Mentoring toward technology use: Cooperating teacher practice in preparing student teachers

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MENTORING TOWARD TECHNOLOGY USE:
COOPERATING TEACHER PRACTICE IN
PREPARING STUDENT TEACHERS

by

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ABSTRACT

Mentoring Toward Technology Use: Cooperating Teacher Practice In Preparing Student Teachers

by

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This study investigated the practices of cooperating teachers as they prepared student teachers to integrate technology into teaching and learning activities. Descriptive statistics and qualitative methods were used in this study.

Participants included 16 cooperating teachers from grades K-12 and seven of their student teachers. The cooperating teachers attended a series of monthly full-day workshops during the semester long project. The school district and the university jointly sponsored the workshops. Seven of the cooperating teachers and their student teachers were selected for case studies.

Data sources included electronic transcripts from discussion forums, transcripts of workshop discussions among the cooperating teachers, artifacts created during workshops, field notes, data from a final questionnaire, transcripts of semi-structured
interviews with cooperating teachers and student teachers, and data from cooperating teachers and student teachers on a self-evaluation rubric assessing technology skills.

Mentoring literature was used to frame the data. Findings describe the practices of cooperating teachers in mentoring student teachers toward technology use in six areas: system information practices, resources and materials practices, instructional practices, productivity practices, modeling practices, and support and challenge practices. Although findings are limited to one setting, a complex variety of contextual factors influencing the integration of technology into student teaching experiences are described. Recommendations for other school district/university partnerships attempting to integrate technology in field experiences are included.
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DEDICATION

With gratitude
to all the mentors in my life
who willingly gave of their time
and shared their talents
to help me find my voice.

I am deeply indebted to:

My parents, Vic and Jane Lechtenberg who shared their vision of education and undertook seriously their role in supporting me in its lifelong process;

My sisters, Suzanne, Jean, and Torie for their steady email missives to pursue my dreams regardless of the obstacles;

My children, Jennifer, Benjamin, and Jonathan, for reminding me to "use the force" to overcome hurdles;

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The teachers and student teachers in this study who generously shared their time and expertise;

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My husband, Russ, whose unwavering support and irrepressible sense of humor helped me learn the value and strength in friendship and love.
CHAPTER 1

INTRODUCTION

Purpose of the Study

This study describes the mentoring practices of a group of cooperating teachers working in a large K-12 school district in the southwest United States as they prepared student teachers to integrate technology into teaching and learning activities. In particular, it investigated how cooperating teachers described and defined their practices in supporting student teachers' use of technology. The study also investigated how cooperating teachers refined their practice as a result of professional development activities.

Background

Student teaching is cited as a critical component in the professional preparation of preservice teachers as a means of establishing practices they will use in future settings (Evertson, 1990; Feiman-Nemser, 1983; Guyton & McIntyre, 1990; Lanier & Little, 1986; Strudler, McKinney, Jones, & Quinn, 1999). The factory school model created in the early part of this century that prepared students for the relatively low-level jobs of the past has been deemed inadequate to prepare students for the knowledge work and the increased use of technology that characterize the job needs of the 21st century (Darling-
Hammond, 2000). Student teachers need to be guided by knowledgeable teachers to meet this challenge of preparing students for their place in tomorrow's world (Moursund & Bielefeldt, 1999).

Cooperating teachers play a central role in meeting this challenge. Researchers in the field of teacher education, and particularly those investigating the area of student teaching, indicated that we have few explicit accounts of what cooperating teachers do and how they do it in their work with student teachers (Cochran-Smith, 1991a). A recent review of the mentoring literature has argued that mentoring can provide a means to begin fostering in novices new reform-minded ways of teaching that are consistent with the current standards movement in teaching (Odell & Huling, 2000; Wang & Odell, 2001). This approach can help support and introduce student teachers to standards-based and innovative teaching practices, such as those brought about by the introduction of technology, rather than merely mentor them to replicate past practices (Cochran-Smith, 1991b).

Recent research from the field of technology education indicates that colleges of education need to improve the integration of technology throughout their teacher preparation programs in order to adequately prepare teachers for entering the profession using new and developing technologies (CEO Forum, 1999; Cooper & Bull, 1997; Hasselbring et al., 2000; Moursund & Bielefeldt, 1999). Findings suggest that when technology topics are woven throughout university courses and field experiences, student teachers are more apt to integrate technology in their instruction (Thomas, Larson, Clift & Levin, 1996). Adding complexity to the issue of integrating technology in the field
experience component of teacher preparation is the problem of locating technology -
using teachers for these placements (Strudler & Wetzel. 1999).

**General Mentoring Practices**

Mentoring practices have been addressed in research from several different
perspectives. Odell (1986) analyzed mentor practice as forms of actual assistance
provided to first year and “new to system” teachers. The data revealed categories of
support that were actually offered in mentors’ practices with novice and “new to system”
teachers. Ganser (1996) used a series of two interviews with K-12 mentors who were
working with beginning teachers to identify practice as the roles, benefits, and obstacles
in effective mentoring. The respondents identified 285 mentor roles, which were later
collapsed into 20 items. These items included practices such as: providing beginning
teachers with support and encouragement, information on policies and procedures, and
helping with teaching skills.

In a comparative study of mentoring practice exploring the relationship between
mentoring context and reform-minded mentoring practice, Wang (2001) studied practice
by identifying patterns and topics of mentor-novice interactions. He used semi-structured
interviews, logs of mentor-novice interactions, and supporting documents from the
mentoring programs and the school systems. His analysis included percentages of
interactions on topics such as pedagogy, curriculum, novices’ needs, and general ideas.
One of Wang’s implications was that information was needed to identify how mentors
conceptualized mentoring and their experiences in conducting relevant mentoring
practices.

