuest or other big project, or collaborating with other

> teachers, I use a traditional lesson plan format. I also like to map plans because it gives me a quick way to determine my activities and assessments based on both the TEKS and the big understanding I want the kids to get. I often use storyboards to plan my WebQuests …I actually design about 75 % of the materials I use for teaching resource.

Ms. Marley keeps a planning calendar to schedule her lessons and uses a table created in Word® to keep track of the URLs for her lessons. She designed WebQuests and Treasure Hunts to help motivate her struggling readers and to aid in math problem solving.

Ms. Marley designed a Trip to the Moon simulation using a WebQuest, PowerPoint®, and a multimedia projector for her 23 students in three blocks of resource math classes. Students simulated the launch sequence of a rocket to the moon. Students learned about the different phases of the moon and e-mailed Ms. Marley a postcard from the moon. Though students are not assigned school e-mail accounts, they can e-mail using the website's e-mail feature. The simulation activity spanned three days and took Ms. Marley a long time to plan and put together.

This year's teaching assignment includes overseeing a 7th grade learning lab and two 45-minute periods of resource with the remainder of her schedule in inclusion. The technology-equipped classroom is amply supplied with a multimedia projector, desktop and laptop computers. However, the laptop computers were picked up by the technology department to be upgraded with a new operating system. Though this is an inconvenience, Ms. Marley continues to make use of the one-computer concept. She describes her frustrations about not having the hardware.

> You have to plan for technology in the classroom in the same way you plan for anything—that something could go wrong. But it's hard when it doesn't go right. When you've got your room set up and you can't get online or five of the kids can't connect or something's going on. It seems like we've had a lot of upgrading and change of plans. When you put that much into it, you build it up and then it doesn't work. I have spent hours on some of the things that I have done and when we're already stretched so thin with so many things that we're doing, a lot of teachers look at that and just don't think it's worth it, but I'm coming from a perspective of children with disabilities.

Ms. Marley designed other lessons involving collaboration, the Internet, and videoconferencing. In one lesson, her 8th grade students created problems for 2nd graders who were struggling with problem solving using fractions. The 8th grade students prepared fraction word problems, placed them in a PowerPoint® presentation and e-mailed it to the 2nd grade classroom. The students had a classroom-to-classroom videoconference where the 2nd graders solved the problems and the 8th graders provided feedback. Ms. Marley described an outcome from participating in this project.

> There were a lot of different outcomes to this but the one that seemed to mean the most didn't have anything to do with TEKS. Before we actually went online and we connected our classrooms together, my students said to me, …one of my students raised his hand and said Mrs. Marley, do these kids know that we're in resource? And I said, are you math students? And they said yeah. I said, are you 8th graders? And they said yeah. And I said, that's what they know, you are 8th grade math students. And it was just very powerful. And the coming together, oh, it was something, the interaction, the laughter, and the fun, and the kids.

Ms. Marley selected this particular project for her students because her eighth graders "bonded in a unique way" and she knew they would help each other. Ms. Marley believes in continuous quality improvement for herself and for her students and involves them in decision making as much as possible.

Mr. Adam Herrera—High School Teacher

Mr. Herrera is a certified social studies composite teacher, meaning that he could teach subjects ranging from history, geography, and economics to government. He is currently in his third year of teaching.

His first experience with using technology in the classroom was his use of the overhead projector. He used political cartoons on transparencies and ready-made slides from the *History Alive Series*, lessons based on a specific area of study. This history resource is supplied by the school district and comes with transparencies, slides, audiotapes of speeches, or music from specific eras. Mr. Herrera had planned to include slides or scanned pictures of his grandfather's tour of duty in World War II but, for reasons of time, he did not use them. He felt that his use of these materials was of sufficient interest to the students that, during the next school year, when he covers the Vietnam Era, he plans to include his father's experiences in Vietnam.

Mr. Herrera's computer experiences began in elementary school, where he acquired keyboarding skills and learned to use Microsoft® Word. In high school, he continued honing his computer skills. For example, he remembers learning DOS but never using it, because it was already outdated. He described his early experiences:

> We had gotten a computer as soon as I got out of high school, when I was going to start going to [college]. My parents got us a computer because they knew it was important. My brother, on the other hand -- he went to school and got out of school about eight years before I did -- in high school, when he was going through his higher education, he had to give his written pages to my mom because he had no typing skills or computer skills, and my mom would type them up for him.

As a history major in college, Mr. Herrera made use of his word processing skills for typing papers and presentations. He used PowerPoint for a couple of presentations, but he was not too familiar with the application and did not use it regularly. His skill with using PowerPoint increased after he was hired by the school district and he began attending professional development sessions in technology. He modified a template that was modeled after the *Jeopardy* game that he used for helping students review basic facts in history every nine weeks. He added that visuals help the students learn.

Mr. Herrera has access to maps, charts, graphs, and photographs from textbooks, and he also has resources such as teacher kits and the Internet. He doesn't remember when he learned to work with graphics, but Mr. Herrera says learning to use PowerPoint has saved time in preparing his notes for his lectures, and he can re-use them instead of preparing transparencies. This school year he has five "preps" or classes for which he has to prepare. Instead of starting from scratch each year, he plans to enhance and improve his PowerPoint lessons as he gains teaching experience each year.

Mr. Herrera participated in professional development offered by the district. He has not completed the training sessions required by the district in technology; however, he has taken a number of the technology assessments administered by the campus' technology teacher, Daniel Gonzales, whom I also interviewed for this study. Mr. Herrera says that the reason for not finishing the training sessions has been the lack of time needed to complete the training, since he has also been busy attending professional development offered by the social studies department. It was in one of these social studies meetings that he learned to create activities based on the game of *Jeopardy*. Mr. Herrera uses various types of technology equipment that he makes available to his students in the classroom, including a CD player, an LCD projector, and TV/VCR/DVD players.

As he becomes more proficient in using technology, Mr. Herrera knows his students will also become more proficient. As he describes it,

> I hope to have them doing some other things as far as their presentations are concerned, but I think at this point [they have] made some growth, some progress–or I have at least. I think the more I learn, the easier it is to have the students do it.

Mr. Herrera says that his students are familiar with e-mail because they use it at home. The students do not have e-mail privileges at school, however. When asked about working on projects with other schools using telecomputing tools, Mr. Herrera said he plans to do so but—because of time restraints and his lack of familiarity with telecomputing—he has not yet done so. Mr. Herrera is aware of online programs, but has not accessed any Websites. Besides teaching, Mr. Herrera offers tutorials, coaches for students participating in UIL activities, and works with some on-campus student groups. His time is limited, and he described his frustration about this issue he faces as a teacher, as follows:

> It's just so many things that you have to do that it's [frustrating]…until I get to that point where I've learned… [when I was in school], I didn't have as much respect as I do now for teachers, because it's just like, "Man, where do you find time to do anything?"

Mr. Herrera gets to school between 6:30 and 7:00 each morning and leaves after 4:15 p.m. He recalls that his former teachers made teaching seem easy, but he also remembers that not all of his teachers put forth their best efforts. He said that his experiences as a student with some of his teachers who did not put forth enough effort has served as a motivating factor for him to improve his own performance as a teacher. When I interviewed Mr. Herrera at the end of the school year last year, he expressed his wish to buy a laptop to enhance his lessons with visuals, which he felt helped students to understand the concepts. He said he did not want to fall into the trap of becoming a history teacher who only lectured, as he described in recalling his high school history teacher:

> In high school my U.S. History teacher…was very knowledgeable. He was so smart, and he talked about everything endlessly. He was a great teacher in the sense that he knew everything about his content, but I was never able to put a face to a name during class, whereas if he would have had transparencies or a PowerPoint [presentation of visuals] —anything of that nature—it would have been tremendously better to [help me] put faces to names and stuff like that.

Mr. Herrera bought a laptop this year. He used one of the school's laptops last school year to present his lectures to students. He explained his reason for buying his own laptop as follows:

> [I]n buying my own laptop this year, it's completely night and day. My skills with PowerPoint have just increased my [technology] skills tremendously, because what I'm doing is creating all my lectures and notes in PowerPoint form so that I don't have to repeat writing them out. Essentially, by doing it through PowerPoint, I can include pictures, maps, charts, and graphs—a variety of things that you just don't get with a regular teacher's lecture, [which is] you know—[too] cut and dry.

The students in Mr. Herrera's classes come to his class with a wide range of technology skills. Though a few of his students have basic computer skills, others lack even basic keyboarding skills. He addresses this problem by grouping students into "mixed ability pairing" of students, a practice he describes in this manner:

> Well, I don't want to put three kids that are poor typists in one group. I want to put at least one kid who is familiar with PowerPoint or is very good at PowerPoint in a group of three or four, so that at the very least that person can do that while others access information and cite sources and things of that nature.

Mr. Herrera teaches his students citation skills and how to do research, but he does not specifically teach students how to use PowerPoint. Rather, the students learn from each other and they ask for assistance, if needed. For example, Mr. Herrera shows his students how to cut and paste to combine two different files, but he says the students can "figure out what they need to do to complete the task."

Mr. Herrera's classroom has only one computer, so his students use the computer lab located conveniently across the hall. Teachers sign up for computer lab time by accessing the lab calendar on the school's Web page and reserving a time. Mr. Herrera takes his class to the computer lab about once a month to search for primary sources on the Internet. Though his name appears about four or five times on the computer lab calendar, Mr. Herrera explains that he has several classes and each class goes to work in the computer lab about once a month. He differentiates the computer needs of his World Geography class from his U. S. History class and from his World History class as to how much computer lab time is needed. Lessons and activities are planned differently for each course. For example, World Geography is more extensive and is taught to 9th graders. Mr. Herrera believes that 9th graders should have the technology skills to prepare them for their subsequent grade levels in high school and on through college. He believes that technology instruction should not be delayed until the students are 12th graders.

He noted his confidence level had increased with two years of teaching experience increasing his knowledge in subject content, teaching, and knowing what to expect from students. The students today know more about computers than the students he went to school with 10 years ago. Students' computer skills derived from the use of personal computers at home make integrating technology in the classroom easier for Mr. Herrera. He spends more time explaining content to students than teaching them how to use software programs. “At this point, Mr. Herrera explains, “they are able to access what I…what they are looking for and use it, and process it, and make it useful to what they are doing.”

The students often frequent The National Archives Web site. The district’s online filter prohibits students from conducting graphics-only searches. Mr. Herrera explains that students need to search for content that might have an image or graphic to be able to get the graphic they want. The students do not have e-mail accounts and the computers in the computer lab are not configured for e-mail. However, Mr. Herrera did have a student use e-mail to contact a food or grain producer for a project the students were working on last year. Students signed a letter of consent to use the Internet and e-mail at the beginning of the year. Mr. Herrera hopes the use of e-mail will become a part of his regular classroom practice. At the moment he sees no major immediate need but envisions that use of e-mail would become part of what he does in the classroom. I asked Mr. Herrera what it would it take to have the students use e-mail. He replied as follows:

> Hmmmm, probably [depends on] the scope of what I'm asking them to do. What is it like, how you know how involved are they going to get? Are they going to need to acquire information from other people? Or, I guess that would probably be it—the scope of everything that I'm asking for. If I make that a requirement that they talk to someone, I guess that would be something that is a possibility.

Mr. Herrera’s World Geography students are working on case studies focusing on particular issues in various countries. The students research an issue that has relevance to a specific country, identifying the cause and effects of the problem, possible solutions, and what is being done to address the issue. One of the topics includes light pollution caused by too many artificial lights, such as city lights, obscuring the night sky. The students' research has revealed that a group of proponents are pressing the Italian legislature to pass laws that would affect this issue. Other topics include the effects of the Holocaust on socialization and the rebuilding of Iraq. This type of project requires students to do high-level thinking, according to Mr. Herrera, and it is causing some students to struggle with the assignment. "Some of the kids, they took these case studies and they ran with it. Others, you know, they weren't so passionate about it."

Mr. Herrera says that his current approach differs from his expectations of his students last year. Students researched various countries and presented their final product in a report about the culture and other basic facts about the country. Although this project was designed for his World Geography class, Mr. Herrera says he plans to include more projects with students in his other courses, explaining, "World Geography, I guess it lends itself a little bit more to those types of things, although I'm starting to get some ideas about next year in scheduling these types of things for the other classes, but in a different way." Students in Mr. Herrera's 9th grade World Geography class get opportunities to use technology more often than the other grade levels, because geography just "lends itself" to the topics they are addressing better than in his other courses, in Mr. Herrera's view. In addition, Mr. Herrera has thought about—but has not put into action—what he will do in his other classes, but he knows he will refine what he is doing and make more things happen over time and as he gains more experience. For example, Mr. Herrera said he would post a calendar of topics for students to select, discuss, research, and present reports. He believes that giving students more choices makes them more motivated to learn.

Mr. Herrera says that planning with other teachers has occurred minimally and indirectly and has happened primarily by means of the students. Mr. Herrera explained that he probes students by “asking the right questions and pushing the right buttons to have them talk about what they learned already or what they know” from their other classes. For example, when the students made him aware that the art and dance teachers were preparing their students to perform dances and complete projects with themes relating to the war in Vietnam or to the Civil Rights Era, Mr. Herrera emphasized these topics when they occurred in his lessons. The academy’s emphasis is on the fine arts program, so core-content teachers are expected to relate their instruction in the major content areas to the fine arts. Mr. Herrera would like to participate in cross-curricular pairing but finds time to be a hindering factor. He appreciates the team planning that middle school teachers do, and he views this as an ideal situation. However, he is prevented from this kind of team planning because his time is completely consumed by the various things he has to do.

Mr. Daniel Gonzales—High School Teacher

Mr. Daniel Gonzalez is the technology teacher at the high school where Mr. Adam Herrera teaches and in the same district as Ms. Sarah Jaramillo. He does not consider himself to be a "technology teacher by trade." He is a science teacher—certified science composite, which means he could teach any science class at the secondary level. He has taught physics, chemistry, biology and other subjects in the science curriculum.

He has a full day's schedule of six 45-minute class periods. Mr. Gonzales remembers beginning his experience with educational technology about 1997 or 1998, when he was asked by his principal to attend several days of network training to prepare for writing a grant to help fund the building of the school district's telecommunication infrastructure. Before this training, Mr. Gonzales had used the Internet at home and had made minimal use of application programs. The training heightened his awareness and improved his skills in using the Internet and in working with various software applications. He said, "I've always tried to find things that, in fact, would make me a better teacher. At the time of course, the Internet was the up-and-coming thing so I started messing with it back then at [my] house." Once the students became more interested in using the Internet, Mr. Gonzales saw it as part of his responsibility to help his students become more computer literate. Mr. Gonzales has since become

Microsoft®-certified and also teaches technology skills to alternative-certified teachers at the community college.

As the academy's technology literacy teacher, Mr. Gonzales integrates technology with science, such as by helping the science students use Microsoft® Excel® for calculations in their science lab and Microsoft® Word for their lab reports. Primarily, Mr. Gonzales uses technology to extend the concepts taught in the regular classroom in the core subject areas. For example, a few students were working after school on a math project, using PowerPoint for a presentation about mathematicians and their contributions to science. Their project assignments included writing a research paper and making a presentation to their math class. In another example, students from a social studies class preparing case studies learned to use various PowerPoint features, such as importing graphics from the Internet and manipulating text to accompany the graphics on their PowerPoint slides for their case study presentations. Mr. Gonzales teaches the students to use graphics "that bring the full impact of what they're trying to present."

When asked about students' use of e-mail, Mr. Gonzales expressed his concern about computer viruses and said that he prefers students to use e-mail at home. Students do not have e-mail accounts at the school at this time. The Internet is used extensively in Mr. Gonzales' computer lab. The day of my visit, the students in the lab were researching Copernicus and his contributions to mathematics, using the Internet under the close supervision of their lab teacher. Most of his students have access to the Internet at home, so they bring those basic Internet skills with them to school, where Mr. Gonzalez helps them refine their rough research abilities so that they become more efficient in using the Internet. Although at times students may come across inappropriate sites, the school has a system in place to filter out unwanted sites or, with an e-mail or phone call from Mr. Gonzales, to block access to undesirable sites. Mr. Gonzales gave some examples of titles from the students' case studies, such as "Migration in India," "Invasive Species on Different Continents," "Pollution in Mexico," and "Illegal Species Trade from Africa."

The classroom teachers in the school usually develop their own lesson plans and approach Mr. Gonzales for his help with suggestions about how to enhance their lessons with technology. When they provide Mr. Gonzales with a lesson plan ahead of time, it allows him to set up the resource links and lessens the possibility that the Web sites they thought they could use are no longer valid or that they are blocked or inappropriate. Mr. Gonzales offers suggestions about doing Internet research or about using application programs, such as Excel® or Word. For example, he suggested that the Spanish class create menus entirely in Spanish. The students' two-page menus included various dishes and prices for their imaginary restaurants. The students searched the Internet for recipes, especially seeking out-of-the-ordinary dishes. Mr. Gonzales allows the teachers complete control of teaching the lesson in the computer lab. As he described his view, "It's their lesson, and I just provide support to the children on different little points, or they get stuck in their PowerPoint skills or in their Internet research skills—stuff like that." For example, during the menu project, the Spanish teacher was instrumental in locating Web sites in Spanish. Mr. Gonzales learned something too—the Spanish teacher taught him a shortcut for putting accents on words in Spanish. Mr. Gonzales says, "That's the neat part about it. I don't sit back and say, 'Hey, I'm the total expert.' I learn from everybody all the time. I'm glad when the teachers bring me something new."

Teachers in the school often use WebQuests suggested in their textbooks' teachers' manuals. However, several of the teachers in the school have made their own WebQuests. Students have not yet created WebQuests, but Mr. Gonzales hopes to be able to have students create their own soon.

Mr. Gonzales provides teachers with training in basic computer skills and how to apply these skills to their classroom instruction. He offers an example of one teacher's students who created review questions and answers using PowerPoint. Their twelve-slide presentation was printed in handout format to be used by the students. Training for the teachers is conducted during faculty meetings or during teachers' conference times. The teachers call Mr. Gonzales if they encounter problems, and he invites them to the lab when he has an opening and he provides them with some "quick training."

Mr. Gonzales believes in open lab time, but he asks students to notify him prior to using the lab. The lab times are posted online and teachers schedule lab time as needed. Scheduling can be somewhat complex, since the school follows block scheduling. For example, the calendar for the month of April contains bookings for social studies, math, health, and communications classes that are on the schedule, planning to use the lab. Not as many teachers have signed up for that month, says Mr. Gonzales, because of the students' upcoming finals. An entire class usually attends the lab, although Mr. Gonzales may work with individual students from other classes at the same time. Five extra chairs are kept in the computer lab to accommodate additional students.