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Feiman-Nemser (2001) examined mentoring practice in a case study approach that included interviews and observation of one "exemplary" mentor. Feiman-Nemser moved a step beyond merely identifying emotional support and technical advice in mentoring practice. She sought to identify mentoring practice that fostered an inquiring stance and cultivated skills and habits in novices that enabled them to learn in and from their practice. She termed this approach "educative mentoring."

There is also growing support in research to hear more from cooperating teachers concerning their work as field mentors to understand better the student teaching experience and make informed decisions regarding teacher education programs (Kahn, 2001; Koerner, 1992; Tannehill, 1989; Tjeerdsmma, 1998; Veal & Rikard, 1998). Studies have begun to provide opportunities for cooperating teachers to articulate their experiences with student teachers and to identify the general elements of successful experiences for student teaching (Kahn, 2001). Kahn used an initial survey/questionnaire of secondary cooperating teachers, followed by selected cases for an interview to identify elements of successful experiences. Several elements determined to be successful included a mutual learning relationship, and evidence of growth provided by the student teacher. However, little research is available specifically addressing the cooperating teachers' experiences in facilitating technology use by their student teachers.

*Teacher Practices with Technology*

Recently, revised national educational technology standards for teachers were introduced to "provide guidelines for all teachers but specifically for planning teacher education programs that will prepare teachers to play an essential role in producing technology-capable students" (International Society for Technology in Education, 2000,
p.1). These standards provide descriptive performance profile indicators of practices for novice teachers at four levels: general preparation, professional education, student teaching/internship, and first year teaching. The standards were designed as a set of fluid benchmarks to be used in planning and assessing programs at sequential levels in teacher preparation. They also provide general descriptions of what student teacher practices should entail, and indicate foci for cooperating teacher practices in mentoring student teachers. They push the target for effective teaching with technology toward more constructivist approaches that focus on cognitively challenging tasks and active engagement during the learning process (Becker, Ravitz, & Wong, 1999). According to Brooks and Brooks (1993) constructivist approaches are not theories of teaching rather they are theories knowledge and learning. The central idea holds that the learner constructs knowledge and that learning is a process of building functional understandings of concepts rather than memorizing fixed facts. Learning is deeply intertwined with the context in which it occurs and social interaction mediates the learning process (Brooks & Brooks, 1993; Duffy & Cunningham, 1996).

In a national sample of teachers across the nation, research showed that constructivist-oriented teachers tended to use computers frequently with students and apparently use them in more powerful ways (Ravitz, Becker, & Wong, 2000). Teachers with more constructivist philosophies tended to use practices encouraging simultaneous small group projects and student use of presentation software, e-mail, and multimedia authoring software more than drill and practice software.

In a qualitative case study of exemplary technology-using teachers, Ertmer, Gopalakrishnan, and Ross (2001) found that exemplary technology practices of the
teachers in their study, while student centered and student directed, did not readily align with the identifications of best practice found in previous literature. The practices described by the teachers in their study were characterized as hybrid approaches that tempered the vision of exemplary practice with the realities of current classrooms. Researchers suggested, "Exemplary technology practice looks and acts differently depending on a host of variables" (Ertmer, Gopalakrishnan, & Ross, 2001, Discussion section, ¶ 1). Some of these variables included grade level, and the very real constraints of technology access in their classroom and school context. They concluded, "It might also be useful to illustrate teachers at different points in their journeys of technology integration in order to highlight effective strategies for moving forward" (Ertmer et al., 2001, Conclusion section, ¶ 3).

The present study adds another facet to this information on teacher practices by offering a forum for cooperating teachers to describe their practices in mentoring student teachers to teach with technology. The practical wisdom of teachers derived from their actual classroom practices with students continues to be an untapped source for providing insights into the improvement of teaching practice (Feiman-Nemser & Floden, 1986) and the mentoring of student teachers. Ertmer et al.'s (2001) study provided information from a population of exemplary technology-using teachers. They noted discrepancies between their teachers' practices and the descriptions of best practices found in the literature. This study provides information on practices from a population of cooperating teachers and begins building the literature base on cooperating teacher practices in mentoring student teachers toward technology use.
Cooperating Teacher Practices with Technology

Other studies have begun to address the issues of exploring professional development options for cooperating teachers in order to create technology-rich placements for preservice students (Dawson & Nonis, 2000; Wetzel, Zambo, Buss, & Padgett, 2001). Dawson and Nonis (2000) noted, "Ideally, preservice teachers should have opportunities to observe exemplary teachers who are implementing innovative projects within technology-rich environments. Currently, however, the lack of extensive and available role models is a realistic concern" (p.11). Their data indicated that both student teachers and cooperating teachers still benefited from their placements through reciprocal mentoring. They recommended not waiting for ideal conditions to materialize before starting such programs.

While these studies have begun to address the issue of professional development with technology for cooperating teachers, little research is available on how those teachers integrate knowledge gained from that professional development in their practices with student teachers. The current study addressed the issue of providing professional development with technology to cooperating teachers. It explored how knowledge gained from that development was integrated in their practices. It situated the identity and description of those practices in the immediate context of mentoring student teachers to teach with technology.

Teacher Cooperative Inquiry

Concurrently, research with practicing teachers has also revealed a need to find ways of engaging all practicing teachers in updating their knowledge base in specific areas of teaching as well as offering opportunities for those teachers to contribute to constructing
that knowledge base by recording and sharing their knowledge of teaching (Palincsar, 1999). Cochran-Smith and Lytle (1999) suggested that teachers’ work in inquiry communities represented a promising avenue for fundamental educational change in the next decade.

Perry, Walton, and Calder (1999) described a participatory approach to teacher development based on teachers’ cooperative inquiry into reading assessments. The group of teachers met in monthly workshops and researchers found evidence that teachers’ changed their assessment practices to reflect the learning that occurred over the course of the project. They noted that teachers valued the opportunity to learn from one another, and appreciated the time to collaboratively reflect on their assessment practices.

The current study extended this research on teacher inquiry by incorporating a cooperative inquiry approach (Reason, 1998) to enable cooperating teachers to develop their technology skills as well as record and share their practices in preparing student teachers to teach with technology. According to Reason (1998), in cooperative inquiry all participants are equal members whose thinking contributes to the generation of ideas.

Setting

The setting for this study was a school district/university partnership in the southwestern United States. The participants included 16 volunteers from a pool of 21 cooperating teachers from the school district participating in a mentoring program. Additionally, seven of their student teachers were identified to participate in the study. Altogether, 23 participants were identified for this study. The teachers were clustered at five public school sites: two elementary schools, two middle schools, and one high
school. The schools were located in the same geographic area of a school district. Students at the two elementary schools were in the same attendance zone for the two middle schools. Only one of the middle schools was in the attendance zone for the high school. All of the schools had greater than 50% minority student populations, and above average populations of second language learners.

The cooperating teachers were enrolled in a series of monthly mentoring workshops during the semester they worked with student teachers. In the past, cooperating teachers in the school district had attended four half-day sessions designed to address their roles as mentors of student teachers. For this partnership project, an additional half-day was added to each of the four workshop sessions. The focus of the additional half-day was to support cooperating teachers in developing their skills with computers while learning how to integrate technology in constructivist contexts. The additional time for the cooperating teachers was funded by a federal grant to prepare tomorrow’s teachers to use technology. The grant was titled Project THREAD (Strudler, Heflich, & Anderson, 2000).

The workshops were delivered via a K-12 school district/university partnership. Professionals from the K-12 school district provided instruction on the teachers’ roles and responsibilities as mentors. The university professional provided the instruction on integrating technology in constructivist contexts. The university professional was also the researcher for this study. The workshops consisted of four monthly full-day face-to-face workshop sessions. The workshops were piloted in the previous year, and the sessions in this study were a continuation of that program. The instructors were the same for both the
pilot series and the current series. Three of the cooperating teachers were participants in both sessions.

One addition to the workshop series for this study was the integration of online communication between sessions. The online communication component was included as a means for cooperating teachers to collaboratively share and identify their practices in supporting student teacher use of technology in standards based learning activities. Data for the study were generated by the cooperating teachers during their work with student teachers. Their daily practice with the student teachers was the natural setting for the study.

Theoretical Framework

The theoretical framework for the study had multiple dimensions. The guiding theoretical lens that provided a frame for the study was grounded in a sociocultural perspective of learning (Brown, Collins, & Duguid, 1989; Feiman-Nemser & Remillard, 1996). Within this overall frame were three layered theoretical dimensions funneling toward a focused look at teachers' practice. The first layer addressed mentoring dimensions, the next layer addressed technology contextual dimensions, and the top layer addressed a technology effectiveness dimension to identify a cross section of cases for further study. Each dimension is described below.

Sociocultural Base

The overarching theoretical framework for this study was grounded in a sociocultural perspective of learning (Feiman-Nemser & Remillard, 1996). In this perspective, knowledge is situated in and developed in the context of its use (Brown, Collins, &
Duguid, 1989). Knowledge about teaching is situated in the activity of teaching and it grows out of practice in authentic situations (Perry et al., 1999). According to Feiman-Nemser and Remillard (1996), "What teachers need to learn not only includes knowledge, skills, and dispositions, but also ways of knowing, thinking, caring, and acting" (p. 78). Thus the practices of teaching are equally as important as the knowledge of teaching.

Sociocultural perspectives hold that teachers' knowledge draws from their world of practice (Elbaz, 1983), and that the expertise of experienced teachers is richer than that of student teachers because it is developed over time through their contextualized classroom practice (Carter, 1990). In a mentor-novice relationship, the sociocultural perspective emphasizes that interactions with more capable or experienced others are critical in order for the novice to acquire knowledge beyond the independent level of exploration (Vygotsky, 1978). Thus, cooperating teachers are in a position to support and mentor student teachers in acquiring skills and practices, such as technology integration methods, that student teachers are unable to develop by themselves (Feiman-Nemser & Remillard, 1996).

**Mentoring Dimension**

The proposed study drew on the methodology of Wang (2001) who used interview strategies to explore the relationship between context and mentoring practice, and Odell (1986) who used journal/log strategies to identify mentor practices based on the nature of assistance offered to novices. It also drew on the methodologies of Feiman-Nemser (2001) who used case study and the words and terms introduced by one exemplary mentor to characterize conceptual approaches to mentoring practices. It extended their
work by adding the element of cooperative inquiry (Perry, et al., 1999; Reason, 1998) for these cooperating teachers to jointly negotiate and construct descriptions of practices supporting student teachers' use of technology.

*Technology Contextual Dimension*

The theoretical framework also derives from studies that address the technology practice of teachers (Becker et al., 1999; Ertmer et al., 2001). These studies suggest that constructivist oriented teachers tend to use technology in more powerful ways in their teaching. Becker et al., (1999) classified technology use in the classroom in ten categories ranging from word processing to use of the Internet and computer simulations. However an important factor in use of technology with students was the level of access teachers had to computers (Becker, et al., 1999). Grove, Falba, and Barmettler (2001) used questionnaires to identify classroom and lab access to technology, and to gather historical data on teachers' use and access to classroom computers during their student teaching. Research has indicated that teachers tend to teach they way they were taught (Cuban, 1986), and that student teaching greatly influences the practices that student teachers will use in future settings (Guyton& McIntyre, 1990). Thus an important component of technology use involved identifying if it was used during student teaching. In addition to access, teachers' skill levels with technology also affect their use with students. The Staff Self-Evaluation Rubric (Bellingham Public Schools, 2001) was used to define their levels of technology use.