Training teachers to use technology tools for integrating technology into their teaching practice is one of Mr. Gonzales' responsibilities. He finds that teachers who are comfortable with the use of technology tend to push the use of technology with their students, while teachers who are not technology proficient tend to shy away from using technology with their classes. Mr. Gonzales relies on "more technology friendly" classroom teachers to frequent the computer lab to ensure that students get the technology skills mandated by the state. Mr. Gonzales would like to see the English Language Arts teachers come to the lab more often. He believes that "technology is advanced far enough that it's open to all subjects. There's something in every subject that can be done in here."

Mr. Gonzales is currently piloting use of an online attendance application. He also does troubleshooting and gets assistance from the district's technicians. The high school has approximately 450 students and several computer labs that vary in size. Mr. Gonzales' computer lab has 30 computers that are used primarily for instruction. The Mac lab has 32 computers that are used for animation. The E-communications lab has 10 Mac computers using Final Cut software programs for video editing. All of the classrooms in the high school have at least one computer and a multimedia projector. Students working in the lab can save their work to the server so that the teacher can download and share projects with the students in the classroom using the multimedia projector.

In addition to the computer labs, classrooms can share a laptop computer lab on wheels. As Mr. Gonzales describes it, "We have wireless capability throughout the building, and teachers can use this in their classrooms in lieu of coming to me. I'm pleased to say it's used every day." Students use these laptops in engineering and other classes, to do research, and to access WebQuests. Unfortunately, half of the laptops were stolen two weeks ago along with the cart. Mr. Gonzales is currently working to get the laptop computers replaced.

Chapter Five: Development of Emergent Themes

This chapter provides a description and definition of the major emergent themes. The most prominent emergent themes that participants mentioned as relevant to their decision-making about use of technology in their classrooms can be grouped into considerations about lesson planning, telecomputing tools, and the use of technology for instruction—all of which are integral parts in teachers' decision making about technology use for instruction in their classrooms.

MAJOR EMERGENT THEMES

Though the three main topics are discussed separately, they are inseparably interconnected in the ways that teachers plan and make decisions about their use of telecomputing tools for instructional purposes in their classrooms.

Under the general topic of lesson planning is included the informants' mental planning about their classroom instruction, their conversations about classroom instruction with their colleagues, and their written lesson plans. Telecomputing tools for this study included the use of computers with online connectivity for Internet and e-mail. In addition, use of the computers in the classroom was also considered by the teachers as coupled with the use of various other types of electronic or audiovisual equipment. For example, one teacher's Internet-based project involved her use of videoconferencing equipment to communicate with others outside her classroom. The topic of using technology for instruction involves teachers' understanding of the ways that technology can be put to use in serving their instructional needs, and it also involves discussion of problems that teachers see with using technology, such as safety issues. The following pages contain detailed discussion of these three major themes that emerged in this study—throughout the research process of data gathering and analysis—from the interviews, follow-up conversations, classroom observations, and documents as well as other instructional materials provided by the informants.

Decision making refers to the decisions that teachers make in their day-to-day routines of teaching and learning, and—specifically for this study—decisions made about their use of telecomputing tools in the classroom. The chapter summary is a discussion of how all three of the major themes that emerged in this study are vital considerations that contribute to teachers' making specific decisions about integrating technology into their teaching.

LESSON PLANNING

According to Borko and Putnum (1996), "the classroom is a powerful environment for shaping and constraining how practicing teachers think and act. Many of their patterns of thought and action have become automatic—resistant to reflection or change" (p. 4). Though the use of technology in the classroom has the potential to transform teaching and learning, teachers in general tend to stick with tradition in the way they plan lessons. Not only are teachers bound by their own expectations of what a lesson plan should look like, constraints about what is deemed acceptable in their written plans may come from the administrative staff, who may or may not actually look at their daily or weekly lesson plans.

The informants varied in the way they planned their lessons and in what they believed was required or accepted by their administrators. The teachers' process of planning was evident throughout their conversations. For example, they talked about how they decided on a topic based on TEKS, about their mental and written planning, and about the communications and meetings with the support teachers and staff that surrounded and supported them as they integrated technology into their teaching practice. The following describes the informants' perspectives on instructional planning.

Ms. Allen's Instructional Planning

One of the themes which emerged when talking about instructional planning was aligning instruction to TEKS. Ms. Allen's lesson plan for the Kigluait Educational Adventures project included the required TEKS for social studies, geography, culture, reading, math, writing, and technology expected of 5th graders. The list of TEKS-based subjects was appropriate to the teacher's lesson objective, which was "to create an interesting product that crosses several curriculums." No specific procedures were listed, but Ms. Allen did include a list of the technology and resources she used: computers, calculators, video, videoconference, conference by chatting, e-mail, and current video of the Iditarod. A list of resources for the unit of study included two novels and a movie about the Iditarod. The Kigluait Educational Adventures project contact information was added at the end of the lesson, along with a list of questions promoting higher-level thinking, which are listed below:

- Based on what you know, what choice would you make?
- What data were used to evaluate this choice?
- Can you predict the outcome if you choose this information?

Ms. Allen planned the Kigluait Educational Adventures project to parallel her students' reading of a novel about the Iditarod. This project met the TEKS standards for social studies, science, language arts, geography and math. She said, "We had to do lessons—we had to prepare technology lessons—and then I just knew that I could do the Kigluait Educational Adventures project and that I could connect it to the curriculum standards and the TEKS all over the place."

Collaboration with support teachers and staff emerged when Ms. Allen and other participants talked about receiving assistance from others not on their team. Ms. Allen thought about the type of help she needed to be able to assist her students in becoming proficient technology users and in completing the Kigluait Project. Ms. Allen described her lesson planning with the computer lab aide when she said, "We had a designated computer time every week, and we had a time when we would make the lesson every week." She also welcomed assistance from an education service center facilitator and collaboratively planned the type of instruction he would provide the students once a week.

Ms. Allen did not think she had the computer skills to undertake this project on her own, so she surrounded herself with individuals who could provide her with technical advice and assistance. For example, Ms. Allen enlisted support help from an education service center to help her use teleconferencing to connect to an Alaskan school and to the coordinators of the Kigluait Educational Adventures project. As a number of researchers into teachers' use of technology in the classroom have pointed out, teachers often balk at using a new type of technology if they consider its use to be beyond their level of knowledge and skills (Ellis, 1992; Pastore, 2001; U.S. Department of Education, 2000). In this case, though Ms. Allen considered this project as a task beyond her knowledge and skills, she overcame this obstacle by gathering the support she needed to accomplish the tasks required by this project. When she videoconferenced with the project coordinators and other participating classrooms in Alaska, Ms. Allen had to set time aside to make the needed connections through the services provided by the local education service center.

Mental planning emerged throughout the interviews and at times was evident as teachers spoke aloud during classroom instruction. Teachers talked about changing plans in the middle of a lesson when the technology did not work. Ms. Allen planned extensively throughout the duration of the project and elaborated and adapted as planning continued (Clark & Yinger, 1979b). As suggested by Glatthorn (1993), Ms. Allen's written lesson plan did not reflect the entirety of her on-going mental planning, which evolved as support people—including the computer lab aide, project coordinators, the principal, parents, mentors, and network personnel—were available to lend technical, instructional, network, and program support. Ms. Allen described in detail what she had planned for the videoconference and what was involved in work she had to complete at home. This mental planning process was thus an important aspect of her instructional planning, but it was not included in her written lesson plan.

One of the emergent themes included written lesson plans which were written using various formats. The words "lesson plans" bring to mind a bound book filled with pages, each with days of the week written above separate columns and with rows of boxes below the heading for each day listing objectives and procedures for each subject. However, the lesson plan I received from Ms. Allen was a unit plan rather than a daily or weekly lesson plan. The unit plan was about the Kigluait Educational Adventures project. Ms. Allen transformed and modified the curriculum to meet a particular teaching situation (Clark & Yinger, 1987). A sample of Ms. Allen's unit plan can be found in the appendices (see Appendix F: Sample Lesson Plans).

The majority of the teaching materials and most of the resources were provided by the project, so Ms. Allen did not have to plan the content or sequence of instruction. However, she did engage in mental planning throughout the duration of the project. Ms.

Allen thought about how she could manage 22 students, each working individually, and how she would need to turn in the required activity sheets and forms for evaluation. She decided to pair students and to select specific classroom activities that she would do with her students. Because of a lack of time, she did not consider a few of the activities that were designed for more advanced students. Other mental planning included considering how she was going to teach students to read contour maps, how to understand the concept of heredity as related to dog breeding, how to calculate distance, and how to plan for the types of supplies needed for the long trek on the Alaskan route of the Iditarod. This type of instructional planning was also not reflected in her written lesson plans.

The deadlines for submitting student evaluations and scores to the project coordinators required Ms. Allen to remain after school, beyond her regular school day. She usually completed the required paper work at home so that she could meet the posted deadlines for entering data into the project's database. Her students were in competition with other schools and meeting the various deadlines was important to the successful completion of the project.

Mr. Gonzales' Instructional Planning

Mr. Gonzales is the technology teacher, and in some instances provides direct instruction to students or facilitates their use of computer technology while the classroom teachers provide the instruction. On occasion the teachers use WebQuests whose links are provided by the textbook companies in the teachers' materials that accompany the state-adopted subject-matter textbooks the teachers use in their classrooms.

Mr. Gonzales, a veteran teacher, plans for instruction in a different way. Working in a high school setting, Mr. Gonzales plans collaboratively with teachers who have diverse subject matter backgrounds. He relies on the teachers to plan their own lessons and to collaborate with him about how their lessons will be conducted in the computer lab. Teachers usually go to the lab with a clear idea about the specific skills or concepts they want their students to learn. Mr. Gonzales offers his teaching and technology expertise to the teachers by providing them with professional development and with individual training and assistance, at the teachers' request, prior to their bringing their students to the computer lab. Drawing on his 30 years of teaching experience, Mr. Gonzales also provides teachers with suggestions about how to extend a lesson using technology through individual conversations with teachers. He provided the following example of a Spanish teacher approaching him about enhancing a Spanish lesson:

> The teachers, sometimes they'll come to me and they'll say, "You know, I've got an idea, something I want to do as part of a lesson. Is there anything that we can do in the lab to enhance the lesson?" Then this is where I'll come forward and say, "Well, here's an idea for maybe some Internet research" or "Here's an idea maybe of a way we can use Word to enhance that, or Excel®."

In this case, Mr. Gonzales provided a few suggestions for research on the Web that the Spanish teacher's students could do, such as using the Internet to search for recipes and graphics and creating a menu entirely in Spanish. This is what the Spanish teacher planned for the students to do, including making detailed descriptions in Spanish on the menus of a variety of dishes and their prices.

Mr. Gonzales' written plans take the form of a posted a calendar on the school's Web server so teachers can sign up for a specific time and date that they want to use the computer lab with their classes (see Appendix F-Gonzales). The calendar corresponds to the class periods when the computer lab is available. Teachers can sign up for as many lab sessions as they feel will be needed. Mr. Herrera, who is one of the informants in this study and who is a teacher at the same school as Mr. Gonzales, signed up for four computer lab sessions on four consecutive days, with a total of ten days for the month of October. A closer look at the schedule indicates that Mr. Herrera's second period class attended two times each week for two weeks. His fourth period class attended three times during the month. Mr. Herrera explained the differences between the schedules, noting that each class differs in the content and in the grade level of the students. In addition, he said that some topics lend themselves better to the use of technology than others. The online scheduling calendar gives Mr. Gonzales a written reminder to supplement the mental notes he makes in planning an integrated technology lesson.

Mr. Gonzales relies on teachers to plan the lesson they will teach in the computer lab so he engages in a lot of mental planning in preparation to offer teachers support in the computer lab. Mr. Gonzales offers suggestions to the classroom teachers about different types of activities their students can do using technology that can maximize or extend concepts the teachers discuss with students in their classrooms. Mr. Gonzales mentally plans what a lesson would look like and what the final outcomes should be as he plans with teachers individually. Ms. Gonzales is not required to turn in written lesson plans. His online monthly calendar suffices as his plan. According to Clark and Yinger (1987), experienced teachers make the least use of written lesson plans. This is definitely the case for Mr. Gonzales.

Mr. Herrera's Instructional Planning

Mr. Herrera was the least veteran teacher among the group of informants in this study. Having less than three years of teaching experience, Mr. Herrera is still considered to be a novice teacher. He follows the TEKS and district benchmarks in planning his lessons. Mr. Herrera's lesson planning took the form of PowerPoint presentations, which he used to enhance his history lectures for his World Geography and U.S. History classes. Ironically, being the newest teacher of the group, he sees his teaching experience as a big help with his lesson planning. He uses the Internet to gather information for his PowerPoint slides, and he often includes pictures and audio—many of which resources he finds via the Internet—to enhance his presentation and keep students motivated. In addition to his in-class presentations, he plans hands-on activities for student enrichment and interaction.

Mr. Herrera collaborates with the technology teacher to reserve computer lab times and dates. He discusses the lesson with the technology teacher in preparation for his students' use of the computer lab. Mr. Herrera teaches the lesson with technical assistance from the technology teachers. Though he does not collaborate with other teachers, Mr. Herrera gathers information from his students about the topics they are studying in other classes. He uses this information to integrate other subject content into his lessons. For example, if his students are studying dances from a particular region, he teaches the government and culture of that region.

Mr. Herrera's written plans come in the form of PowerPoint presentations. He incorporated some forms of technology from the beginning. His first year, when he began teaching, he used transparencies and an overhead projector. Soon, he began using the slide projector as well. His slides were provided in the teaching materials, courtesy of one of the state-adopted textbook programs the school had purchased. Mr. Herrera's recollection of how overly abstract and boring his history teacher's lessons were motivated him to plan his own lessons differently, as he explained:

> In high school, my U.S. history teacher was very knowledgeable, and he was so smart about everything. He talked about everything, you know, endlessly. He was a great teacher in the sense that he knew about his content, but I was never able to put a face to a name.

Mr. Herrera wants his lectures to be enlivened with PowerPoint presentations that come to life for his students with colorful visuals and sounds that keep his students motivated and that help them remember the instructional material. Mr. Herrera uses the textbooks as a resource, but he prefers and he enjoys designing his own lessons. His students actively engage in activities appropriate to the lessons taught.

Mr. Herrera sees the value of integrating the use of computer technology into his teaching as part of the same continuum of instructional enrichment. He uses computers with his lessons when it fits and adds value to the lessons. Mr. Herrera is excited about the future and knows that his abilities to enhance his lessons will increase with experience because, as he commented, "It's not good to lecture from bell to bell."

Ms. Jaramillo's Instructional Planning

Ms. Jaramillo is required by her principal to turn in weekly TEKS-based lesson plans. As long as she follows the TEKS and district benchmarks, she can decide which activities and materials her team will use. Though each teacher is responsible for implementing the TEKS for technology application, no one is specifically responsible for writing lessons that are technology integrated, nor are the technology TEKS generally discussed at these meetings.

She is one of six 4th grade teachers, and each member of her grade-level team writes the lesson plans for a specific subject area, which include reading, math, language arts, science, social studies, and the bilingual component for language arts and reading. Ms. Jaramillo's responsibility is to write the science lessons for her grade-level team. She collaborates with her grade-level team each week when they each discuss their lessons for the upcoming week. Since each teacher will conduct the lessons in his or her own separate classroom, Ms. Jaramillo feels that the sharing of lesson plans is important in order to help the grade-level team maintain a sense that they are “on the same page.” Ms. Jaramillo also collaborated with a 4th grade colleague in designing a project to address social studies TEKS about Texas. Collaboration with the computer lab manager and technology teacher provided additional support in reserving lab time and troubleshooting network problems.

Mental Planning

Ms. Jaramillo's mental planning is more time consuming than her written plans because she evaluates possible alternatives (Glatthorn, 1993; McCutcheon, 1980). Ms. Jaramillo's mental planning for this project included not only scheduling extra computer lab time but also anticipating any technical problems and providing information that students would need to know before going to the computer lab so that they could make full use of their lab time to accomplish the tasks that were included in their assignment. She planned instruction about learning to use software application tools and the research and collaborative skills they would need to complete this project. She also thought about how students would need to save their work on the lab computers so that they could later have access to their work when they returned to their classroom. Ms. Jaramillo’s main objective was for her students to learn more about Texas and to learn the technology skills they needed as they journeyed through the process of putting together a travel brochure, using computer-based presentation tools.

In addition to the resources supplied by the district, Ms. Jaramillo often surfs the Web for lesson plans created by teachers nationwide. Ms. Jaramillo prefers to create her own teaching materials she uses for instruction, explaining, "I'd rather be able to make my own material and modify it to the needs of my kids than go out and buy it or buy stuff that my kids won't use." According to Ms. Jaramillo, her lessons are more in-depth than other prepared lessons she has seen. She feels that in developing her lessons, she has been influenced by the courses she takes online for her masters degree technology program.

She follows a template to create her lesson plans. At the time of my visit to her class, Ms. Jaramillo no longer had her lesson plans available because she had already turned them in to the office. However, she did provide a unit lesson she had created to meet the TEKS for social studies, reading, language arts, math, and technology. The lesson was created as a handout for students and did not list the TEKS (see Appendix F-Jaramillo). Ms. Jaramillo planned this lesson, the Travel Texas Project, to meet the TEKS across subjects and viewed it as a motivational project for her students. She invited her colleague across the hallway to take part in planning and to participate with her students in the project. Like Ms. Allen, Ms. Jaramillo planned for her students to work in groups and thus had to decide which students would work well together. The assignment for each of the student teams was to invent a fictional travel company. Each “travel company” team would then compete in designing a five-day family vacation in Texas. The students, in teams of four, first selected their company name and logo. Their first online task was then to research sites in Texas that they thought promised family vacation adventure and entertainment. The directions provided by Ms. Jaramillo listed the criteria the teams were to follow, which included providing five different family activities per vacation plan, such as camping, going on amusement rides, visiting historical sites, visiting museums, and spending a day at the coast. The students were then to create a brochure—in the form of six PowerPoint slides—to present to their clients (i.e., their classmates and the students from the neighboring classroom).

Ms. Jaramillo planned to use the computer lab during her class’s regularly scheduled lab time, but she soon found that her students needed more lab time to complete their projects. She then planned for her students to use the eight computers in her classroom and signed up for any other times that were available in the computer lab. She provided students with pre approved Web sites by adding them to the Web browser’s "Favorites" folder for student use. She subscribes to LessonPlansPage.com, which she uses to download free lessons and to incorporate new ideas into her teaching practice.

Ms. Sanders’ Instructional Planning

Ms. Sanders uses e-mail to plan with the other teachers on her grade-level team, in addition to planning in person with them on a daily basis. They have an established team planning time, but unfortunately this does not coincide with the technology teacher's planning time. Therefore, the technology teacher and Ms. Sanders usually do their collaborative planning before school or after school—whenever they find an opportunity. However, as Ms. Sanders commented, they don't plan together "as much as they should." The technology teacher follows the technology application TEKS and talks to teachers to help them integrate technology into what they are teaching in the classrooms.