*Technology Effectiveness Dimension*

Jones, Valdez, Nowakowski, and Rasmussen (1995) posited that the intersection of two continua - learning and technology performance - can be useful in defining
technology practices that support student learning. They termed this approach the “Technology Effectiveness Framework.” Learning in this framework referred to the engagement level of students in the learning process and ranged from passive to actively engaged. Technology performance referred to technology skills levels of the teachers ranging from low to high. Becker et al. (1999) characterized teaching philosophies that influenced technology use along a continuum ranging from transmissive practices, in which teaching is closely related to telling and students are more passive learners, to more constructivist practices in which students are more actively engaged learners.

Becker et al.’s (1999) teaching philosophy criteria were used to define the component of learning engagement on the continuum. The Staff Self-Evaluation Rubric (Bellingham Public Schools. 2001) was used to define the continuum of technology performance. This technology effectiveness component was used to identify a cross section of cooperating teachers for case studies.

The focus of the study was on addressing the knowledge gap of cooperating teacher practices in mentoring student teachers to teach with technology. The layered components in the framework supported exploration of multiple perspectives of those practices. The studies cited will be discussed further in the following chapter.

Significance of the Study

This research study provides insight into the practices of cooperating teachers in supporting student teacher use of technology. Descriptions of the practices will help provide teacher educators with an understanding of how cooperating teachers identify
their practice, define their work as field mentors, and share the wisdom of practice they have to offer on technology integration in the student teaching experience.

Results may prove useful to mentoring programs seeking to help teachers refine their practice while enhancing their skills in the mentoring process. Specific findings could inform the selection of professional development activities on technology integration for mentor teachers. This study also broadens the research base on use of online communication in professional development activities. Research results will benefit educational institutions seeking to understand better the student teaching experience and more fully prepare preservice teachers for teaching in tomorrow's technology-rich classrooms.

Research Questions

This study investigated the following questions:

1. What are the general technology contexts in which the cooperating teachers work, and what are their conceptual perspectives about mentoring?

2. What are the mentoring practices of cooperating teachers in preparing student teachers to teach with technology?

3. In what ways might cooperating teachers refine their own mentoring practice with student teachers to reflect learning from professional development activities for cooperating teachers introducing new technologies and constructivist practice?
CHAPTER 2

REVIEW OF RELATED LITERATURE

This study investigated the practices of cooperating teachers in preparing student teachers to integrate technology in their teaching practices. To provide a foundation for the research, this review of the literature addresses the selected areas of technology in teacher education, mentoring in preservice education, cooperative inquiry communities, and use of online communication. A summary of the review concludes this chapter.

Technology in Teacher Education

As more technology is placed in pre-K-12 classrooms, the need for knowledgeable teachers to use these tools effectively becomes a pressing issue. Research indicates that while the majority of teachers now have a computer in their classroom, in many cases, it is not used for instruction often due to lack of prior experience in using this tool (Becker, Ravitz, & Wong, 1999; Hope, 1998; Trotter, 1999; U.S. Congress, 1995). Recent national reports have highlighted the need to prepare teachers who are knowledgeable about how to use technology to support teaching and learning (Moursund & Bielefeldt, 1999; NCATE, 1997; Thomas, 1998). Given the increased access to technology and the emphasis on using those technologies for curriculum-related applications, schools of education are being challenged to improve the instructional technology preparation of their students.
Research on classroom use of technology has emphatically determined that teachers are the key for effective classroom use of technology (Cooper & Bull, 1997; Sandholtz, Ringstaff & Dwyer, 1997; Sheingold & Hadley, 1990; U. S. Congress, 1995; Wenglinsky, 1998; Willis, 1993). Teacher preparation and ongoing professional development have been identified as essential ingredients for powerful use of digital content in the classroom (Trotter, 1999). Willis (1993) posited that in order for teachers to understand how to use a computer effectively in the classroom, they must be introduced to curriculum-related applications they could use along with their students, rather than merely be shown how a computer operates.

According to Jonassen, Campbell, and Davidson (1994), the emphasis in the instructional context should shift from learning about computer media or software applications to learning with computers. The priority in developing technology skills should be on using technology as a support for the processes of learning and acquiring content area knowledge, rather than simply acquiring skills to operate software applications. The Year 2 STaR Report from the CEO Forum on Education and Technology (1999) underscored the importance of developing knowledgeable and enthusiastic teachers who are able to shift the focus of technology from hardware and software applications to technology as a tool for teaching and learning: “The real strength of technology in education comes from using the right technology at the right time to meet the right objective” (p. 6).

**Historical Background of Technology in Education**

Cooper and Bull (1997) acknowledged a climate of rising expectations for technology use in teacher education, and recognized the difficulty of planning for integration
activities against a constantly moving target of technological change. As technology advanced and introduced greater opportunities for productivity and communication, recommended goals were adjusted and best practices were redefined to accommodate these changes. Willis and Mehlinger (1996) recognized this dilemma and described how the history of technology use in education could be understood by looking at the theoretical perspectives underlying how teachers used the equipment. They framed the theories guiding the use of technology against the evolution of the equipment that was available at the time. They organized the research into three equipment booms.

The first boom occurred during the late 1960s and early 1970s with the introduction of teaching machines accompanied by programmed instruction books (Willis & Mehlinger, 1996). Teachers were guided by the behavioral model of teaching and learning in the use of these machines. The second equipment boom occurred during the mid-1970s with the arrival of personal computers (Willis & Mehlinger, 1996). Computer-assisted instruction was introduced to education with much of the software focused on drill and practice activities or tutorial instructions. Due to equipment limitations, many of the programs were limited to linear presentations of text with simple graphics. Again, the underlying theoretical perspective for teacher use with students was the behavior model of learning.

The third equipment boom occurred during the late 1980s with the arrival of multimedia computers (Willis & Mehlinger, 1996). These machines brought increased capabilities for adding sound, animation, and virtual environments. While some of the multimedia software continued to be based on behavioral theories and essentially supported teacher-centered direct instruction, an increasing number of programs began to
support cognitive theories of learning through the use of hypermedia (Bransford, et al. 2000). Hypermedia programs offered users a nonlinear approach to accessing information and opportunities to control the flow of information according to personal cognitive preferences (Najjar, 1996). The introduction of hypermedia shifted the control of information from the teacher to the learner and provided opportunities for student directed and student centered learning (Willis & Mehlinger, 1996).

At the time of their research, Willis and Mehlinger (1996) had not yet seen what they would surely have classified as the fourth boom of equipment, the introduction of ready access to the Internet, and more specifically the graphical portion of the Internet known as the World Wide Web. However, research from Bransford et al. (2000) provided information on theoretical perspectives that undergirded technology use in the 1990s and picked up where Willis and Mehlinger (1996) left off. The perspectives Bransford et al. identified were not limited to a single theory, but rather combined perspectives from cognitive psychology, social psychology, developmental psychology, anthropology, socio-cultural theory, learning transfer, and neuroscience in a convergent perspective that underlies effective learning environments. They viewed technology as an opportunity for extending the possibilities of “old” but useful technologies such as books, blackboards, and videotapes, as well as offering possibilities for new local and global learning experiences in learner centered environments.

In a 1995 report to Congress, the Office of Technology Assessment (OTA) offered a vision for technology use in schools. It did not advocate technology use for technology’s sake (U. S. Congress, 1995). “Instead, what drives the use of technology is a vision of how educational technologies can solve instructional problems and provide curricular and
administrative opportunities that could not be achieved as efficiently or powerfully otherwise” (p. 192). The report addressed the rising societal demands for schools to help students learn how to effectively use technology in their future roles in an increasingly technological world, and the important link that teachers play in preparing students to use these new tools.

**Current State of Technology in Preservice Education**

A recent report noted that “a thorough search of the literature revealed that while a great deal of information existed on the ways that technology was being adapted for use in other disciplines, only a handful of studies on the use of technological applications in schools of education exists” (Hasselbring et al., 2000, p. 12). The report declared that research was needed to explore the connection between teaching practices and classroom technology use. While noting that professional development on technology use was increasing in areas of teacher-preparation coursework, the opportunities were not deemed sufficient to support the types of changes needed for today’s teachers. More development that focused on technology integration across all areas of teacher preparation was recommended.

In 1998, the International Society of Technology in Education (ISTE) developed a set of technology standards for students to describe what they should know and be able to do with technology (International Society for Technology in Education, 1998). The standards were accompanied by student performance profiles to serve as guidelines for teachers to use in planning technology-based activities for students. Two years later, ISTE introduced standards for teachers to serve as guidelines for developing teacher preparation programs which would integrate technology-rich experiences throughout the
teacher preparation process (International Society for Technology in Education, 2000). These standards also contain descriptive performance-profile indicators of practices for novice teachers at four levels: general preparation, professional education, student teaching/internship, and first-year teaching. The indicators are grouped under six standards: (a) technology operations and concepts; (b) planning and designing learning environments and experiences; (c) teaching, learning, and the curriculum; (d) assessment and evaluation; (e) productivity and professional practice; and (f) social, ethical, legal, and human issues. Specific performance indicators include items such as managing student-learning activities in a technology-enhanced environment and applying technology in assessing student learning of subject matter. A complete listing of the indicators can be found in Appendix A.

While technology standards for students and teachers have been defined, findings from Moursund and Bielefeldt (1999) on the field-experience component of teacher preparation revealed that while most K-12 classrooms where student teachers were placed had technology available, most student teachers did not routinely use technology during the experience or work with master teachers or supervisors who could guide their use of these tools. The survey indicated that less than half of preservice students had opportunities to apply instructional technology applications in K-12 classrooms and that cooperating teachers were often unable to advise students on these issues. Additional research has found that “when technology topics are infused throughout meaningful, contextualized experiences in university and school settings, student teachers are more apt to embrace, model, use, and incorporate technology into their instructional planning and classroom organization” (Thomas, Larson, Clift, & Levin, 1996, p.6).
School districts and colleges of education have begun addressing the need to provide more technology professional development to practicing and preservice teachers (Hasselbring et al., 2000). Research in the area of technology use by practicing teachers indicates that while the majority of teachers now have a computer in their classroom, in many cases, it is unused for instruction because the teachers are not prepared to use it (Becker, Ravitz, & Wong, 1999). Integrating technology in classroom practices can be a challenging task for many teachers, for not only do they need to learn how to use the technologies, but they might also need to change their teaching practices to integrate these technologies (Schmidt, Sasser, Linduska, Murphy & Grether, 1999). Thus, one problem identified in preparing student teachers to teach with technology is locating enough effective technology-using cooperating teachers for field experience placements (Dawson & Nonis, 2000; Strudler & Wetzel, 1999).

An approach suggested for addressing this problem advocated the creation of K-12 university collaborations to develop technology skills of cooperating teachers (Cooper & Bull, 1997; Hasselbring et al., 2000; Strudler et al., 2000; U.S. Congress, 1995). One such plan designed professional-development opportunities for five K-8 teachers to help create technology-rich classroom placements for preservice students (Wetzel et al., 2001). The teachers were selected by an application process, and received over 100 hours of university training, which included a two-day workshop followed by four half days of development and three follow-up days at the end of the semester. Initial results indicated that the teachers were enthusiastic about what they were learning and were using it in their classrooms. Researchers noted that technology had become an integral part of the teachers' classroom activities, rather than an add-on activity that was done only in visits.