Mental planning for her classroom instruction is an ongoing process for Ms. Sanders. During our conversation, she recalled a teaching moment in which she tried to explain to her 2nd graders about copyright laws and citing references. As she gave a description of her lesson—which involved teaching her students the need for acknowledging an owner's copyright—she provided insight into her thoughts with implications about her process of mental planning:

> When the teacher is there [in the midst of the lesson], she knows how to go about explaining it so [the students] can understand it. It's interesting with technology, because there are people who have a much better grasp of it than I do, by far. But they'll kind of impart their wisdom, and you'll hear it and you'll think, "Okay, well, my kids could understand this, and they could do this thing." In fact, [with] the whole copyright thing right now, [one student got an understanding of it and said], "Look, Ms. Sanders, we're giving thanks." Their concept of it is not adult. It's different. There are a lot of issues to work out where you have to know the way they are going to interpret [the topic] and how you can help them use that tool.

Ms. Sanders shared her lesson plan for a lesson about the topic of the American tall tale (see Appendix F-Sanders). The objective of this lesson is "to explore various American tall tales to become familiar with the genre and identify characteristics of the tall tale (e.g. bigger-than-life characters, exaggeration, humor, and explanations of everyday discoveries)." The next item on her plan listed the TEKS for language arts followed by four Web links to sites with information about tall tale stories and related resources. The last item on the unit plan succinctly described follow-up activities that the students would do after visiting the Web sites. Ms. Sanders matched the software to the task by assigning the use of Microsoft® PowerPoint for student presentations of their tall tales (Greenhalgh, 1996).

Ms. Marley's Instructional Planning

Ms. Marley had extensive practice with goal-directed management and planning from her previous job at a human service agency. She infused these skills into lesson planning for her classes. She referred to this planning process as "person-directed planning" or "person-centered planning," since the individual's perspective is central to the planning process, which begins by assessing where the individual is and listing his or her goals. A circle of support is then created to meet those goals. Student contracts are written based on this planning process. Ms. Marley does not turn in lesson plans each week, although she does write them, as she explained:

> I can't teach without lesson plans, but I don't have one for every lesson. For my technology part, I have pretty elaborate lesson plans. I sketch out my plans. I

> have so much diversity [among my students], I have to really differentiate in the way that I teach. I may have various ways of presenting information, because with different kids [in a classroom] at the same time, [it's challenging] trying to keep them as a community. Right now, I'm teaching language arts … I have kids that read on a 1st grade level, and some [who are] reading on the 6th grade level. Everything we do is around TEKS. We collaborate. It's not true to say we don't have lesson plans. I keep a calendar—where I've got my plans written down doing this, this, and this—where I actually designed, I'd say, 75% of materials I use.

Big projects such as creating a WebQuest or collaborating with other teachers demands more formal lesson planning according to Ms. Marley. She usually uses a type of goal-mapping to plan lessons. She begins with a TEKS-based objective, then adds activities and steps to meet the teaching objective, and puts all of them into a table. She finds the table format to be easy to use when searching the Internet and organizing her resources for each step toward meeting the lesson objective.

Ms. Marley collaborated with a second grade teacher to provide her students with experiences in problem solving while second graders learned about fractions. She collaborated with other teachers on a project that created a homework helpline.

USE OF TELECOMPUTING TOOLS AND RESOURCES

The first thing I noticed about this group of informants was that teaching computer skills was not mentioned as a separate subject but was perceived as a prerequisite to learning a tool to aid in concept learning. In some cases, general computer skills or use of software was perceived as something taught to students while they were learning a specific concept in one or more of the subject matter courses or during an integrated lesson designed to teach concepts based on TEKS.

Computer Equipment

Earlier studies (e.g., Brickner, 1995), have suggested that teachers' limited use of technology in the classroom was due to insufficient access to hardware and resources, teachers' lack of computer skills, low to nonexistent administrative support, and technology taught as a separate subject. The participants in this study did not mention the lack of support or lack of equipment as barriers to their integration of technology, but they did express concern about not having the equipment they needed available because of a variety of factors outside their immediate control, such as upgrading or other troubleshooting or maintenance problems.

Unlike the use of traditional classroom equipment such as paper and pencil, the use of computer technology for instruction has its good days and bad days. For example, Ms. Sanders did not get her laptops until late September. She was anxious about not having her classroom set of laptop computers at the beginning of the school year because they were being re-imaged. By the time of our second meeting, her laptops had been returned to her. However, she did not mention them until I made a specific inquiry about this issue, which I interpreted as meaning that she considered that she had returned to the normal routine she had expected, of using the laptops.

Ms. Marley had her laptop re-imaged as well and had not received it half way into the school year. She described missing her laptops after they were collected by the technology department to upgrade the operating system:

> They've pulled in all of our laptops and things that we have, and so those of us who have been working really hard, you're feeling like "Where did it all go?" I don't have the equipment that I need anymore right now.

Mr. Gonzales had half of his wireless laptops stolen in the middle of the year and, at the time of our last conversation, was working to get them replaced. Ms. Jaramillo had to wait to have her computer configured to print to the classroom printer. Because Mr. Herrera used the computer lab at his school, he did not mention experiencing any technical problems. He relied on the technology teacher to have the lab ready for his students to use. The informants had experience in teaching with computers and had become accustomed to using them. These teachers had their computers taken from them at a critical time, the beginning of the school year, when setting up their classrooms and routines sets the tone for the rest of the school year (Fishman & Pinkard, 2001). The informants also had access to other electronic equipment.

The equipment available to each of the teachers ranged from one computer available in the teacher's classroom—although there was a computer lab across the hall, accessible as needed—to a full classroom set of wireless laptops. The teachers did not voice concerns about lacking equipment, and generally felt that if they needed equipment the district would supply their needs. In addition to hardware (i.e., having at least one computer available in the classroom), all of the teachers had Internet accessibility in their classrooms. They also had a multimedia projector. If not in their immediate possession, teachers could check out, for use in their classrooms, various items of electronic or audiovisual technology equipment, commonly including digital still cameras, camcorders, or scanners. All the problems that had occurred early in the year, such as the laptops that were out for re-imaging, had been resolved in some way by the time of my return visits a month or so later, so that the informants did not mention having any problems with access to computers but, rather, discussed enthusiastically the projects or activities students were engaged in.

Multimedia Projectors

One of the pieces of equipment all of the informants deemed especially useful was the multimedia projector. The informants described their use of the multimedia projector as having changed the way they used technology in their classrooms. For example, Ms. Sanders has a multimedia projector that is wireless and mounted on the ceiling of her classroom with a large screen located on the front wall. She shared her experience in using her multimedia projector—describing a time when she only had one computer in the classroom for her and all of her students—as follows:

> We went and tried to get TV aids or plugs or something so we could hook [the one computer in the classroom] to our TV, so we could at least go on the Internet and see a site and all the kids could sort of see it. . . . I have a projector on the ceiling, so if I want the kids to do something online, I can demonstrate it and they can see it. For a classroom application, for children to see what they need

> to…do…at a site, you need a screen for them. If you're going to do whole group instruction, they really need that.

Ms. Marley's experience with the multimedia projector prompted her to make a particular lesson about taking a trip to the moon in a spaceship (Hill, Yinger, & Robbins (1983) a little more exciting for her students:

> I actually set the classroom up. I did this pretty elaborately. I don't always do this, but I used the Light Pro, and I had the windows shut, and we were using laptops. We had a wireless lab at the time, so everybody was wired. I turned the chairs—I set [the students] up [with] partners so they could work together on WebQuest—and I faced them outwards all the way around the room, and that way I'd be full of wires in the middle—kind of like the hub. My idea was to create a little bit of a sense of maybe you were getting into your spaceship. Then I used the Light Pro and I projected this really nice picture of the moon up on the [overhead screen].

Ms. Jaramillo also related her experience when she first received a multimedia projector, as follows:

> I had a little PC, and we tried to do as much as we could [with it]. It was a stand-alone. We didn't have Internet, so once our school was wired to the Internet, we were able to do a whole lot more. But [back then], it was just basic Internet searches—the kinds of things you could do with worksheets—and this past year … I got a presentation station and *that* really opened up doors for the kids. All of the kids could see what they needed to do. I taught them how to use the PrintMaster® Gold Program, and it was a whole lot easier because I could show them all at once, and they could write down their notes and then they could go and start doing their graphics programs.

Teachers regularly use certain electronic equipment when it serves a purpose (Greenhalgh, 1996). Mr. Herrera continues using his overhead projectors for the transparencies he adds to enliven his lectures and using the LCD projector for his PowerPoint presentations. Mr. Gonzales ordered five more multimedia projectors for the teachers at his school, adding that almost everyone has a multimedia projector in their rooms.

Videoconferencing

Ms. Marley signed her class up for an electronic fieldtrip with the use of the school's videoconferencing equipment. Ms. Allen had technical problems with the videoconference she had during her class's Kigluait Educational Adventures project, connecting her class to a class in Alaska and the project coordinators, also in Alaska. During the videoconference, her connection failed. Ms. Allen was able to carry on only because another school nearby was able to help her work around the technical problems that interfered with her video connection. Only these two participants in this study mentioned using videoconferencing, perhaps because of the complexity involved.

There are a number of hurdles that teachers have to overcome in order to use videoconferencing. For most teachers, using videoconferencing means reserving the equipment (e.g., many teachers' classrooms do not have videoconferencing equipment), arranging for a connection, and then coordinating the meeting with the persons on the other end. In addition, teachers may need to arrange for technical assistance from the school's technology teacher or a technology aide in order to have everything work smoothly in the timeframe of a specific class period.

Software

Software did not seem to be an issue, and the teachers all talked about the various types of software programs that they were using for their personal and instructional use. The informants differentiated between the software they used as teachers and the software they used for their students. For example, the teachers used software for recording their grades, and one teacher was piloting use of a software program for recording grades online.

Instructional software programs for students use varied among the informants. Unlike the findings suggested by Clark (1978) and Glatthorn (1993), these teachers selected software that addressed the TEKS objectives first instead of planning the activities according to the available software. There were some software applications that were specific instructional programs used according to the particular subjects or grade level the teachers taught (Greenhalgh, 1996). General use software applications the teachers used included such titles as Microsoft® PowerPoint, Microsoft® Word, Microsoft® Excel®, and AppleWorks®. There were also some types of specialized software that some of the teachers used, such as PrintMaster® Gold that was used for graphics. Some teachers used varied keyboarding programs. The more experienced teachers used more and varied software applications (Sheingold & Hadley, 1990).

Early Experiences with Technology

The informants seemed to feel that they were far removed from their earliest experiences with technology. When asked to describe their first experience in using or learning technology, at first, most of the teachers hesitated and said they couldn't remember. The exception was the youngest teacher of the group. At 25 years of age, Adam Herrera readily remembered and described his earliest experiences with learning to use technology, which he first encountered during his elementary school years. He recalled learning keyboarding at the elementary grade level and wordprocessing in middle school. He said the skills he acquired early were further honed when he entered college and had many papers to type, which he did using wordprocessing software.

After pausing to recollect their thoughts, the other informants eventually offered what they remembered as their first experiences with technology. For example, Daniel Gonzales remembered working on an E-rate grant for his district to wire the schools for Internet connectivity. He didn't really use technology in the classroom at the time. Rather, he recalled, “Mostly I used Internet and e-mail at home.” His experience with technology while he was writing the grant prompted him to make the effort to bring technology into the classroom.

Evelyn Allen talked about buying a computer for her children in the ‘80s, when home computers first became widely available. At that time, and because of the experience she gained on her home computer, she learned enough to become interested in using computers in the classroom. She saw the need to prepare her own children to be familiar with the technology to prepare for their future careers, and later, she wanted to extend the same benefits to her students.

Sarah Jaramillo learned technology on her own and by attending school-provided technology training sessions. Her reason for wanting to become proficient in the use of technology was, as she explained, to help her students avoid “the digital divide.” Working in a low socioeconomic area, she knew that many of her students did not have access to computers in their homes.

Trisha Marley learned her computer skills at her previous job. She learned to use the tools needed in an office type job and transferred her computer skills to the classroom. Teachers teach the way they were taught, however, only Adam Herrera received technology instruction in his years before entering college. He vowed to change the way he used technology in his classroom so that he would not become his high school teacher. The remainder of the informants learned their technology skills either as teachers or college students.

INSTRUCTIONAL USE OF TECHNOLOGY

The teachers varied in ways they planned to use the technology for instruction. In general, they mentioned their lesson plans as their starting point and then seemed to look for a technology-based activity that they believed would enhance that planned lesson. Teachers tended not to be stopped by having few items of technology equipment available, but they seemed to be strongly affected by their sense of whether they had enough technology skills to provide instruction and troubleshoot and to be able to take technology integrated instruction to the next level. The issue of how to help teachers understand what they can do with the technology in terms of enhancing their instruction has been addressed by a number of educational writers, as discussed in the following section on activity structures. In the section following the discussion of activity structures are some considerations about issues that concern teachers about student use of the Internet.

Activity Structures

Harris (1998) provides an inventory of activity structures for specific curriculum activities and projects that use telecomputing tools. Harris grouped the eighteen activity structures she identified into three main genres: interpersonal exchange, information collection and analysis, and problem solving. Each informant in this study used telecomputing tools in ways described in Harris' three major genres. Table 3 shows how each informant used telecomputing tools. Among this group of informants, the greatest use of telecomputing tools was for interpersonal exchange, which Harris noted as being the most used by teachers of the three major genres of telecomputing activities (1998).

Interpersonal exchanges, as previously described in Chapter 2, are defined as the exchange of information between and among individuals and groups using e-mail, videoconferencing, real-time chatting facilities, and other electronic media. The students of the teachers in this study were not given e-mail accounts. Teachers typically used their own e-mail accounts for the exchange of information. Information that was exchanged during the course of carrying out a variety of telecomputing projects conducted by the teachers in this study included exchanges of e-mail between their classes and other classes that ranged in location from different rooms on the same campus to classrooms thousands of miles away; exchanges of e-mail between their classes and a person who, for the sake of educational interactivity, was impersonating Benjamin Franklin; and exchanges of e-mail from a group of 8th graders who were participating in a telementoring question-and-answer session by mentoring—via e-mail, a group of 2nd graders about strategies for math problem solving. Ms. Marley's students experienced a simulated trip to the moon. She used a Website to simulate messages exchanged during the launch sequence of a spaceship and subsequent astronauts' exploration of the moon.

Table 3. Activity Structures for Telecomputing

Activity Structures	*Frameworks*	*All*	*Gon*	*Her*	*Jar*	*San*	*Mar*
Interpersonal Exchange	**Keypals**	✓				✓	
	Global Classroom	✓					✓
	Electronic Appearances						
	Telementoring						✓
	Question & Answer Activities						✓
	Impersonations					✓	
Information Collection Analysis	**Information Exchanges**						
	Database Creation						
	Electronic Publishing						
	Telefieldtrips	✓					
	Pooled Data Analysis						
Problem Solving	**Information Searches**						
	Peer Feedback Activities						
	Parallel Problem Solving						
	Sequential Creations						
	Telementoring Problem Solving						
	Simulations	✓					✓
	Teacher-directed purposes for student searches using the Internet						
Teacher Directed Teleresearch	**Practice information-seeking skills**	✓	✓	✓	✓	✓	✓
	Learn about topic/answer question	✓	✓	✓	✓	✓	✓
	Review multiple perspectives			✓			
	Solve an authentic problem						
	Publish information for student use				✓		✓

Note. From *Design Tools for the Internet-supported Classroom,* by J. Harris, 1998, Alexandria, VA: Association for Supervision and Curriculum Development. Copyright 1998 by the Association for Supervision and Curriculum Development. Adapted with permission of the author.

The major part of teachers' telecomputing use was to access information from the Internet. Harris identified five general purposes for which teachers usually engage in teleresearch: to practice information-seeking skills; to learn about a topic or answer a question; to review multiple perspectives on an issue; to solve an authentic problem; and to publish information overviews for other students to use (Harris, 1998, pgs. 44-49), as shown in the preceding table (see Table 3).

Searching for information on the Internet was a skill that teachers often taught their students prior to beginning a specific research project or activity. The informants used the Internet to learn more about a topic and had their students do the same. Students also used the Internet to find information to answer specific questions. The informants did not mention projects or activities that fit the problem solving genre. Only two of the informants mentioned projects or activities that fit under the problem solving genre, the simulated moon launch that Ms. Marley adapted for her students and Ms. Allen's simulated Iditarod sled race. A noticeable gap can be seen when comparing the number of activities in the Interpersonal Exchange genre with the Interpersonal Exchange and Problem Solving genres. Designing lessons that target analyzing the information collected and problem solving requires additional planning and preparation time in an already overscheduled school day. The participants selected activities that matched their students' abilities, the equipment available, and their own personal interests, such as the Iditarod for Ms. Allen. A model of the decision making process teachers may employ when selecting the types of activities they will use when using telecomputing tools can be see in Table 4. For these informants, the use of telecomputing tools for major projects averaged about once or twice during the school year and were hampered by malfunctioning or missing equipment.

Safety Issues

A concern that all of the participants mentioned in their interviews was related to safety issues with students using the Internet and e-mail. This issue is problematic in all school districts and invariably ends up being addressed similarly by most districts. The tremendous benefit of telecomputing to help students go beyond the limits of the classroom is also a detriment in terms of leaving students to possibly negative influences via the Internet. This issue is a barrier to some schools or teachers integrating the use of telecomputing tools into curriculum-based learning.

The loss of control over what students might access when using the Internet or what unwanted types of content they may be open to through e-mail has caused some of the informants in this study to become overly cautious, and in some cases to abandon the use of e-mail with students or even to lessen their use of the Internet. Concern about inappropriate Websites that students might access is of concern to teachers, administrators, parents, and school district personnel. School districts have invariably attempted to block unfavorable sites which are of little value to the educational program.

Primarily, schools' filtering software programs attempt to screen out pornographic sites, games, audio clips, and chatrooms. Most school districts have subscribed to filtering programs to prevent students from accessing adult sites or sites with little or no educational value. However, in using filtering software, teachers have also been blocked from accessing sites which would be useful in their instructional programs.

Ms. Sanders' students do not have e-mail accounts. She uses her teacher's e-mail accounts when the need arises. For example, students whose parents are serving in the armed forces and are deployed overseas send e-mail messages to their parents using Ms. Sander's e-mail account. She explained, as follows:

> They [students] have a log-in account that gets them online to the Internet, but they cannot send or receive e-mail. In some ways, well, I think that's a good thing. With today's world, I think that's good. We get along without that.

The Flat Stanley project was done by Ms. Sanders' students using the postal service, even though the Flat Stanley activity can be done online. The students viewed the Flat Stanley project on the Internet, but used paper and pencil to participate in the project. Ms. Sanders had explored participating in a pen pal project online, but this project did not come about. In fact, Ms. Sanders—in explaining that concern over safety issues influenced her decision to delay using e-mail with her students with the pen pal project—actually contradicted her earlier explanation that it was better not to use e-mail with students. She made the following comment on that issue:

> But as far as student e-mail, that's about the only thing I miss with them having their own e-mail. It's a way that they could make a connection with students

> from other parts of the world and just kind of compare the culture and interests. I think it's important as educators to bridge those [distances] and reach out [to] see what's going on.

When asked about whether she could work with students having their own e-mail accounts, Ms. Sanders responded that this would be a problem, because, as the teacher, she would be held accountable for making sure that students did not send or receive inappropriate messages, saying, "You would almost have to read everything coming in and everything that goes out as well." She was unsure about being able to manage this additional task. She finds it less time consuming to use her own e-mail account with students because then she can regulate outgoing and incoming e-mail.

MAKING DECISIONS ABOUT TECHNOLOGY USE

Who makes the decisions about how teachers use technology in their classrooms? Ms. Sanders described integration of technology into instruction at her campus:

> At this point [integration of technology] has been teacher driven, and that's very nice because I haven't felt under the gun. This has been something that has been a tool for me to use and enjoy and embrace. If I had somebody telling me, "You will do this," it would take a lot of the fun out of it, I think.

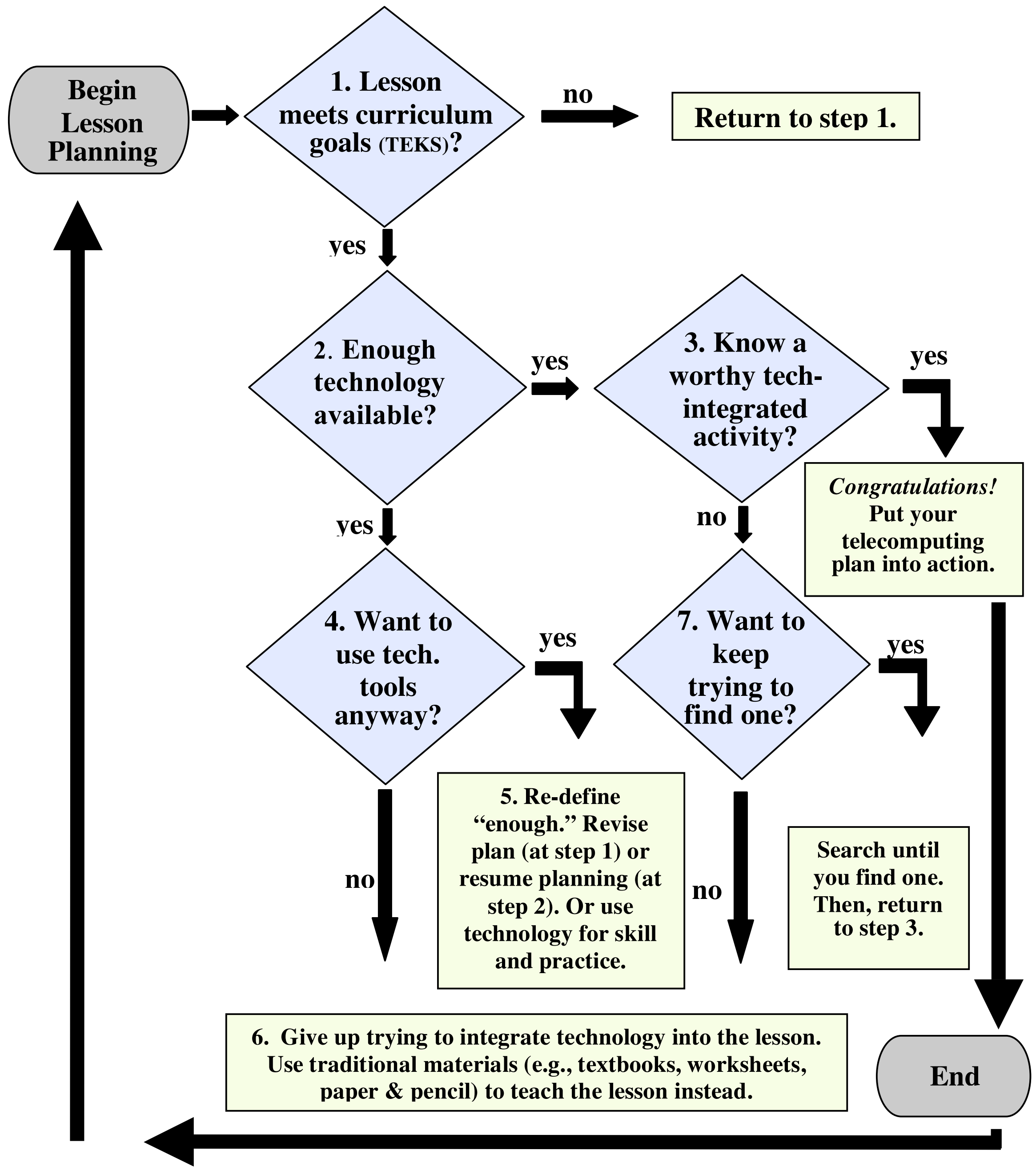
Teachers making decisions about the use of technology in their classrooms seem to consider each of the three issues that arose as emergent themes in the course of this study as part of the process of deciding to integrate technology into their instruction. That is, the teachers in this study considered the critical factors of lesson planning, the use of telecomputing tools, and the use of technology for instruction when planning their lessons and deciding whether or not to use technology in teaching the lesson. These critical factors and how teachers considered them are illustrated in Table 4, following.

Teachers usually began with their lesson plans, having particular curriculum issues that they wanted to address. They usually decided what to teach before they began considering how to teach it, and using technology was usually one of the options that they considering in reviewing possibilities for instructional activities. They had to consider whether they had technology available to them, and then think about what kinds of technology they might want to use, the time frame during which the technology would be available, and how capable their students would be in using the technology.

Another part of the decision-making equation for the teachers was always how the use of the technology would make a lesson better, educationally. Using technology always takes teachers extra time for planning, for connecting students with enough equipment to do instructional activities and helping them be successful in carrying out their assignments, and for identifying the kinds of activities that would help students connect with the material being taught in a way that is meaningful and motivating to them. Difficult as this issue is for teachers to resolve, the teachers in this study were unanimous in their recognition that the use of technology was motivating for their students. To these teachers, this was the paramount reason that they thought taking all of the effort to integrate technology into their instruction was “worth it.” In brief, to these teachers, being "worth it" meant that the technology was something that excited the students and made them eager to learn.

These three main aspects that teachers considered when making decisions about using technology all had to work favorably for them in order to have them decide to use the technology with their classes. They had to feel comfortable that the technology would meet their curriculum goals (i.e., a lesson planning issue), that the technology would be available for them to use (i.e., a technology tools issue), and that integrating technology into their lesson would enhance it as well as provide a good learning experience for their students (i.e., a use of technology for instruction issue).

Table 4. Model of Teacher's Decision Making Process for Technology Integration



Chapter Six: Conclusions and Implications

Main Considerations in Teachers' Decision Making

This study set out to explore the low incidence of telecomputing use among teachers, gathering information from a group of informants who, as classroom teachers, had decided to use telecomputing tools and resources in their classroom teaching. In the process of looking at these teachers who made the decision to use technology in their teaching, this study hoped to identify considerations that helped them decide to take that step as well as to identify, if possible, factors that would tend to dissuade them. This study thus examined the ways in which this group of technology-using classroom teachers made decisions about how, why, and when they would use telecomputing tools and resources to support curriculum-based learning in their classrooms.

As discussed in Chapter 5, the themes that emerged from the analysis of the data collected indicated that there were three main categories of consideration that were factors in teachers' decision making about integrating technology into their teaching. Those three major categories in teachers' decision making were

- lesson planning,
- availability of telecomputing tools, and

- use of these technology tools for instruction.

Teachers' decision making involved them in a complex and reiterative process, in which they typically weighed each of these major factors, adjusted and juggled aspects pro and con in each category, and then—when the concerns and considerations in all three categories aligned so that the teachers felt them to be reasonably balanced and "right"—teachers would proceed to make plans for a specific instructional unit and put those plans into action. Although these three categories of consideration are discussed separately in the sections following, none of them is independent of the others in teachers' decision-making process about integrating technology into their instruction.

Lesson Planning

Although the process of lesson planning often varied in particulars among these informants, they all found that their lesson planning was more complicated and the lessons they planned were more complex to teach when they used telecomputing tools in curriculum-based teaching in their classrooms. They all also had one major aspect of their lesson planning in common: When they planned and wrote lessons for use in their classroom instruction, the first step that each of these teachers took was to identify their specific curriculum-based lesson objectives. The best part of this aspect of their instructional planning was that they perceived the technology as needing to fit the curricular purpose for the lessons taught. The unfortunate part of this aspect of their instructional planning was that if they did not readily visualize a way to fit the technology into the lesson plan, they seemed to have few strategies or resources for finding ways to make it fit. If they did not have an idea—or could not come up with one fairly quickly—for adjusting or adapting activities so that the technology worked with the lesson they were planning, they often decided not to use the technology.

Curriculum Goals

All of the teachers in this study were acutely aware of the curriculum goals of their particular instructional discipline or grade level. The state curriculum standards (or TEKS), more than any other criteria, were the guidelines that they followed in their instructional planning. All of the teachers knew that the state's educational guidelines included an expectation that they include technology into their teaching. Therefore, while planning, the informants needed to align their instruction with the state curriculum standards (TEKS), and they were also aware that the technology application TEKS supports the use of telecomputing tools across the curriculum.

The lesson plan documents that the informants provided this researcher in the course of the information-gathering part of this study were their written plans for units that they had designed specifically to integrate telecomputing tools into their teaching practice. Generally, the participating teachers' written plans were in the form of daily lesson plans rather than unit plans. These teachers indicated that planning at the unit level helped them, since this was a level of planning that best helped them identify and meet their curriculum and technology goals. At the point when teachers decided to integrate telecomputing tools and resources in their lessons was also the point at which their planning changed to accommodate the use of technology.

Planning Details

The informants said that they needed to write more detailed lesson plans when they worked on projects or activities in which they intended to use the Internet, e-mail, or videoconferencing. In addition to writing their usual types of unit-level curriculum plans, the teachers commented about having to anticipate and plan for more complex factors that could affect their lessons when they planned instructional units for which they used technology than for teaching units for which they used traditional methods of instruction.

In regard to technology-based lessons, the need to anticipate complicating factors generally occurred in the form of teachers' mental planning. This mental planning played an important role in these teachers' preparations for a technology-integrated lesson, since it took them time and effort to anticipate the greater variety of possible interruptions in activities when they used telecomputing tools. This seems to confirm the observations made by other researchers that mental planning actually takes teachers more time than written plans (e.g., Glatthorn, 1993). The teachers in this study saw the use of technology as increasing the probability of technical problems occurring during a lesson. To compensate, they tended to over-plan by identifying ways that they could "go to Plan B" if the activity that they had planned to supplement the lesson had to be scrapped, such as might occur due to technical malfunctions or lack of access to the technology equipment.

The informants frequently engaged in collaborative planning with their colleagues and support staff, especially when these individuals provided assistance and support the teachers needed to carry out their lesson or project. This collaborative planning may include addressing issues such as scheduling time for the use of the computer lab or arranging for the use of the school's conference room to participate in videoconferencing with a classroom 3,500 miles away. The informants planned curriculum-based lessons with their grade-level team, although some of the teachers commented that they tended not to discuss use of technology with their grade-level colleagues. Rather, teachers who planned to incorporate technology into their lessons tended to seek out helpers who could provide technical support, and they also sought out individuals outside their school campus that directly affected the success of their planned project or activity, such as those involved with distance learning, guest speakers, project coordinators, and technology support technicians.

The Time Factor

Overall, time was a very critical factor in the teachers' decisions about whether to use telecomputing tools in their classes. Time was of such great concern to each of the informants because, to use technology, they always needed extra time. As mentioned previously, the teachers needed extra time for their lesson planning, including extra mental planning time to anticipate possible problems that might arise. They often needed extra preparation time and extra teaching time as well.

As detailed in Table 5 (following), integrating technology into their teaching practice required the informants in this study to spend additional time in planning and preparing their lessons. This is a drawback, because teachers already feel that they are operating in the red in regard to available time. The emphases of the No Child Left Behind initiative and the demands of the required curriculum, the state-mandated TEKS, have given the informants little choice but to focus their teaching on covering the intended curriculum.

Table 5. Needs Requiring Extra Time When Teaching with Technology Tools	
Teachers felt that when they used technology in their teaching, they needed extra time to address many or most of the following concerns:	
1.	gaining knowledge and skills necessary to become proficient in using the technology,
2.	lining up support, such as tech support, that might be needed to undertake and complete the task,
3.	gathering or creating materials and resources needed,
4.	scheduling computer lab time or shifting time within the regular classroom schedule to allow sufficient time to complete a project,
5.	creating a rubric or evaluation instrument appropriate to the lesson,
6.	instructing students in the use of technology tools prior or in addition to the lesson being taught,
7.	troubleshooting technical problems occurring before or during the lesson,
8.	storing the final product in various formats,
9.	displaying or assisting students in publishing their work in various formats,
10.	being vigilant concerning safety issues for students when using the Internet and e-mail, and
11.	preparing a backup plan should the technology malfunction.

Marzano (2003) collected data from several studies and teacher estimates of how much time it took to "adequately address the content" in their grade levels or subject matter courses (p. 25) and concluded that 15,465 hours are needed to cover an estimated 200 standards and 3,093 benchmarks required by the national and state level subject area documents (p. 24). Calculating an average of instructional time available among all the variables found in different districts and schools, Marzano (2003) estimated that 9,042 hours of instructional time is available on average each school year. Using Marzano's calculations to compare the amount of time available to teachers (approximately 9,000 hours per school year) to the amount of time that is estimated as required to cover the various curriculum standards and benchmarks (approximately 15,000 hours), means that teachers only have available to them about 60% of the time they need to cover the curriculum they are mandated to teach.

Not surprisingly, the informants in this study cited time as a major factor that limited their use of telecomputing tools. Not only did technology-based lessons require teachers to spend more time to plan, they also required more time for the teachers to teach, because students often needed extra time to use the equipment effectively to complete the activities assigned, a process which might be further complicated by actual technical malfunctions or limits on equipment available.

Clearly, the time factor can act as a barrier to integrating telecomputing tools into curriculum-based learning. Bound by the state's intended curriculum (TEKS), and having only about 60% of the time they need available, teachers feel it difficult to decide which concepts merit the use of telecomputing tools, considering the amount of time and effort that is required to integrate the use of technology into their teaching. Using technology takes extra planning and teaching time, and teachers have other activities and additional school duties they have to perform in addition to teaching. Thus, the time factor continues to be problematic for teachers integrating telecomputing tools into curriculum-based learning.

The informants described how they managed to make use of the Internet and e-mail by integrating use of these telecommunication tools into their teaching the subject matter content for which they are responsible. They often had to find extra time in order to do this, however. For example, Ms. Allen spent several hours each day at home evaluating student activities to meet deadlines for the project her class engaged in online, and Mr. Herrera came in to school early and left late to create his PowerPoint presentations, which required extensive searches on the Internet to gather information for his lessons and student activities.

The testing climate has drawn teachers away from fully integrating telecomputing tools into their teaching practice. On numerous occasions my visits to the schools of some of the informant teachers were postponed because of testing or other disruptions to the class routine. The informants found the single most challenging aspect of using the Internet and e-mail in curriculum-based learning was finding the extra time required to plan their technology-based lessons, including time to prepare, develop, instruct, monitor, and evaluate a lesson, unit, or project that would meet varying student abilities both academically and in technology skills.

Telecomputing Tools and Resources

Although having technology equipment available was not necessarily a primary factor mentioned by most teachers in this study as a reason for deciding to integrate technology into their teaching, the absence or lack of technology equipment was seen as a factor that slowed or hindered teachers in being able to integrate technology into their teaching if they were already disposed to do so (Becker, 2000). The teachers in this study—teachers who use and see the value of using technology in their teaching—were fairly flexible in being able to find ways to work around limitations of time in the computer lab or limitations in the numbers of computers that were available in their classrooms. All of the teachers had access to a multimedia projector, so they felt that—even if they were limited in the number of computers that were available at any one time—they could use their multimedia projectors to share a particular technology experience with the whole class.

Availability Interruptions

The major complaints among the teachers about computer availability occurred when they had no access to computers at all. For example, two of the teachers began the school year expecting that they would be able to use their classroom laptops with their students. It was thus a considerable inconvenience when their laptops were held up for routine maintenance for several months. Having computers at the beginning of the school year is critical for successful technology integration, since this influences teachers' thinking and behavior and sets the tone for the rest of the school year (Fishman & Pinkard, 2001). However, once these teachers had their equipment returned, they were very quickly able to resume using the computers with their students. A number of teachers' access to computers was interrupted by theft of the laptops on the school's rolling-cart computer lab. At the time of this report, that particular problem had not yet been resolved. However, the technology teacher had continued to offer use of the school's computer lab to supplement their lessons.

Equipment in good working condition always dictated when telecomputing tools were used by the informants in their teaching practice. According to Solomon and Solomon (1995), teachers fear not being able to handle technical problems when using computers with students. However, for this group of informants, technical problems were only regarded as an inconvenience to be remedied so that they could proceed with their instruction. As Ms. Sanders put it, "teachers have to work through glitches"—and these teachers did. For example, Ms. Allen had her videoconference with Alaska interrupted because of technical difficulties and had to modify her lesson by conversing with other area schools that were also participating in the videoconference call. In general, most of the informants had to change their plans to a greater or lesser degree while they were teaching their technology-based units, such as when they experienced equipment or network failure.

Concerns About Students

Another factor related to use of telecomputing that influenced the teachers' decision making about telecomputing use was consideration about students' safety. Specifically, teachers' decisions about the use of e-mail and the Internet was highly influenced by safety concerns about students' being exposed to inappropriate people via e-mail or to inappropriate materials via Websites not intended for student access. The informants were hesitant to use e-mail with their students because, in order to ensure their students' safety, it would take a lot of extra time for them to supervise all of their students, multiplied by the number of messages sent and received by each student.

Awareness and caution about unwanted, unsolicited, and inappropriate Internet sites influenced the decisions the informants made, generally by limiting the frequency of their use of e-mail or the Internet. School districts usually provided filtering software that prohibited students from accessing non-educational sites. However, this filtering software often blocked teachers from using sites that they thought were valuable in teaching a lesson. Again, the teachers often found ways around the problems. For example, some of the informants created Web pages or WebQuests to provide students with links to Internet sites that were safe for viewing and limited students' information searches to sites that were selected and approved by the teacher. In another example, Ms.

Jaramillo's students often searched the Internet from home and provided her with sites for possible use in their Travel Texas project. After reviewing the Web sites to assess their educational value, Ms. Jaramillo would add them to the students' Web browser's "Favorites" list so that these approved sites could be used by all of the students.