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to a computer lab. No results were yet available of the impact of this project on preservice teachers, but researchers planned to follow the development of these technology-rich placements.

Another view of the school/university approach in designing field-based technology experiences for preservice students was a partnership titled the Technology Infusion Project (TIP) (Dawson & Nonis, 2000). The initiative involved fifth-year teacher education students who had already completed their student teaching experience. The students were paired with an inservice teacher who was interested in educational technology and willing to make a commitment to the collaborative project. The goals of the project were to develop positive relationships between the university and the local public schools, provide inservice teachers with opportunities to explore instructional applications of technology, and provide preservice teachers with experience in the use of classroom applications of technology. The focus of the study was on developing the technology skills of the preservice student. Findings revealed growth in areas such as developing knowledge and skills related to instructional use of technology and management issues connected to the use of technology. There was no specific mention of classroom practices of the inservice teachers.

The Dawson and Nonis (2000) study also noted the difficulty in finding sufficient numbers of exemplary teachers who were using innovative technology-rich applications. Interestingly, the findings from the study revealed that preservice teachers still benefited from their field placements even though the teachers were not identified as exemplary users. Researchers identified reciprocal benefits in the mentoring as teachers and preservice students shared knowledge about teaching and technology at their varied
levels of expertise. It was also believed that these situations were beneficial in that they reflected the reality of many classroom environments and forced students to cope with the reality of typical classroom issues. The researchers recommend not waiting for ideal conditions to materialize before starting such programs, but to be proactive in planning inservice-preservice partnerships.

Teacher Practices with Technology

In a historical look at technology in the classroom beginning with film and radio in the 1920s, Cuban (1986) noted the slow cycles of acceptance for previous innovations in the classroom. He carefully explicated the historical arguments presented in defining the difficulties involved in changing teacher practice. He concurred with previous research that teachers tend to teach the way they were taught (Lortie, 1977) and that adoption of technological innovations was a slow process often involving decades.

In a later work, he suggested that adoption of computers might not follow the slow time line of previous technologies. He explained, "Computers are by far the most powerful teaching and learning machines to enter the classroom" (Tyack & Cuban, 1995, p. 126). They offer opportunities for students from preschool to graduate school to write, edit, receive tutoring, learn languages, retrieve information, prepare multimedia reports, communicate with others in the next room or a continent away, and practice with state-of-the-art technology used in the workplace. However, in order for students to fully capitalize on these opportunities, they need skillful teachers willing to change their practice and learn right along with them (Sheingold & Hadley, 1990).

In a nation-wide survey of over 600 teachers accomplished at using technology in the classroom, Sheingold & Hadley (1990) found landmark changes in the teachers'
traditional classroom roles. Most notable was that classrooms with higher levels of computer-integrated activities were more student-centered than teacher-centered. It was also found that using the computer permitted greater individualization, along with more opportunities for collaboration and small group work. The role of the teacher shifted from dispenser of knowledge to coach or facilitator, and students became engaged in meaningful learning by doing projects and creating their own products on the computer.

Additional findings cited three factors that contributed to teacher achievement with technology: commitment to student learning and their own development as teachers, the need for on-site support and collegiality, as well as access to technology. The downside is the finding that it took five to six years of teaching with technology for these practices to become well organized.

Becker (1994) conducted a survey study similar to Sheingold and Hadley's (1990) that culled exemplary computer-using teachers from the general population of computer-using teachers to analyze how they differed. Of the 516 respondents, only 5% (45) met a majority of the pre-determined standards for their groups and were determined to be exemplary. Technology practices identified as exemplary included having students use computers as a tool to solve problems or create a product, and having students use computers to accomplish consequential activities such as make charts or graphs or write for an audience.

A computer mentor program explored mentoring as an approach for inservice education to help teachers learn to use computers effectively (MacArthur, Pilato, Kercher, Peterson, Malouf, & Jamison, 1995). In this program, experienced, computer-using teachers were selected at school sites to serve as mentors. They recruited from one
to five teachers at their schools to serve as protégés for the program. The mentors were enrolled in a university course on mentoring, and the protégés received inservice credit for their participation in the project. An evaluation of the project indicated that both mentors and protégés increased their knowledge of computer applications. Mentors noted benefits from improved professional skills as it extended their process of professional development. In addition, the protégés showed more extensive and varied use of computers in both professional tasks and in their use of technology with students. Researchers suggested this mentor model as an alternative approach to inservice technology education.

In a ten year study conducted by the Apple classrooms of Tomorrow (ACOT) researchers found the introduction of technology to be a powerful tool in the classroom that led to changes in teacher instructional practices (Sandholtz, Ringstaff, & Dwyer, 1997). They noted that as teachers experimented with the innovation of technology, new patterns of teaching and learning emerged, and there was a predictable flow to this instructional change. Multiple observations of this phenomenon of progression gave rise to a five-stage instructional evolution model. In Stage 1 Entry, the teacher focus was on the technology as they dealt with initial problems of where to put it and how to manage it in instruction. Stage 2 Adoption teachers required technical support as they tried to merge technology with their existing pedagogical framework. In stage 3 Adaptation, technology was integrated with traditional classroom practice and student productivity increased leading teachers to discussion and exploration of alternative pedagogies. Stage 4 Appropriation brought a shift in attitudes as teachers began understanding the technology and comprehended its usefulness as a tool for accomplishing real work. This stage
signaled a turning point as it marked the end of efforts to simply computerize traditional practices, and led to the final stage of Invention. In Stage 5 Invention, teachers began experimenting with new patterns of instruction and ways of relating to students based on new beliefs. They also increased collaboration with colleagues as they sought new strategies for incorporating complex, higher order thinking activities in the classroom.