Comfort Levels

The informants said they had a sufficient number of telecomputing tools that were available and accessible to them. Except for Mr. Herrera, who only had one computer—a laptop—in his classroom, the informants all had access to computers in their classrooms, access to computers in the lab, access to a multimedia projector, access to videoconferencing equipment, and access to cameras and various software programs. The informants thus had the tools and resources needed, including online connectivity, and some also had wireless capabilities that helped them to integrate the use of telecomputing tools into their curriculum-based teaching.

The informants varied in their comfort levels about using the telecomputing tools available to them. Though some of the informants needed help in teaching the students specific software programs to complete their projects, the limits of their skills did not create a barrier in their deciding to do or complete a technology-based project. The informants took the initiative to ask for—and they generally received—the assistance they needed from various sources, including computer lab aides, education service center personnel, network managers, interns, project coordinators, and technology teachers.

According to Pratt (2000), secondary school teachers use the computer labs more frequently than teachers of younger children. As Ms. Sanders pointed out about her experience with kindergarten-level students using computers, younger students often need more guidance, more time, and more repetition when learning something new. Limits on computer lab time may not provide for the kind of extra time and attention that younger students need. The elementary and middle schools have access to the computer labs, but they also have four or more computers in the classroom. Previous research has shown that teachers with a greater number of classroom computers use them more frequently (Smerdon et al, 2000). Ms. Sanders' third grade students used their classroom set of laptops about two hours before going to recess. Ms. Jaramillo's students used their eight desktop computers about the same length of time while working in teams.

Most of the informants' classes rotated once a week on average to the computer lab, but they were able to schedule additional time if they needed it. The informants would extend the lesson if they needed more time to work on a project and give less time to another subject. Typically, the informants would integrate the project across the curriculum because of the additional time required for using telecomputing tools as part of their instruction. They often needed their technology-based projects to meet a greater number of curriculum objectives in order to justify the amount of time that was required to carry out these more complex and time-consuming units of study.

Use of Technology for Instruction

The informants unanimously identified students' interest as their number one reason for using telecomputing tools in their classrooms. The use of telecomputing tools was viewed by the teachers as a means to motivate and challenge students to learn beyond the skill and drill level of computer-assisted instruction. The students enjoyed working with the technology, and the teachers were quite aware of this student interest.

Students' Needs

Teachers were motivated by their students to learn more about using telecomputing tools, and, in turn, the students were motivated by their teachers' enthusiasm and the promise of learning through the use of telecomputing tools. In order to motivate their students, teachers first had to motivate themselves to learn how to use the telecomputing tools in ways that could allow them to teach their students to problem solve, create, and communicate more effectively.

The teachers wanted their students to be prepared to function in the information age of electronic media and global communications. For example, Ms. Jaramillo said she did not want her students to become victims of the digital divide. Working in a low-income area gave her the impetus to provide a technology-rich environment for her students, who would otherwise not have access to technology in their homes. Some of the teachers said they wanted to be knowledgeable about the use of the technology before they felt comfortable putting themselves in positions to be role models for their students or to be able to instruct their students in using the Internet and e-mail in meaningful ways.

Student ability also influenced informants' decisions to include the use of telecomputing tools in their lessons. One of the informants, Ms. Allen, said she had gifted students in her classroom and knew they could tackle a project intended for students two grades above their grade level. "The reasons that I undertook this project were that my class had a high rate of gifted children and they were suffering from " '5th grade-itis,' plus a little spring fever." Other informants talked about grouping their students to make the use of telecomputing tools manageable. By grouping students with different abilities, students could share their strengths within the group.

At the other end of the spectrum, special needs and low achieving students also demonstrated increased motivation and performance when "properly instructed in using technology" according to researchers (Werb, 2005, p. 12). Ms. Marley understood this very well. She provided learning experiences for her 8th grade special education students that challenged them to increase their problem solving skills by becoming mentors to 2nd graders via videoconferencing and e-mail.

These teachers often grouped or paired their students for success. For example, Mr. Herrera formed groups of three students to work on projects, with each group having at least one member with better than average technology skills. Ms. Sanders worked mostly with the whole class as a group because her younger students needed more help and required more time to complete tasks. When students collaborated on projects, even these seasoned teachers were surprised by how well they could handle problem solving. For example, Ms. Allen recalled watching her students work through difficulties they encountered, saying, "It was amazing to see that some children could make this thing work—and there would be problems! There was a *lot* of troubleshooting in there."

Benefits to Instruction

The informants discovered that using telecomputing tools and resources provided a vehicle for extending learning beyond the classroom walls in ways that textbooks could not. For example, students in Ms. Allen's class in Texas conversed with students in Alaska and got a glimpse of how dog-sled racers in the Iditarod lived in the cold Arctic environment. Ms. Marley's 8th graders in a special needs class were able to provide 2nd grade students with assistance in problem solving—for which they provided mentoring via videoconferencing— about math problems the eighth graders had created.

The grade level or course content was a factor in teachers' decisions about whether to use the Internet, e-mail, or videoconferencing to extend or enhance their lessons. For example, Mr. Herrera used technology more with 9th graders because he believed technology integrated better with certain subjects more than with others. He targeted his 9th graders for honing their computer skills, emphasizing to them that becoming computer literate early on would serve them well throughout high school and beyond. Ms. Sanders clearly found difficulty working with kindergarteners in using certain programs because they often forgot their user names and passwords. She found third grade students capable of doing more with technology and planned accordingly. Although the specific teaching situations of these teachers varied, all of these teachers were sure than the use of telecomputing tools would provide instructional benefits for their students.

DECISION MAKING

Teachers' decision making about using technology in their instruction was a reiterative process. There were three major components for teachers in making their decision, and each of these had considerations that teachers felt had to be met before they could comfortably decide to take the step of committing to using technology to teach their lessons, as shown in Table 6, following.

First, decisions about what to teach were invariably nested in the demands of the state curriculum standards (TEKS). Each informant planned lessons for his or her classes with consideration of these overarching curriculum needs. The informants usually designed their own lessons, often according to topic or subject matter "chunks," typically planning—in terms of size—for units of content at a time. The time required for these lesson units might vary from one to five weeks, or even longer if a technology project had to be stretched out in order to give students access to equipment in a computer lab they only attended once a week.

Table 6. Decision Making About Using Telecomputing for Instruction			
Aspects of Technology Integration (Themes)	Major Technology-Use Considerations for Teachers	Constraints on Teachers (Cons)	Plus Factors (Pros)
Lesson Planning: Teachers make decisions about how they plan for technology use	Teachers must meet curricular goals (TEKS).	Technology lessons take more time to plan out and to do in class.	Technology-based lessons can meet a variety of curricular requirements at the same time.
Technology Tools: Teachers consider tools before making decision to use	Administrators generally want teachers to integrate technology and are generally willing to supply equipment if possible.	Technology tools may not be available to the teacher, may be only occasionally available, or may be limited in number. Teachers must consider "safety issues" for students.	Use of technology offers connections to many rich educational resources outside the school. Use of technology-based lessons generally satisfy administrators' push for teachers to integrate technology into teaching.
Use of Technology for Instruction: Teachers consider how, when, and why to use telecomputing tools with instruction	Use of technology in instruction can enhance the value of instruction and serves to motivate students.	Teachers may not know of specific activities or resources that can be used to support particular instructional goals.	Teachers can seek out activities, plan their own, or adapt technology-based activities that they know about.

Next, teachers generally thought about the types of activities that they wanted students to do in conjunction with a unit of study. At this time, many of the teachers would start to consider whether the main activity for the unit might be computer-based. One critical factor at this point tended to be whether teachers could think of an activity that they thought would work for both the content they wanted to cover and the technology equipment they had available. Sometimes this part of the equation would weigh more heavily on a teachers' decision making than any other.

For example, Ms. Allen had an interest in the Iditarod. She went looking on the Internet to find teaching ideas for ways that she might cover the topic of the Iditarod, and during that Internet search found the Kigluait Educational Adventures project, which she thought would fit her content focus, meet her curriculum needs, and interest her students as well. Deciding to do the Kigluait Educational Adventures project was thus influenced by her interest in the topic (the Iditarod), her passion for including novels in her teaching, and her need to satisfy the school's requirement for the teachers to integrate technology.

Mr. Herrera took his cue from his students' interests. His students selected topics for research and exploration, and then Mr. Herrera assigned the use of telecomputing tools to facilitate his students' informational searches. With access to the computer lab across the hall, all of his students had access to the Internet for their information searches.

CONCLUSIONS

The informants were able to use telecomputing tools in curriculum-based learning because they knew what they wanted to teach and how they planned to teach it. According to their self-reporting, if they lacked the technology skills they thought they needed, they would often seek to acquire support by learning new technology skills, team up with a second person knowledgeable enough to instruct students in using technology, or attend professional development sessions that covered the kinds of skills they thought they needed.

Teachers had a lot of leeway in making decisions about their use of technology. As long as their lessons met the general curriculum standards (i.e., were TEKS-based), teachers were free to select which lessons they wanted to enhance and extend through the use of telecomputing tools and resources. The lesson plans teachers shared during the course of this research study were unit lessons they created—not traditional fill-in-the boxes types of lesson plans. By creating their own lessons to integrate technology, they maximized their own decision making capabilities to the fullest extent in their teaching. The participants shared lesson-planning sessions with their colleagues on a regular basis. The teachers said that collaborative planning occurred more frequently when they were integrating the use of telecomputing tools into their teaching than when they were planning more traditional types of lessons. This statement may be misleading because the frequency of the collaboration increased because they met with individuals, other than their grade level team members, who provided support for technology integration such as the computer lab manager, technology teacher, or an education service center representative. The majority of the lessons the participants designed when using telecomputing tools in curriculum-based learning were unique to the participating teacher and taught by the rest of the grade level team members.

Equipment and resources were not considered to be a barrier issue, except for the maintenance and troubleshooting interruptions at the beginning of the year for some of the teachers. Teachers were using the equipment they had available to them and seemed satisfied that they were provided access to enough of the hardware and support they needed. Professional development helped teachers reach a comfort level with technology sufficient for them to feel that, even if they were not experts, they could attempt to use telecomputing tools for curriculum-based learning.

Having tools is not the same as using them, however. According to earlier studies when computers were first introduced into the classroom, the lack of equipment availability was cited most often as hampering the integration of technology (e.g., Becker, 2000). The same cannot be said today in the schools of the new millennium. The informants in this study all said that they had enough hardware and infrastructure in place for using telecomputing tools.

For these informants, the use of telecomputing tools in curriculum-based learning occurred with varying degrees of implementation and was influenced by the teachers' teaching experience and additional support. Apparently, the greatest factor in these teachers' deciding not to participate in collaborative problem solving activities online to a greater extent is the lack of time. As Marzano (2003) pointed out, there are more standards to cover in a year than there are hours of instructional time. Further research is possibly needed to explore the paradox that the very tool whose use requires more time to plan for is also the tool that can help teachers manage time more efficiently and teach more effectively.

IMPLICATIONS

The findings in this study suggest that teachers' decisions to use technology in curriculum-based learning are not easily made. It is not simply a matter of teachers having access to technology equipment or knowing how to use technology equipment but, rather, knowing how to use the technology equipment effectively in instruction.

Knowing how to use telecomputing effectively in teaching is related to the paradigm shift taking place as part of the education reform movement that has been transforming education from a tradition of students' rote learning to having students engaged in creative problem solving and critical thinking. This intended transformation of teaching is still in its early stages. Technology integration represents a part of this process to the extent that projects that incorporate telecomputing into curriculum-based lessons tend to encourage students to engage in the kinds of higher level thinking skills (e.g., problem solving and critical thinking) that are envisioned in the reform plans for teaching. However, for teachers to use technology effectively in their classrooms, they have to be able to translate the demands of their particular curriculum standards into specific unit lessons, during which their students will participate in technology-based projects. Often, this is not an easy process for teachers to accomplish.

One critical limitation is time. The informants in this study all took the time to design lessons that integrated technology effectively into the content they taught. The amount of time it took for each of the teachers to plan these lessons as well as to teach these lessons was considerably more than the time it would have taken them to teach a traditional type of lesson. These teachers felt constantly pushed by time constraints in their teaching. They feel continuous pressure to meet all of the curriculum standards mandated by the state for their particular subject or grade level, which makes them feel that there is never enough time. As Marzano (2003) suggested, teachers have only about 60% of the hours available for teaching that they actually need to cover the curriculum standards and guidelines for which they are responsible. Teachers already feel their teaching time is limited by various school-activity interruptions and by school duties and responsibilities that they have outside of their teaching assignments. Little wonder, then, that time is such a precious commodity for them and that teachers often feel that trying to fit in a good technology-based lesson is just too much for them to handle in terms of the time they have to plan and teach such a lesson.

Other limitations that cause teachers to be reluctant to try to integrate technology into their teaching include concerns over safety issues for students. There is a definite risk that teachers feel when having their students use telecomputing tools that their students will either access sites they should not link to or that others outside the school will communicate inappropriately with their students. Although the school districts have filters in place that are supposed to block Web sites that have little or no instructional value, these filters are not as effective as they could be. In some cases, teachers and their students are blocked from sites that actually are of instructional value and that they would like to access. For example, a high school class looking for information about recent advances in treating breast cancer might be blocked, by the school filters, from accessing any Web sites that use the word “breast.” In other cases, students are able to access sites that look acceptable to the school filters, but whose content is inappropriate for them. Although teachers try to work around these problems that occur with school-based filtering software—with varying degrees of success—there are enough problems with the filtering system to cause teachers to worry that something unintended and inappropriate might happen during their students’ telecomputing sessions for which they will be held accountable. The perceived risks can outweigh the perceived benefits for most teachers.

Despite the drawbacks, it is encouraging that some teachers keep trying to find ways to integrate computer use into their teaching. Teachers know that their administrators want them to integrate technology because of the technology requirements in the state curriculum standards.

The most consistently cited reason, however, that teachers keep trying to add technology to their teaching is that their students usually enjoy using telecomputing tools and are much more motivated to learn during technology-based lessons. Even teachers who are reluctant to deal with the extra planning time, the potential frustration of technical problems, and the greater amount of scheduling and coordination that they have to do to teach technology-based lessons keep trying and say that they will attempt to do more of it, because it is "for the kids."

LIMITATIONS

This study's limitations included the limited number of teachers in the selection pool. In some districts, superintendents, principals, and district technology coordinators declined the request to have their teachers participate in this study because it would detract from their focus on TAKS. Scheduling classroom observations of the teachers who did participate was limited by the school's testing schedules and availability of technology equipment in the classroom. For example, one teacher had scheduled a classroom observation only to learn that the SmartBoard™ she was going to use was removed from her classroom the day before. Another limitation included the low number of documents available for viewing. Computers were reimaged and teachers lost the documents of student work and lesson plans they had saved. The teachers shared what they had printed and saved.

One might consider the low number of participants as a limitation, however, though generalizations cannot be made, the rich descriptions and interpretations provide perspectives that cannot be obtained using a post positivistic paradigm and, therefore, should not be considered a limitation in this interpretive study.

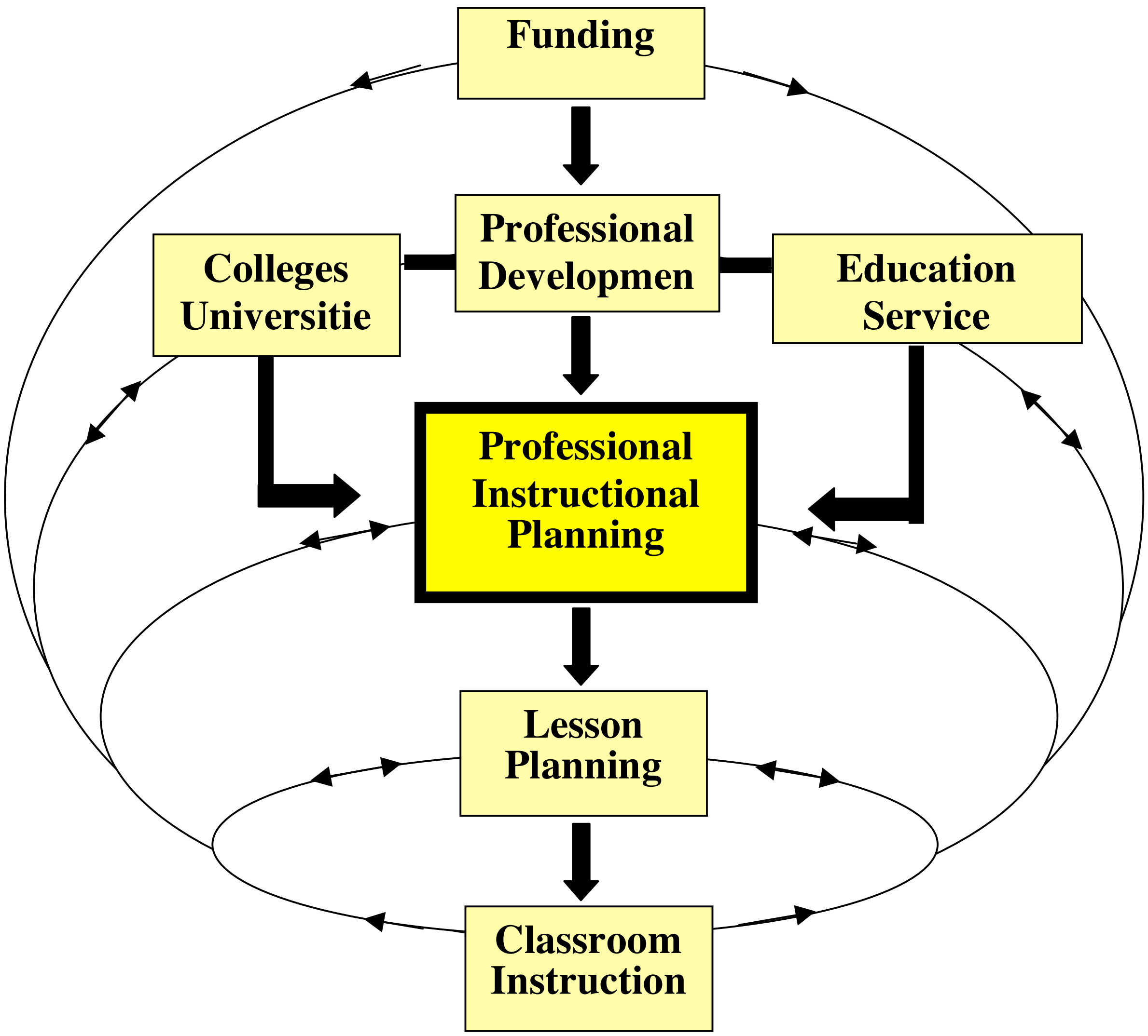
RECOMMENDATIONS

Federal and state mandates provide the objectives and standards for integrating technology into the curriculum. The monies provided to school districts for the purchase of hardware and the infrastructure needed to infuse technology into student learning also provides the budget for professional development. One recommendation as a result of the findings from this study is to take professional development a step further by providing a system of support for teachers that can help them plan for effective technology integration into the curriculum. This could also be a means of improving teaching effectiveness in ways envisioned by the calls for educational improvement and reform. For the sake of this discussion, the proposed system can be called Professional Instructional Planning (PIP), as described below and illustrated in the following figure.

Professional Instructional Planning is intended to provide teachers time to

- transfer learning gained from professional development or coursework into the design phase of lesson planning,
- collaborate with colleagues/team members in designing technology and cross-curricular integrated lessons,
- design integrated lessons emphasizing higher order thinking skills,
- utilize a teachers' toolbox of resources to aide in designing lessons for technology integrated curriculum-based learning using telecomputing tools (e.g., Judi Harris' Activity Structures).
- design technology integration lessons within single subject disciplines.
- attend design and planning sessions throughout the school year and summer months by hiring substitutes or paying teachers stipends.

Figure 1. Professional Instructional Planning for an Integrated Curriculum



Professional development provides teachers with new programs to learn, or new methods and strategies for teaching. However, in the current environment, insufficient time is given to teachers to transfer their learning from professional development sessions to classroom applications. The Professional Instructional Planning system (illustrated in Figure 1, above) should emphasize having teachers take the knowledge and skills they gain during professional development training into the design phase of instructional planning and then directly into their classrooms. Teachers could work collaboratively in teams, by grade level or subject matter content, to create technology-integrated lessons or activities.

Colleges and universities can help in several ways. First, they can prepare preservice teachers to integrate telecomputing tools into curriculum-based learning. In part, this may involve helping students learn strategies for translating curriculum requirements into activities that emphasize students' use of higher order thinking skills. Admittedly, preservice programs in today's colleges and universities often attempt to do this, but preservice teachers can be guided further by helping them learn a variety of strategies that they use, as a sort of "teachers' tool box," when they are planning their curriculum-based lessons, particularly when these are technology-based. For example, the short list of specific types of activities that Harris (1998) calls "activity structures" can be taught to preservice teachers as a kind of "tool" they can use to develop effective learning activities to support practically any curriculum. Then, having provided a concept for a basic "teachers' tool box," college professors and instructors—of math, science, or fine arts majors, for example—should emphasize to their preservice students the need for using these activities in their teaching to integrate technology within their disciplines.

To address the gap in the Information Collection and Analysis and Problem Solving genres in Harris' activity structures, teachers can be provided the time to design technology integrated lessons that address higher order thinking skills. PIP provides teachers with time to collaborate with their colleagues in designing these lessons and time to learn to use telecomputing tools in innovative ways.

Second, colleges and universities can work more closely with local school boards as well as regional educational service centers, coordinating efforts to provide professional development for practicing teachers as well as preservice teachers to help teachers develop effective strategies for improving their teaching as well as for integrating technology into their regular instruction. Professional development sessions could be offered during summers, night classes, or in short courses taught during professional days at specific schools to help guide grade level teachers or subject matter teachers to work together to plan effective and technology-integrated lessons.

As illustrated in the figure (see Figure 1), Professional Instructional Planning (PIP) is shown in the center of this schema because teachers are key. As the ones who primarily decide what happens in the classroom, teachers need to have at least a basic foundation of the knowledge and skills and the time required to design lessons for the curriculum that will be implemented in their classrooms. Preservice teachers can bring recent college experience of designing “best practice” types of lessons, and they should also be able to bring recent college experience of designing effective lessons that integrate technology.

Under this Professional Instructional Planning system, during increased professional development time, teachers should take what they have learned—whether through their own teaching experience, their professional development and training, or their recent college coursework—to plan and design lessons, activities, or units of instruction that integrate a curriculum-standards aligned curriculum across subject matter content and technology use.

Teachers should include in their lesson plans appropriate types of lessons, activities, or units they have designed during their instructional planning time. The lessons could be taught in the classroom, with the teacher having opportunities to return to the university or college for additional coursework, to sign up for professional development, or to participate in professional instructional planning. Professional Instructional Planning would not be designed to be a one-shot opportunity to plan. Teachers should have the opportunity to participate in Professional Instructional Planning throughout the school year and during the summer months as preparation for the coming school year.

Others can help at various levels in this Professional Instructional Planning system as well. For example, since state mandated textbooks often provide teachers’ manuals and other supporting information and materials to be used in teaching, textbook Publishers should be strongly encouraged to extend their heavily content-based instructional suggestions into the realms of higher order thinking project planning as well as to provide Web sites with links that can be used by students taking part in specific types of projects. Textbook Publishers, for example, could provide WebQuest pages, or similar types of teachers' resources pages, for each of the major units in a textbook. These types of resources could help to minimize the risk of exposing students to unwanted or inappropriate Web sites.

Teachers' lesson planning can be aided by a variety of others as well. For example, there are numerous lesson-plan providing Web sites, many of them created or maintained by volunteers. Unfortunately, many of these provide only traditional types of drill and practice types of activities. Teachers could, as part of their professional development, help one another to expand the resources available so that they can guide one another to good resources that help support more problem solving or critical thinking kinds of activities. In addition, teachers can help one another learn ways to use technology in their classroom teaching. For example, among the participants in this study, Ms. Jaramillo helped a neighboring teacher—who did not know much about using technology tools with her class—take part in the Travel Texas project that her class was doing, and both classes benefited from working together. Teachers could use this kind of collaboration and support more often to help one another share their learning on technology-based projects.

Perhaps the Professional Instructional Planning idea may be overly idealistic, but as an integrated system it represents something that often does not exist as a resource and support for teachers that perhaps should. Most people would not think it overly idealistic to speak of an "education system," whereas the structures that are currently in place are, too often, anything but systematic. Preservice training in colleges and universities are often completely separated from the professional lives and educational experiences of teachers working in school systems. The wealth of knowledge about teaching that all branches of "the education system" have available to them could certainly be better used to improve educational practice. Suggesting ways that can provide resources and support to help teachers overcome the difficulties they face in integrating technology into their teaching is an example of how the "educational system" could possibly use its wealth of knowledge and skills to help teachers to improve their teaching and raise student academic achievement.

Appendix A: Researcher as Instrument

Teachers have a multitude of opportunities to decide how they will use the hardware at their disposal. My own experience brings to mind the whirling and whizzing sounds of a computer about to connect to an entity somewhere in cyberspace. I had no idea what would pop up on my computer screen because no one else on campus had online connectivity. Through trial and error, the configurations I entered resulted in an audible dial up signal, followed by white static noise, and then a high pitched shrill when it failed to connect. The district had not yet installed the network infrastructure needed for connecting to the Internet nor had it furnished the schools with dedicated telephone lines or a service provider for this type of venture.

The school's computer lab had received new PowerMac computers with network capabilities. The computer lab was set up with a server providing a local area network which allowed the lab computers to print from the same printer, to share files, and to download software programs from the main computer. The server also allowed for management of student records and to track student progress using prescriptive software. The phone line, which ran into the computer lab, was to facilitate and encourage communications between the lab managers in other schools within the district. The phone system limited calls within the local network and no direct calls could be placed outside the network. Understanding the limitations this physical structure presented, I had to wait for the district to provide connectivity outside the local area network—not that the district was lagging behind—the district was ahead of its time in the early days of computing.

My duties as an instructional facilitator did not include integrating curriculum and technology or even providing professional development for teachers in the use of technology. The computer labs sufficed as the required technology at the time. Students scoring below 40% on the reading and math ITBS test were assigned remediation skill and drill activities in computer lab. This elementary school made the decision to switch the computer lab manager from an aide's position to two full time experienced teachers working in each of two computer labs. The students rotated between the two labs with one lab offering prescriptive learning with teacher led instruction and the other lab integrating the use of tool-based software applications with classroom learning. The classroom teachers were not in attendance during their students' computer lab time. Since certified teachers provided instruction, the classroom teacher had extra time for planning, or meeting with other teachers at least twice a week. Hence, the classroom teachers did not grow along with their students in their efficiency with computers. Planning between the classroom teacher and the computer lab teacher went smoothly, however, teachers did not have computers in their classroom, therefore, teachers' lesson plans did not reflect what the students would be doing during their computer lab sessions, but indicated only their computer lab time-long sentence and rephrase. The lab teachers' lesson plans reflected the learning objectives and how these would be addressed using technology.

As the enrollment continued to grow, I was privileged to occupy a corner of the computer lab as my office. This allowed me to observe students from kinder to sixth grade evolve into technology savvy students as they advanced from one grade level to the next. My second attempt at connecting to the Internet came when I received a dedicated phone line in my office corner in the computer lab. A commercial Internet service provider was offering free service to schools—one per customer. Eagerly, I configured my computer to get online. I held training sessions for teachers during early release and inservice days. Without computers in the classrooms, and with only one computer with Internet connectivity, the computer lab teacher and I were the only ones with full access because of time constraints. I started a school Web page, worked with small groups of students assisting them with their projects, and joined MathLine.

MathLine is a PBS and NCTM telecommunications-based teacher professional development service for elementary, middle, and high school teachers. A teacher facilitator is assigned to a community of 25 to 30 math teacher participants. Online discussions, nationwide, provide the platform for the sharing of ideas, introducing math topics, addressing questions, and discussing video series tapes. Teachers were given scheduled times when classroom demonstrations would be aired for recording purposes. A fee of $500 per participant made it impossible for the entire school to participate, although, into the second or third year of my participation, other teachers could use the video tapes, but did not get online privileges. The fee was reduced fifty percent for each year thereafter. MathLine was also accessible from home, but at the time I did not have Internet connectivity at home, and my time as instructional facilitator was devoted to other duties during school time which made it difficult to make full use of the services available.

MathLine has evolved into a new pilot program called TeacherLine sponsored by PBS and the Department of Education. The program has expanded its offering of topics by providing several professional development modules which take 15 to 20 hours to complete and are accessible online. Participation is free during the piloting phase and limited to 30 participants.

I encountered less technology integration as I began a new assignment at a nearby elementary school. The school of less than 400 students had a library which housed a single Internet ready computer which students used to access Accelerated Reader, a computer-assisted assessment of student reading comprehension. Students earned points according to their test scores, which they redeemed for prizes. Participation and readership were high among students and Internet usage was infrequent to non existent. The librarian encouraged and aided students in the use of the Internet when she was not engaged in direct instruction. Access to the Internet in the classrooms was not available. The teachers had a single computer in their classrooms which were distributed once the computer lab was equipped with new computers. Many of the computers laid dormant with some not even plugged in to a power source. My instructions from the administrator were not to work with technology and to focus on the TAAS related objectives—the school was not rated low-performing, but the central office administrators wanted to see an increase in the test scores.

A possible opening for a technology teacher at a larger school of 800 plus students prompted me to apply for the instructional facilitator position and then to move into the technology teacher position when it became available. The instructional facilitator before me had ordered 10 new PowerMacs for the classrooms. Ideally, these computers were Internet ready. The district was in the process of installing T1 lines for Internet and e-mail access district wide. The school's location on a hill and the six separate buildings presented a problem for wiring for online connectivity which took a year to complete. Both computer labs were wired for Internet connectivity, but only one lab was configured for its use because of the newer computers. Each regular classroom and support classroom had seven drops each plus a telephone. The problem now was getting an Internet ready computer into each of the 45 regular classrooms plus the support rooms. Without the infrastructure and hardware in place, teachers had no access to the Internet or e-mail. The difficult part now is the journey in making technology an integrated part of our curriculum and teaching practice.

Appendix B: Consent Form

IRB# 2005-01-0103

Informed Consent to Participate in Research

The University of Texas at Austin

You are being asked to participate in a research study. This form provides you with information about the study. The Principal Investigator, Tracey de la Garza, or his/her representative will also describe this study to you and answer all of your questions. Please read the information below and ask questions about anything you don't understand before deciding whether or not to take part. Your participation is entirely voluntary and you can refuse to participate without penalty or loss of benefits to which you are otherwise entitled.

Title of Research Study:
Teachers and Telecomputing Tools: A Matter of Decision

Principal Investigator(s) (include faculty sponsor), UT affiliation, and Telephone Number(s):

Tracey Victoria de la Garza	UT Austin Doctoral Student	210.436.9353
Min Liu, Ph.D.	UT Austin Associate Professor	512.471.5211

The University of Texas at Austin
Institutional Review Board
has approved this consent form

Approved: 04/01/2005
Expires: 04/01/2006

Funding source: None

What is the purpose of this study?
One of the problems facing schools with online connectivity is the low number of teachers integrating the use of telecomputing tools and resources into PK-12 curricula as a routine practice. Since teachers are the primary decision-makers about what occurs day-to-day in K-12 classrooms the low incidence of curriculum-based telecomputing should be considered to be a result of teachers' instructional decisions, and the reasons for these decisions uncovered. This study will examine how classroom teachers make decisions about how, why, and when they use telecomputing tools and resources to support curriculum-based learning. Six K-12 teachers will be selected to participate.
What will be done if you take part in this research study?

You will participate in an initial face-to-face interview at a time, date, and location convenient to you. Follow-up interviews will be of short duration, 15 to 30 minutes, and will allow you to review the constructions and interpretations for accuracy and to clarify or add any new information. In addition, a classroom observation will be conducted during a telecomputing lesson.

What are the possible discomforts and risks?
There are no known risks or possible discomfort except for loss of confidentiality. If you wish to discuss the information above or any other risks you may experience, you may ask questions now or call the Principal Investigator listed on the front page of this form.

What are the possible benefits to you or to others?
Possible benefits may include sharing of study results with participants or school district.

If you choose to take part in this study, will it cost you anything?
There are no costs associated with this study.

Will you receive compensation for your participation in this study?
No compensation is provided for your participation.

The University of Texas at Austin
Institutional Review Board
has approved this consent form

Approved: 04/01/2005
Expires: 04/01/2006

What if you are injured because of the study?
No medical treatment will be provided or available in case of injury as a result of participation in this study.

If you do not want to take part in this study, what other options are available to you?
Participation in this study is entirely voluntary. You are free to refuse to be in the study, and your refusal will not influence current or future relationships with The University of Texas at Austin and or participating sites such as ____ Independent School District or any other organization.

How can you withdraw from this research study and who should I call if I have questions?
If you wish to stop your participation in this research study for any reason, you should contact: Victoria de la Garza at (210) 436-9353. You are free to withdraw your consent and stop participation in this research study at any time without penalty or loss of benefits for which you may be entitled. Throughout the study, the researchers will notify you of new information that may become available and that might affect your decision to remain in the study.

In addition, if you have questions about your rights as a research participant, please contact Clarke A. Burnham, Ph.D., Chair, The University of Texas at Austin Institutional Review Board for the Protection of Human Subjects, 512/232-4383 / orsc@uts.cc.utexas.edu.

The University of Texas at Austin
Institutional Review Board
has approved this consent form

Approved: 04/01/2005
Expires: 04/01/2006

How will your privacy and the confidentiality of your research records be protected?
Authorized persons from The University of Texas at Austin and the Institutional Review Board have the legal right to review your research records and will protect the confidentiality of those records to the extent permitted by law. If the research project is sponsored then the sponsor also has the legal right to review your research records. Otherwise, your research records will not be released without your consent unless required by law or a court order.

If the results of this research are published or presented at scientific meetings, your identity will not be disclosed.

The interviews will be audiotaped and the cassettes will be coded so that no personally identifying information is visible on them. They will be kept in a secure place (e.g., a locked file cabinet in the investigator's home). The tapes will be heard only for research purposes by the investigator and his or her associates; and they will be retained for possible future analysis.

Will the researchers benefit from your participation in this *study*?
Your participation in this study will help the researcher meet the requirements in obtaining a doctor of philosophy degree in instructional technology.

Signatures:

As a representative of this study, I have explained the purpose, the procedures, the benefits, and the risks that are involved in this research study:

____

Signature and printed name of person obtaining consent Date

You have been informed about this study's purpose, procedures, possible benefits and risks, and you have received a copy of this Form. You have been given the opportunity to ask questions before you sign, and you have been told that you can ask other questions at any time. You voluntarily agree to participate in this study. By signing this form, you are not waiving any of your legal rights.

____

Printed Name of Subject Date

____

Signature of Subject Date

____

Signature of Principal Investigator Date

The University of Texas at Austin
Institutional Review Board
has approved this consent form

Approved: 04/01/2005
Expires: 04/01/2006

Appendix C: Sample of Coded Interview

Codes	Interview Transcription
	Interviewer: So tell me about these (papers with schedule). I noticed some of these say video conference.
Video conference	**Evelyn:** Yes, yes. We did that. We ah…we have the video conferencing in the library and, but we can talk back and forth. Wonderful. And that happened on those dates.
	Interviewer: And who did you talk to?
	Evelyn: We talked to Alaska. We talked to the people in Alaska.
Alaska	**Interviewer:** The ones who were actually in the race?
Directors virtual	**Evelyn:** Yes. Not the ones who were in the race but the ones who were the educational directors of the of the Kigluait. They called it the Kigluait Educational Adventures. Everything was virtualistic, but they would tell us what was going on at the race. They would show us the actual cabins where the dog sledders stayed and all of that information was given to us by the video conference
	Interviewer: Oh.
Mushers snow	**Evelyn:** and…so that way the children could see where the actual mushers were staying. And it showed Alaska. Just the snow and everything. They panned outside and everything and the children could see what Alaska looked like.
	Interviewer: Cool. How many classes were involved? I know it was your classroom were there any other classes from other places?
	Evelyn: Mhh…there was Sandoval…Sandoval was involved.