Sandholtz, Ringstaff, and Dwyer (1997) found that the magic bullet for change in practice was not the technology; rather, it was the teachers who struggled and experimented with new ways to integrate technology that led to the adoption of new beliefs about instruction and learning. The introduction of technology interacted with teachers’ beliefs and produced changes in practice that led to a learner-centered environment with higher expectations for student learning.

Recent research on teacher practices with technology has supported the ACOT research (Sandholtz et al., 1997) and suggested that teachers who integrate technology in their teaching often go through an evolution of practices toward a more constructivist, student-centered framework (Becker et al., 1999). A recent series of studies drawn from a national data sample of practicing teachers contained survey items describing classroom-teacher practices with students (Becker et al. 1999; Becker & Riel. 2000; Ravitz et al., 2000). Researchers identified two dimensions of constructivist-oriented practices: emphasis on cognitively challenging tasks rather than drill and practice uses, and emphasis on active engagement during the learning process as opposed to passive roles for the students. The active learning dimension sub-divided into three elements of technology use: (a) small group work, (b) integration of student projects for learning, and (c) infrequent use of activities involving direct instruction. Specific teacher practices used
in the survey included examples such as having students learn to: express themselves in writing, work collaboratively, find out about ideas and information, present information to an audience, and communicate electronically with others. Other specific items asked teachers what software titles they used and how their students used the software.

Findings from that survey connecting teacher professional engagement with computer use revealed that teacher leaders who were professionally engaged in the practice of teaching were more likely to teach in ways consistent with constructivist theories and to use computers more often and in more exemplary ways than teachers described as "private practice teachers" (Becker & Riel, 2000). The researchers also suggested that these teacher leaders engaged in more informal collaborations with peers; and with sufficient access to computers and time, they helped nurture other teachers in becoming more accomplished users. While the practices mentioned in this study don't refer specifically to practices in mentoring student teachers to use technology, they shed light on the collaborative and constructivist directions those practices should take.

A study describing teacher uses of laptop computers identified additional practices in using technology (Falba, Grove, Anderson, & Putney, 2001). Findings categorized the practices into individual use of computers and group use of computers. The individual use included professional productivity practices such as creating teaching materials and gathering online resources, and student use of the computers for alternative learning opportunities. The portability of the technology proved to be a key feature in increasing teacher practices with technology and resulted in two types of benefits. It afforded teachers more time to learn how to use technology, as they were able to take the laptops from school and practice their skills at home. It also allowed greater opportunities for
collaborative learning activities as the device was easily moved around the classroom to accommodate new learning situations. The group uses included using a projection device for students and teachers to deliver presentations or model software use.

In a qualitative case study of 17 exemplary technology-using teachers, Ertmer, Gopalakrishnan, and Ross (2001) found that exemplary technology practices of the teachers in their study, while student centered and student directed, did not readily align with the identifications of best practice found in previous literature. The practices described by the teachers in their study were characterized as hybrid approaches that tempered the vision of exemplary practice with the realities of current classrooms. Researchers suggested, "Exemplary technology practice looks and acts differently depending on a host of variables" (Ertmer et al., 2001, Discussion section, ¶ 1). Some of these variables included grade level, the relative use of technology by teachers around them, and the very real constraints of their classroom and school context. They noted, "Although being able to integrate technology is fast becoming an expectation for all teachers, it is not clear how this translates into practice" (Ertmer et al., 2001, Conclusion section, ¶ 1). Their recommendation was that expectations of best practice should be achieved by working within teachers' existing situations.

A framework for examining teacher practices posits that the intersection of two continua – engaged learning and technology performance – can be useful in defining effective technology practices in supporting student learning (Jones, Valdez, Nowakowski, & Rasmussen, 1995). They defined this as a "Technology Effectiveness Framework." The framework's horizontal axis represents a continuum of learning. This axis progresses from passive learning at the low end of the continuum to engaged and
sustained learning at the high end. The vertical axis represents a continuum of technology performance, progressing from low to high. When the two continua are crossed, four patterns emerge in the quadrants of a grid: a) passive learning and low technology performance, b) passive learning and high technology performance, c) engaged learning and low technology performance, and d) engaged learning and high technology performance.

The current study adapted the “Technology Effectiveness Framework” (Jones et al., 1995) to characterize the technology uses of the cooperating teachers in order to situate their identification of practices in a meaningful context. The measures for the continuum of technology performance were constructed using data obtained from the Staff Use of Technology Self Evaluation Rubric (see Appendix B). The measures for the continuum of learning were constructed using data obtained from Becker et al.'s (1999) survey questions on teaching beliefs (see Appendix C).

Mentoring in Preservice Education

Research from the field of mentoring provides theory to inform programs involving preservice and mentor teachers. The concept of mentoring for novice teachers first surfaced in the early 1980s (Odell & Huling, 2000). Prior to that time, the prevailing view was that teachers arrived from the university ready to teach and assume roles similar to those of experienced teachers. However, the reality of the situation was that beginning teachers struggled through those early years much more than veteran teachers (Odell & Huling, 2000). They lacked experience with aspects such as classroom management.
knowledge of the curriculum, and instructional practices. Mentoring was viewed as a strategy to help address that situation.

**Historical Background**

The term "mentor" derives historically from Homer's epic poem *The Odyssey*. In this poem, Odysseus sought the help of his loyal friend Mentor. Mentor's job was to take responsibility for nurturing Odysseus' son Telemachus while Odysseus ventured off to battle in the Trojan War (Odell. 1990). Mentor assumed the task of educating Telemachus in all facets in life. Thus "a mentor, historically and traditionally defined, is an older, more experienced person who is committed to helping a younger, less experienced person become prepared for all aspects of life" (Odell. 1990, p. 6). During the late 1970s and 1980s the concept of mentoring began to surface in business and educational contexts. Business adopted the practice to support the career advancement of young professionals, and empirical studies substantiated the value of mentors in promoting business careers (Odell. 1990). Educators recognized this value and began developing teacher-mentoring programs (Huling-Austin. 1990; Odell. 1990).