Sandoval Koger	Koger was involved and those were, you know, towns that we were familiar with because, you know, there were only like 15 in 11 miles away. You know, they were very close to us.
	Interviewer: And were you all hooked up at the same time during the video conference so all of those schools were able to get on at the same time to interact?
questions	**Evelyn:** Mmmhmmm. And then if we would ask questions, they would say okay Delano now you may ask questions. And then we would have the opportunity to interact. And then, you know, they may go to Sandoval and say go Sandoval. You may ask questions. You know, but they, they…there would be about three of us.
	Interviewer: Did you interact with any of the other schools?
interaction	**Evelyn:** At one point we did. At one point.
	Interviewer: Was it during the teleconferencing?
Technical difficulties	**Evelyn:** At one point we could… they had trouble accessing Alaska so they just…they just put us in with Sandoval. And we talked back and forth with Sandoval because we had a… a connection problem, one day. But those video conferences also explained, you know, how the race would be conducted and what would be happening next, you know. It was also…They were also teaching us how to run the races and how to use the information you know that they were giving us. It had many aspects. It wasn't just…They just didn't do one thing. They did several things.
	Interviewer: Well, you've got here…several dates here. That these were all dates that you all were…
connected	**Evelyn:** We connected.
	Interviewer: Were connecting to Alaska?
	Evelyn: Mmmmhmmm

	Interviewer: You had the awards banquet also?
fun	**Evelyn:** Oh, gosh was that fun!
	Interviewer: Through teleconferencing?
food	**Evelyn:** Yes! And we had our natural foods, you know, people from ah from my school area made, you know, dishes like we had like authentic like tortillas ,we had chips and dips, and you know, authentic food from around Delano and cookies that you know, that German, you know, German and Hispanic and we had all these dishes and we shared those with the people from Alaska. And then they showed us tofu and they showed us food from Alaska. It was a real celebration.
	Interviewer: By sharing what do you mean?
sharing	**Evelyn:** Sharing?
	Interviewer: That you shared these foods?
Shared knowledge	**Evelyn:** Well, we shared knowledge.
	Interviewer: Oh. [laughter].
celebrating	**Evelyn:** Yeah, we're celebrating and we're eating and we have this kind of food that the children had brought I mean the parents really went into it. We had so much food.
	Interviewer: And were the parents involved in the celebration?
celebrate	**Evelyn:** No, just… no they just provided refreshments. And the people in Alaska were also having refreshments. It was like we were all celebrating and we shared the different types of food that we use to celebrate.
	Interviewer: Do you want to tell me a little bit about

	yourself?
education	**Evelyn:** I am a University of Texas graduate, 1966 and I have 28 years teaching experience. My minor is actually in physical education and I started out in the Aldin area with 2 1/2 years in that department. I've taught fourth grade many years. Fifth grade many years. And ah, in the middle of my career I was a phys ed director of a Catholic school in the Aldin area. But I've taught in [Texas], ah, Georgia, a little bit in Alabama. And then of course I ended up in Delano, Texas, which was my home town. I came back home.
	Interviewer: What was your major? You said your minor was…
major	**Evelyn:** Major was elementary ed which would be first through eighth. My certificate is first through eight.
	Interviewer: So you taught for 28 years. You taught P.E.?
Teaching experience	**Evelyn:** I taught P. E. five and a half. I taught, ah, fourth grade…ah, let's see…two, ah, three, seven years… fourth grade seven years and fifth grade, and fifth grade was five…twelve, twelve years. And I also taught four year olds which didn't even count. I mean that was a day care. That was two years. Put those two years in there. I think that should add up about right. I think I have 23 years with CRF and 28 total in education.
	Interviewer: So with PE, fourth grade, fifth grade you pretty much taught everything, all subjects?
Self contained	**Evelyn:** Oh yeah, self-contained. Self-contained 5^{th} grade for ten years.
	Interviewer: When you did this project you were teaching 5^{th} grade?
	Evelyn: That's right, self-contained.

Early technology experience	**Interviewer:** Tell me how you started with technology? **Evelyn:** It started when I was in Redding, Texas. I taught in Redding and it was when it… technology was just coming into its own. That would have been in I want to say 90 about 93, the year 93. You know just when computers started when we started computer lab and I started…I started using technology and I started using, ah, you know, just the basic, you know, and then, and then I…if increased…the knowledge has increased that and there are certain people that are very adapt to computerize. What do they call them? There are certain words. I would be a dinosaur I think. [laughter] You know, I mean because, you know, it's just that I'm much older and it took me longer to get into the swim of it but then I just loved it. **Interviewer:** When they had it in the lab, what was your role?
Computer lab	**Evelyn:** I would, I would go with the children. I would take them to the lab in Round Rock. That's where it started. **Interviewer:** And was somebody in there? Was someone else in charge? **Evelyn:** No, no. **Interviewer:** So you had to conduct the lesson?
Lab lesson	**Evelyn:** I did the lesson. I did the lesson. **Interviewer:** What kind of lesson did you do? **Evelyn:** Ah…varied lessons in math. Some of it was just in ah…studying, ah…writing, some writing skills and… **Interviewer:** Keyboarding?
keyboarding	**Evelyn:** Keyboarding, definitely keyboarding.

	Interviewer: So on the lessons like when you did math were there programs already…were the programs already…on the computer, and you taught the kids?

Appendix D: Samples of Categories and Themes

The following is a sample of an informant's categories and themes. Each informant was coded and categorized then taken collectively with emergent themes described in Chapter 5.

<table>
<tr><th colspan="3">Trisha Marley
Themes/Categories/Explanations</th></tr>
<tr><th colspan="3">Informant's Personal Info</th></tr>
<tr><th>Themes</th><th>Categories/Labels</th><th>Definitions/Explanations</th></tr>
<tr><td>Personal Info:
Informant talked about family</td><td>• children</td><td>• daughter, son</td></tr>
<tr><td>Education:
College degrees earned</td><td>• degrees
• certifications</td><td>• Bachelor's Degree
• Master's Degree in Curriculum & Instruction
• teaching certificate
• special education certificate</td></tr>
<tr><td rowspan="3">Teaching Experience:
Informant discussed her current and previous assignments and accolades</td><td>• years</td><td>• 2 years (1974) interrupted
• 5 yrs at Oak Meadows Middle
• assignments included other jobs: MHMR for 22 years which included work in training and education</td></tr>
<tr><td>• accolades</td><td>• study
• conference presenter</td></tr>
<tr><td>• assignment</td><td>• language arts—8th grade</td></tr>
<tr><td>School:
Basic facts of last school of employment.</td><td>• Middle School</td><td>• Oak Meadows Middle School
• about 1,306 students
• 6th, 7th, 8th
• located in outskirts of a large city</td></tr>
</table>

	• Students	• 18 students plus 15 inclusion • 2 Down Syndrome-1 CP • 2 Street wise kids
Technology		
Themes	**Categories/Labels**	**Definitions/Explanations**
Technology Experience: Informant discussed her early experiences with technology	• Early technology	• Learned computer skills from previous job • Considers herself more of a designer
	• Personal Use	• Type, edit, and save letters to parents • Mostly taught self • Technology made life easier • Grades
Technology in the Classroom: Informant discussed how she used technology with her students	• Integration	• Displays lesson on large screen • Lessons designed for hands-on activities and interactivity • Telecollaborative project with 2nd graders/fractions • Trip to the Moon Simulation
	• Equipment	• large screen—changes way teacher teaches • Access to Web cam • SmartBoard • Laptops • desktop computers • LightPro multimedia projector
Computer Lab: Students and teacher attend computer lab on a regular basis	• lab teacher	• certified teacher • different things required by classroom teachers • role of tech teacher changing • 45 min/wk

	• content specific	• included math lessons, writing
	• software	• Microsoft® Excel®, PowerPoint®, Word®, Math Program, Kidspiration®
	• keyboarding	• keyboarding-done during lab time
Professional Development in Technology: District provided technology training	• technology training	• summer workshop at Lake Tahoe
	• computer proficiency	• more of a designer
Support: For technology	• district	• expectation is to use technology
	• principal	• provided budget, support
	• technology teacher	• district technology teacher would help teachers integrate technology-service no longer available
	• technicians	• technical support available
	• cooperating teachers	• other teachers agreed to work on projects
Telecomputing Tools: These tools include the use of Internet, e-mail, and videoconferencing.	• Internet	• Students need parent permission • Webpage—use template • Internet searches • Interactive games • Field trip to the moon simulation • Ask the Expert
	• E-mail	• Teacher uses e-mail to collaborate with grade level team • Students do not have e-mail accounts

	• Video-conferencing	• Connected to a 2nd grade class
Online Projects: No online collaborative project; other projects using Internet searches or the Web are listed plus WebQuests created.	• WebQuests	• Fieldtrip to the Moon—simulated trip to the moon • What Rules in School—students pretend to be principal • NetStar Gold
	• Homework Helpline • Homework Support Page	• Provided by local newspaper company • Each class has helpline phone number • Connect class to home • Communicate homework assignments • Web page updated daily
Limitations to using telecomputing tools: Informant described difficulties in using the Internet or e-mail. Safety concerns and problems are listed.	• Internet	• Allrecipes.com—lesson on proportion • Tie to literature –Charlie and the Chocolate Factory • Create Webquests • Supports multintelligences for disabilities • Teach kids to make a table to remember Web sites, store notes, and pictures, cite resources • Concentration game; use storyboard • Netscape, Composer; FrontPage
	• E-mail	• Students do not have e-mail accounts • Time was also a factor in using e-mail with students

		• E-mailed Benjamin Franklin
	• Safety issues	• Uses Bess
	• Problems	• Malfunctioning equipment may not seem worth the trouble after many hours of planning • Upgrade changes plans
Decision Making		
Themes	**Categories/Labels**	**Definitions/Explanations**
Decision making: How technology is used in the classroom	• Teacher-driven decisions	• Teacher makes decisions about how technology is used in her classroom • Principal is supportive of teachers' decisions
	• Non classroom teacher decisions	• CAI software used in computer labs • E-mail for students • TEKS
	• Student-driven	• Invites students to give input
Lesson Planning		
Themes	**Categories/Labels**	**Definitions/Explanations**
Planning for technology: This includes any type of planning the teacher does.	• Written plans	• required but does not have to turn them in every week • Writes formal plans when collaborating or doing a technology lesson • Makes lists of lessons • Writes lessons on calendar • Uses mapping—plans for self • Make a table • Uses storyboard to plan WebQuests
	• Mental planning	• Peer collaboration • Mapping—

<table>
<tr><td></td><td></td><td>what I want the kids to understand
make sure it's TEKS based
activities and steps</td></tr>
<tr><th colspan="3">Documents and Artifacts</th></tr>
<tr><th>Themes</th><th>Categories/Labels</th><th>Definitions/Explanations</th></tr>
<tr><td rowspan="5">Materials: Created by informant</td><td>• Handouts</td><td>• Samples in teacher notebook</td></tr>
<tr><td>• Lessons</td><td>• Design 75% materials used</td></tr>
<tr><td>• Website</td><td>• Teacher's Website is located within the district's firewall</td></tr>
<tr><td>• WebQuest</td><td>• Field Trip to the Moon—simulation created by informant</td></tr>
<tr><td>• Rubrics</td><td>• Teacher made</td></tr>
<tr><td rowspan="2">Resources</td><td>• Websites
• Concentration Game</td><td>• Moon Phases Website
• Ask the Expert Website</td></tr>
<tr><td>• E-mail</td><td>• Postcards from the moon-e-mailed to teacher from students</td></tr>
<tr><th colspan="3">Other Comments</th></tr>
<tr><th>Themes</th><th>Categories/Labels</th><th>Definitions/Explanations</th></tr>
<tr><td>Influence on Colleagues:</td><td>• colleagues</td><td>• inspired teachers to continue with homework helpline
• promoted the use of classroom Webpages through NetStart Class—a tool to help publish and maintain content on the Internet</td></tr>
<tr><td>Future goals</td><td>• digital photography</td><td>• would like to learn more about digital photography about
• hook up with other classrooms
• get up and running earlier with technology</td></tr>
</table>

Concerns	• technology	• Homework Support Page—teachers change teaching assignment and no longer participate in teams which support Webpage, etc.

Appendix E: Samples of Reflexive Journal Entries

Reflexive Journal

Victoria de la Garza

Thoughts and Feelings
Decisions and Actions

July 10, 2005
Great news! I e-mailed Trisha Marley about receiving approval for the amendment to include another district from IRB. About time. YEAH!!!

July 18, 2005
E-mailed Trisha Marley about meeting for an interview for the first week of August. She lives in central Texas so I will need to drive up there, preferably on a Saturday or late evening during the week. I'm glad she's willing to meet with me.

July 20, 2005
Received an e-mail from Diane Sanders about meeting at a restaurant on the outskirts of town. We will meet at 11:30 and I'm eager to meet with her. She's an elementary teacher and teaches 3rd grade. She attended the TTCC program. I had made several calls to the superintendent. The superintendent told me to call the principal. I made several calls and sent several e-mails to the principal. Finally, I will get to interview Diane Sanders.

August 15, 2005
Received an e-mail from Trisha Marley about meeting for an interview. Because of the start of school, Trisha is finding it difficult to schedule. Will send some dates later into the school year when school settles into a routine for me, too.

September 13, 2005
I will meet with my peer debriefing group tomorrow. I need to complete transcribing Evelyn Allen's second interview.

September 15, 2005

Met with my peer debriefing team and discussed Sharla's concern about coding. I updated everyone on my progress and committed to set dates for follow-up interviews and the initial interview for the out of town participant.

September 28, 2005
I e-mailed Daniel Gonzales and Sarah Jaramillo about meeting for member checking. I have completed their summaries and am ready to have them review and give their opinion. I also e-mailed Trisha Marley. I will meet with her on Saturday for our first interview. Hurricane Katrina made it impossible for us to meet sooner. The first two agreed to meet with me tomorrow, Thursday, and Trisha on Saturday. She lives out of town so I will have to get directions from MapQuest. The peer debriefing group meets tomorrow, too. I have e-mailed the members, Sharla and Archie, about moving it to another day.

October 1, 2005
Met with Trisha Marley. She lives out of town and I followed directions to the restaurant where we were to meet. There were no signs on the streets because of construction. We waited for each other at the restaurant not knowing we were both there. We had a good interview. She spoke so softly. I hope the tape recorder picked it up. Trisha is a special ed teacher. Every classroom teacher has special needs children in their classroom so it is fitting that she be included in this study. She brings a special insight.

October 11, 2005
I e-mailed Adam Herrera about a follow-up interview and classroom observation. So far he hasn't replied. I'm running out of time and need to get this done so I can complete transcribing. If I interview him during lab time, I also get to observe Daniel Gonzales. They are at the same school. Daniel is the technology teacher at the high school. That would be great! Come on, Daniel, reply! If I push too hard, teachers say no. I shall practice patience.

October 12, 2005
Took my car to the shop and called Lynda about looking over my Chapter 3 and 4. She said she would. Great!

October 13, 2005
E-mailed Dr. Liu about setting up a date for the defense. I'm not ready yet because I'm having problems getting the informants to agree to an observation. Their schedule is as hectic as mine. Transcribe, transcribe, transcribe. Our peer debriefing group changed our meeting time to next week.

October 14, 2005
Received an e-mail from Dr. Liu. She says I don't have enough time for reading drafts and scheduling a defense in the fall. I e-mailed Jim Maxwell about an extension. He said I needed a form to complete.

October 17, 2005
I sent Dr. Liu my reason for an extension and a timeline for the Spring to modify if needed.

October 20, 2005
I talked to Sharla on the phone today. She is waiting for her committee member to give her feedback on her Chapter 4. I received an e-mail from Dr. Liu in response to my request for an extension. She approved my reasons and wants me to ask for an extension till August 2006. I need to turn in all chapters by mid January 2006. She refined my timeline and I e-mailed all my committee members about the extension. More good news, I heard from Adam Herrera. He says I can see him on Wednesday around noon for the summary member checking. I will take a half day from work. Maybe Sanders would like to do her summary, too—perhaps an observation? Patricia McGee approved my extension. Great!

October 26, 2005
I met with Adam Herrera and Daniel Gonzales. I observed Daniel today in his lab. The engineering teacher had a class in the lab. The students were working on a project with virtual clients they had to design for. Daniel was showing another teacher how to set up classes for an Algebra I software program. I was not able to get an observation of Adam Herrera in the lab yet. I did meet with Adam to review the summary of our first interview. He didn't make any changes except to say he didn't create the template he used for Jeopardy, he merely modified it. He also said I could quote him without all the "ahs." His students are not ready to work in the lab yet. I'll have to hang in there and try later to get an observation.

October 29, 2005
No word from any of my committee members. Maybe I didn't word it correctly.

October 31, 2005

I received an e-mail from Diane Sanders responding to my e-mail about meeting to review the summary of her interview. Her brother broke his leg and she won't be able to meet with

Happy Halloween!

me until two more weeks. Candace replied to my e-mail and approved my extension—three more to go.

November 1, 2005
I still need an observation of Sanders, Marley, and Herrera. Apply pressure…don't apply pressure…apply pressure…don't apply pressure. I've had too many teachers, principals, and superintendents refuse to participate or have their teachers participate. I will practice patience some more.

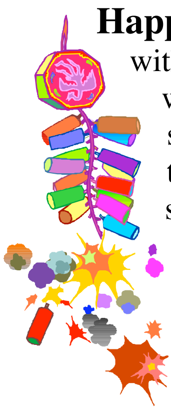
November 8, 2005
Received an e-mail from Dr. Webeck approving my extension. One more.

November 15, 2005
Finally, I have everyone's approval. I called Stephen to get Dr. Field's phone number. I left a message because she was not in her office. I followed up with an e-mail and she returned it. I had her e-mail address wrong previously. Ooops. I e-mailed Dr. Liu and Jim Maxwell the completed forms and e-mails from the committee members.

December 6, 2005
Received an e-mail from Dr. Liu about approval from the committee members. She had not received my e-mail! Say it isn't so!!! I e-mailed her and Jim Maxwell, too, and sent all the forms again.

December 7, 2005
Jim Maxwell e-mailed me that he had not received the forms for extension. UHHH!! However, he did receive the second one. Whew!! Almost missed the deadline. Technology, sometimes it lets you down.

December 16, 2005
I have Christmas holidays coming up. Hope to work diligently on my paper.

January 2, 2006

Happy New Year! Well, living got in the way and I had to pause to celebrate with family and friends. I used the time to complete transcribing the interview with Trisha Marley. I had to go over it time and time again. She spoke so softly, I could barely hear her in some parts. I took me hours just to transcribe two paragraphs because it was inaudible. I thought about paying someone to transcribe it but if I couldn't understand it myself and I was at the interview…I worked on Chapter 5 and 6. The themes and categories are emerging. I e-mailed my peer debriefing group about meeting before my

work schedule becomes too hectic. I start work tomorrow. I need to get home early to work on my chapters. I still need to do a couple of member checking sessions and a summary interview with Trisha. Diane Sanders had agreed to meet with me in January maybe the second week to do an observation. Yeah! I have to contact her after this week.

January 7, 2006
I was just about to e-mail Diane Sanders about an observation date and a copy of her lesson plan when I opened my e-mail and she gave me two dates to choose from for the observation and she also sent a lesson plan. Her principal wants to meet me so I'll swing by the office when I get to the school on Thursday. I'm excited about observing her class. They started a new lesson on American Tall Tales. I will e-mail the other informants about a couple of questions I had that I want them to clarify and also to get a copy of their lesson plans.

January 10, 2006
Trisha e-mailed me with a few facts about the number of classes she teaches. I talked to Daniel Gonzales today at a workshop. I asked him if I could use his calendar to include in my lesson plan section. He said yes. Since he does not formally write lesson plans, he uses an online calendar that teachers use to sign up for using the computer lab. I responded to Diane Sander's invitation to visit her campus. I will go Thursday morning. I have to leave my house at least by 6:45 to be on time. The traffic is brutal and her school is outside the city limits. I'm looking forward to observing her class.

January 12, 2006
Visited Diane Sanders at her school. I met the principal and some of Diane's friendly colleagues. Her room was very inviting and comfortable. The kids had laptops at their desks and were working on creating their own tall tale. Some students wrote and typed, others wrote first, and others started writing but continued typing their stories on their PowerPoint presentation. The kids were enjoying the assignment and the atmosphere was relaxed enough for students to talk to each other and still remained focused. I talked to the principal to make sure I wasn't violating Diane's anonymity if I disclosed the school was on a military base. She said it would be okay to say so and that they worked in a gated community—guards at the gates of the base. It was fun watching third graders log in to their computers and use the correct fingering to type.

January 18, 2006
I visited with Lynda about editing my paper. She said she would. I'm almost finished with all my chapters. I need to tighten up a few things. I e-mailed Dr. Liu about turning in my paper by the 3rd of February—edited and complete. This way I can concentrate on

whatever revisions from Dr. Liu and committee members have in store for me. I still need two observations. I'm hoping to complete them this month. It's been maddening at work with all the testing. That's all we do these days.

January 20, 2006

I received an e-mail from Dr. Liu saying the February 3rd date was okay. Unfortunately, I also received an e-mail from Trisha Marley. She will be testing and has a very busy schedule. She will not be using technology till mid February. She said she will be introducing a new program and I can visit then. Okay, my first reaction is at least it's not a no. I can still continue with my analysis with the information I have. I will add the observation data later.

Appendix F: Sample Lesson Plans

Sample of Allen's lesson plan with informant's comments on the margins.

1. What ages do you teach – the Audience – refer this for 678 – high 5th
2. What is ~~[illegible]~~ mushing? What is the Iditarod?
several for 4 years
3. Blk star – BRIGHT Dawn Connect – Novel Interes
4. IRON WILL
5.
6.

5th Grade/Social Studies/Reading/Math/Writing/Technology

School: [redacted]

Teks:SS- 5-6 geography,5-7 geography,5-8geography,5-23 culture,5-25 studies skills,5-26 studies skills,5-27 studies skills

Reading 5.7a,5.7b,5.7f,5.9b,5.9c,5.10d,5.10h

Math 5.1,5.3abc,5.4b,5.13b,5.14ab

Writing 5.15c,5.17

Technology 5.5a,5.5b,5.6b,5.7b,5.7c,5.8a,5.8b,5.8c,5.9a

7. Stone Fox worksho
8. mentor more don in a
9.

Lesson Objective: to create an interesting product that crosses several curriculums

10. Region 5

Technology Integration: computers, calculators, video, video conference, conference by chatting, e-mail, current video of Iditarod from television

Virtual Iditar starts Feb 23

Resources: novels, <u>Black Star, Bright Dawn,</u> Scott O'Dell, <u>Stone Fox,</u> John Gardiner, <u>Woodsong,</u> Gary Paulsen, movie "Iron Will"Walt Disney PG

11. Student letter Explo
~~12. Bib Packe~~
~~13.~~

Kigluait Curriculum Adventures P.0. Box 1027 Talkeetna, Alaska 99676
http://www.kigluaitadventure.com
chume@kigluaitadventures.com
907-354-1309

12. Schede she

Higher Level Questioning: Based on what you know, what choice would you make? What data was used to evaluate this choice? Can you predict the outcome if you choose this information?

13. Bib Pack

14. Last Day Awards

Teks Charts www.takstorm com.

Appendix F: Sample Lesson Plans (continued):

Sample of Gonzales' lesson plan calendar with teachers' sign up time.

October

Su	Monday	Tuesday	Wednesday	Thursday	Friday	Sat
						1
2	**3B** 2 – 3 – 9 – Lopez 7 – 8 -	**4A** 0 – Gutierr 1 – Gutierr 4 – Gutierr 5 – Gutierr 6 - Herrera	**5B** 2 – Herrera 3 – 9 – 7 – 8 -	**6A** 0 – Pierce 1 – 4 – Herrera 5 – 6- Martinez	**7B** 2 –Herrera 3 – 9 – Lopez 7 – 8 -	**8**
9	**10** HOLIDAY **Columbus Day**	**11A** 0 – Pierce 1 – 4 – Herrera 5 – 6- Martinez	**12B** 2 – Herrera 3 – 9 – Pierce 7 – Pierce 8 - Pierce	**13A** 0 – 1 – 4 – Herrera 5 – 6- Herrera	**14B** 2 – Herrera 3 – 9 – Lopez 7 – 8 -	**15**
16	**17A**	**18B** 2 – Pierce 3 – 9 – 7 – 8 -	**19A**	**20B** 2 – 3 – 9 – Lopez 7 – 8 -	**21A**	**22**
23	**24B**	**25A** 0 – 1 – Cantu 4 – 5 – 6- Cantu	**26B** 2 – Pierce 3 – Herrera 9 – Lopez 7 – 8 -	**27A** 0 – Cantu 1 – Cantu 4 – 5 – Cantu 6 - Cantu	**28B**	**29**

30	**31A** 0 – Lopez 1 – De Luna 4 – Lopez 5 – 6-					

Appendix F: Sample Lesson Plans (continued):

Sample of Jaramillo's lesson plan of Travel Texas.

Travel Texas

What will we need to do?

CREATE YOUR OWN TRAVEL COMPANY

1. Meet with your group. Create a name for your travel company.
2. Design a company logo (symbol, sign or poster). You may want to get the most artistic person in your group to design the logo.

THE PROBLEM

Help!!!!! My family and I have decided to take a five-day tour of Texas. My only problem is that I have no time to plan our vacation. I have decided to hire a travel company (your company) to plan my vacation. The company with the most entertaining and adventurous vacation will get my business.

RULES

The tour must be a five-day tour. I want to visit a different city or town each day. These are the five activities that my family would like to do during our vacation.

- Outdoor Activities-camping, hunting, fishing, or mountain climbing
- Visit and Amusement Park
- Visit a historical site
- Spend a day on the coast
- Visit a museum

None of the cities can be San Antonio. All of the cities must be in Texas.

RESEARCH:

First you want to get to know as much of Texas as you can. For information you can use any of the following resources about Texas.

1. Magazines such as Texas Highways or Texas Monthly
2. Your Parents!!! Believe it or not, your parents can really help you with this project. Ask them where they would like to go on vacation in Texas.
3. Internet Resources-Visit http://www.esc2.net/TIELevel2/projectds/texas/
   Scroll down to the Resources section. You will see a list of travel websites that you can visit to give you ideas.
4. Your Social Studies Books-This will be especially helpful to you in locating historical sites.
5. Library Books

COLLECT DATA

For each city and site you will have to collect the following information:

1. The name, address, and telephone number of a hotel for each city where my family will be staying.
2. The cost per night for one room.
3. The admission price for any museums and/or parks we will be visiting.
4. A picture-This picture can be downloaded off the Internet or can be scanned from a magazine.
5. One sentence that will persuade me to want to visit that place.

POWERPOINT PRESENTATION

You will create a six-slide PowerPoint presentation.
Slide 1 will have the name of your company, your logo.
Slide 2 will have the names of all the group members.
Slides 3 through 7 will give information for each city. Here is an example.

Amusement
Fiesta Texas
San Antonio, Texas

Picture

- Name of Hotel
- Address, Phone
- Cost per night
- Admission Price
- Price of Parking

Your family will have a blast at this adventurous theme park.

ORAL PRESENTATION

After you have collected your data and created a Power Point Presentation, your company will have to present your Texas tour package to me. You will be competing with the other four companies for my business. I will choose the most exciting and adventurous vacation plan, so try to choose interesting sites. The winning company will win a mini-pizza party.

You will use your Power Point show and the LCD projector to present your vacation plan for your company. You will want to dress neatly for this day. Remember Dress to Impress!

Good Luck!

Appendix F: Sample Lesson Plans (continued):

Sample of Sanders' lesson plan of American Tall Tales

American Tall Tales

Lesson Plan: TLW explore various American Tall Tales to become familiar with the genre and identify characteristics of the Tall Tale (e.g. bigger than life characters, exaggeration, humor, and explanations of everyday discoveries.)

TEKS: LA 3:11

(11) Reading/text structures/literary concepts. The student analyzes the characteristics of various types of texts. The student is expected to:

(A) distinguish different forms of texts, including lists, newsletters, and signs and the functions they serve (K-3);

(B) distinguish fiction from nonfiction, including fact and fantasy (K-3);

(C) recognize the distinguishing features of familiar genres, including stories, poems, and informational texts (1-3);

(D) compare communication in different forms such as contrasting a dramatic performance with a print version of the same story or comparing story variants (2-8);

(E) understand and identify literary terms such as title, author, illustrator, playwright, theater, stage, act, dialogue, and scene across a variety of literary forms (texts) (3-5);

(F) understand literary forms by recognizing and distinguishing among such types of text as stories, poems, myths, fables, tall tales, limericks, plays, biographies, and autobiographies (3-7);

(G) compare communications in different forms, including contrasting a dramatic performance with a print version of the same story (3);

(H) analyze characters, including their traits, feelings, relationships, and changes (1-3);

Students will become familiar with Tall Tales by reading books and exploring the following sites:

http://library.thinkquest.org/TQ0312323/index.htm
(American Tall Tale summaries & quizzes)

http://calgarypubliclibrary.com/tales/intro.html
(Canadian Johnny Chinook talking Tall Tale)

http://www.animatedtalltales.com/en/paulb/thanks.php
(Paul Bunyan animated Tall Tale)

http://www.hasd.org/ges/talltale/talltale.htm#Johnnyappleseed
(Summaries of American Tall Tales and elements of Tall Tales)

Once students have become familiar with Tall Tale genre through exploration of classic American Tall Tales they will write and illustrate a Tall Tale and publish it on a Microsoft® Power Point slide. Students will use an exaggerated version of themselves for the main character. Tall Tales will be titled using the character name (e.g. Dally Dancing Dana.) Tall Tales will be set in the 1800's in America. Student Tall Tale will explain how the character invented or created an everyday place, practice, or item. (e.g. Dally Dancing Dana danced so slow that she invented the waltz.) Tall Tales will also include hyperbole. Student created illustrations of Tall Tales will be scanned into Power Point slide. Audio clips, narrated by student may also be added.

Appendix G: Sample of Documents

Allen—Conditioning and Training. Teams completed forms by entering the number of points they received for each section.

Stage 4: Conditioning and Training

Adventure Unit: Stage 4
Section: Conditioning and Training
Lesson Title: Game Tracker

Name: __________________________
Date:____________________________
Directions:
Now that you have a training plan, you need to total your points for your kennel. To do this you must complete the chart below based on Trail Points given on the Trail Description sheets.

Complete this table by copying the information from the Training Log table on the previous page.

Day	Trail #	Speed	Endurance	Leader	Obstacle
TOTAL of each column					

To calculate their Kennel Strength, complete the table by filling in the blank spaces with the corresponding names (i.e. Leader from Training Log=185 should be placed in the Speed column and Musher column for the Leader row)

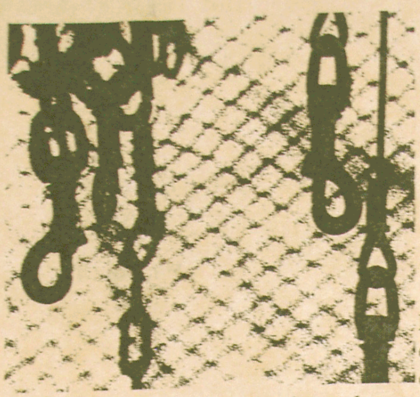
	Speed	Endurance	Feet	Fur	Eating	Musher
Speed		N/A	N/A	N/A	N/A	N/A
Endurance	N/A		N/A	N/A	N/A	N/A
Leader		N/A	N/A	N/A	N/A	
Obstacle	N/A	N/A	N/A			
Sum of Each Column for Total Kennel Strength						

Stage 4: TRAINING AND CONDITIONG TOTAL KENNEL STRENGTH
Now factor in the Average GF (Grading Factor) from the Assessment (Scoring Guide) for Stage 4: Kennel Management Stage.

	Speed	Endurance	Feet	Fur	Eating	Musher
Sum of Columns (From Above) Multiplied by Ave. GF: ____						

Appendix G: Sample of Documents

Allen—Stage 3: Student worksheet about Equipment



Stage 3: Equipment

Adventure Unit: Stage 3
Section: Equipment
Lesson Title: Sled Journal Entry

Name:______________________

Date:______________________

Journal Entry

Modern day sled dog equipment is very similar to historic equipment. However, advances in materials have lightened equipment and allowed for design innovations impossible fifty years ago. Research the following webpages to learn more about the equipment today's mushers rely upon to travel safely across Alaska's frozen landscape. Then answer the below journal questions.

Type of Equipment Carried in Dog Sleds: http://www.ultimateiditarod.com/sledcargoFD.htm
The Anatomy of a Dog Team: http://www.ultimateiditarod.com/DogteamF.htm – Best
The Anatomy of a Dog Sled: http://www.ultimateiditarod.com/DogteamF.htm
General Equipment Information: http://www.ooowoo.com/FAQs/sled_dogs.html#S4

1. Of the four web pages, which was the most informative? Why? Site specific examples from the pages to Support your opinions.

2. What pieces of equipment that mushers carry do you feel to be the most important? Fully explain your Reasonings.

Appendix G: Sample of Documents (continued):

Allen—Mileage
Students complete the following form to calculate their points as they participate in the virtual Iditarod.

Checkpoint: Kmik to Yetna	Mileage: 52 mi					
	Speed	Endurance	Feet	Fur	Eating	Musher
Historical Needs	45-70	45-50	20-30	5-10	20-35	55-65
	Speed	Endurance	Feet	Fur	Eating	Musher
Racer Food Drop						

Checkpoint: Yetna to Skwentna	Mileage: 34 mi					
	Speed	Endurance	Feet	Fur	Eating	Musher
Historical Needs	45-70	45-50	20-30	5-10	20-35	55-65
	Speed	Endurance	Feet	Fur	Eating	Musher
Racer Food Drop						

Checkpoint: Skwetna to Finger Lake	Mileage: 45 mi					
	Speed	Endurance	Feet	Fur	Eating	Musher
Historical Needs	45-70	45-50	20-30	5-10	20-35	55-65
	Speed	Endurance	Feet	Fur	Eating	Musher
Racer Food Drop						

Appendix H: Samples of Authenticity

Subject: lesson plan & visit
From: Diane Sanders (pseudonym)
Date: Sat, January 7, 2006 6:04 pm
To: traceyd@idworld.net

Hi Vicki,

Here is a lesson plan of something that my kids will be working on this coming week. We will begin research on Mon. and probably be starting our Tall Tales by Wed. I would be glad for you to come on Wed. or Thurs. Jan. 11th or 12th of this week. We will be working on this in the morning from 8:15-11:00. We go to recess from 9:30-9:45. I talked to my principal K_ B_. She would love to meet you if you can come. She said that we are not currently leaving names at the front gate. You will just need your driver's license and proof of insurance. You might need to have the gate guards call the school at 555-2345. B_ G_ is our secretary and she will let the guards know that we are expexting you if necessary. Please let me know aproximately when you will come so I can be sure that whoever is in the office knows that you are coming. I hope this will be helpful and I'm looking forward to seeing you.

Diane

Attachments:
American Tall Tales-Lesson Plans.doc (see lesson plan in Appendix G)
(Diane's school is on a military base.)

From "Trisha Marley" <tmarley@xxxxxx.net>
Subject RE: study
Date Fri, January 20, 2006 5:37 am
To traceyd@idworld.net

Hi Vicki -

Next week we have two days of SDAA field testing. (We have field testing today for writing,) I am also using two reading programs that are taking up much of my class time. Read Naturally uses tape recorders, but I must confess the computer is on the back burner at this moment.

How quickly do you need to do this? I will be starting a

unit that uses technology late February. I will access some of the online practice activities before then using a light pro. Next week would be difficult.
I also have 4 or 5 ARDS (briefs) related to TAKS testing decisions for my 7th grade students in inclusion.
Sound like I'm stalling - just a bit. Here's what it looks like the next few weeks and a suggestion:

Week of January 23 - SDAAII Field Testing
Week of January 30 - Mucho ARDS continue, prepare for my conference presentation
Week of February 6 - 3 days of staff development, conference presentation
TAKS writing hits February 21

We could schedule the week of February 13 - better the week of February 27. Will this work or is it too late? If so, we can move it up.

Let me know. T.

From Evelyn Allen
Subject Re: lesson plan
Date Tue, January 24, 2006 9:08 am

To traceyd@idworld.net

Hi Tracey,
Sorry for the delay, but I've really been on the run lately. Also have had some battles with cedar fever. I created that lesson plan for Region 20 to verify that the unit met the qualifications for a cross curriculum technological unit that met our state's Teks for the fifth grade. The hand written notes were added information that I wanted to share at the presentation. The reasons that I undertook this project were that my class had a high rate of gifted children and they were suffering from fifth grade itis plus a little spring fever. They were incredibly proficient in computer skills and looked so forward to lessons in our lab. My background in fifth grade had introduced me to the novels and video in the lesson plan and I was totally able to relate to the nature described and the art of mushing. I knew my class was of the same feeling as some of them had read the novels and expressed interest. When I saw the program come up from Region 20 my principal gave me permission for pursuing every bit of it. It totally involved those active minds and the pairing of students made it one

that everyone could enjoy doing.
I knew the class would have a lifetime memory of chatting with the Alaskans plus conversing in the distance lab setting.
As it unfolded, it met all the qualifications that I desired and parents and students still talk about it with great pleasure.
I hope this is what you wanted. If you need something else, I promise to get back to you. Best wishes. Evelyn

---

From Trisha Marley
Subject RE: study
Date Thu, January 26, 2006 7:25 am
To traceyd@idworld.net

Hi Vicki-

Just wanted to let you know that my computer locked up and I couldn't get into my E-mail again until last night. My daughter loaded Nova net totake an online class and it really put a whammy on the memory of my poor old PC. I've now gotten it going again and have forwarded the interview document to my other address. I also ran off a copy. I'll get it back to you on Friday-Saturday. I may be sending it from: Trisha@xxxxxx.org- my school web address.

Also - my cell phone is - and home phone is -.
Would you mind sending me your cell phone # again as well. Just a precaution. I will also try to send you some of the other documents/lessons you want this weekend as well.
T.

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VITA

Tracey Victoria de la Garza was born in San Antonio, Texas, the daughter of Alfredo de la Garza of San Antonio and Julia de la Garza of New York City. Victoria graduated from Edgewood High School in San Antonio, and received the degrees of Bachelor of Arts and Master of Education at Our Lady of the Lake University in San Antonio.

As a migrant farm worker, Victoria learned early about the value of an education. Her family, which included four siblings, migrated to Michigan during the summer months and harvested cucumbers, strawberries, and cherries.

After graduating from college, she returned to Edgewood ISD where she was employed as a second grade bilingual elementary teacher. She has since taught primary and intermediate grades and all subject areas. Some of her students were also children of migrant farm workers. Along with her teaching duties, she served as an instructional facilitator at H. K. Williams Elementary where she began learning computer skills. She continued teaching at Burleson Elementary, where she also served as instructional facilitator. Several years later, Victoria became the technology teacher at Loma Park Elementary. In addition to her teaching duties, Victoria provides professional development in instructional technology and explores the use of video production with students as a vehicle for learning communication skills and group decision making.

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This dissertation was typed by the author.