In education, the practice of mentoring is recognized as complex (Sprinthall, Reiman, & Thies-Sprinthall. 1996). It supports teachers along a development continuum spanning preservice, induction, and in-service periods (Resta & Huling. 2000). The process of mentoring has also evolved through three approaches: assistance, assessment, and standards-based (Odell & Huling. 2000). In the assistance approach, mentors focused primarily on helping novice teachers by providing guidance, support, and school-orientation information. This approach was developed in response to the alarming retention issue indicating that approximately half of teachers left the profession after
seven years (Schlechty & Vance, 1983). The purpose of this approach was to assist novices in making the transition into their new careers and to help them learn how to succeed as teachers (Odell & Huling, 2000).

The assessment approach focused on assessing new teachers by gathering evidence through observations or portfolios that the novice was skilled enough to enter the teaching profession (Odell & Huling, 2000). The design of this approach was less developmental and essentially served as a gatekeeping function blocking provisional teachers who did not measure up to the assessment criteria from being licensed to teach.

More recently, a standards-based approach has developed in mentoring (Odell & Huling, 2000). This approach grew out of the current standards-based approach to curriculum that defines “what students should know and be able to do” (Odell & Huling, 2000, p.8). The standards for teaching that help define the mentoring process are derived from the Interstate New Teacher Assessment and Support Consortium’s (INTASC) 1991 publication: Model Standards for Beginning Teacher Licensing and Development. This orientation combines the assistance and assessment approaches while supporting a standards-based philosophy for mentoring novice teachers.

Current State of Mentoring

Mentoring programs have developed through an evolutionary process. Early programs focused on providing emotional support to novice teachers to reduce their stress and assist them in the transition to professional practice (Odell & Huling, 2000).

However, in the early 1990s, reformers began calling for new approaches to mentoring. Cochran-Smith (1991a) advocated an approach of reinventing student teaching based on a relationship of collaborative resonance between the university and the school. In this
type of relationship both the student teacher and the cooperating teacher engage in professional development activities guided by university advisors through mutually constructed learning communities. The design of the communities fostered intellectual growth and a commitment to continued learning in diverse school contexts. Both student teachers and cooperating teachers were encouraged to participate in collaborative inquiry on their practice to help student teachers understand and learn to articulate the daily work of teaching, and to explore means for improvement.

In a review of the literature on mentoring practices, Wang and Odell (2001) also called for the integration of new models of reform-minded teaching in teacher mentoring with novice teachers. The term “novice teachers” was expanded to include both preservice and beginning teachers. They supported Cochran-Smith’s (1991a) advocacy of reform in the teaching process but situated this advocacy in the standards-based movement in teaching. These standards have been established by several professional organizations in various subject areas (International Society for Technology in Education, 2000; National Council for the Social Studies, 1994; National Council of Teachers of English and the International Reading Association, 1996; National Council of Teachers of Mathematics, 1991; National Research Council, 1996) to “push teaching toward practice that is based upon different assumptions of knowledge, learning, and teaching” (Wang & Odell, 2001, p.5).

In defining practice associated with a standards-based movement, Wang and Odell (2001) identified several basic principles that were shared across the standards. First, was an emphasis on developing students’ deeper understanding of concepts and their relationship across and within curricular areas rather than memorization of isolated
concepts or facts (i.e., Bransford et al., 2000). Second, was for teachers to challenge students’ misconceptions and connect them to meaningful learning experiences and real life contexts (i.e., Bransford et al., 2000). Third, was an emphasis on active learning (Bruner, 1960) and opportunities for students to engage in discourse to share their learning and negotiate the meaning behind concepts (Leinhardt, 1992). A final principle identified was to encourage excellence for all students regardless of gender, race, or economic background (Kennedy, 1991). These principles were consistent with pedagogies advocated in a constructivist framework for teaching and learning (i.e., Brooks & Brooks, 1993; Duffy & Cunningham, 1996; Holt-Reynolds, 2000). These principles also connected to the constructivist practices identified in the technology use research of Becker and Riel (2000). While Duffy and Cunningham (1996) cautioned that the term constructivism has served as an umbrella for a wide diversity of theories, they identified two elements common in those theories. First, “learning is an active process of constructing rather than acquiring knowledge, and … instruction is a process of supporting that construction rather than communicating knowledge” (Duffy & Cunningham, 1996, p. 171).

In their description of reform-minded teaching, Wang and Odell (2001) stated:

Reformers are calling for novice teachers to learn to teach with a focus on developing students’ conceptual understanding of subject matter and their relationships, building connections between learning and their personal experiences and real life contexts, supporting students’ active discovery of ideas, and careful examination of the ideas in a community of learners, and reaching students from all kinds of backgrounds for excellence (p.15-16).
Wang and Odell (2001) asserted that traditional models of teacher education are ineffective in helping novices adopt the knowledge necessary for reform-minded practices. They noted the intense interplay between the perspectives on teaching and learning that both cooperating teachers and novices bring to the student teaching experience. They also noted “we lack empirical evidence from the practice of teacher mentoring to illustrate what mentors need to know and be able to do in order to support novices’ learning to teach” (Wang & Odell, 2000, p.1). This underscores a need for research to identify the promising practices in mentoring that support and challenge novices to teach in new ways (Little, 1990). Wang and Odell (2001) recommended that cooperating teachers integrate a standards-based approach that challenges novices’ thinking in order to help student teachers learn how to make informed decisions about their instruction and develop reform-minded ways of teaching.

Based on their review of the literature, Wang and Odell (2001) proposed exploration of three models for the mentoring process. The knowledge-transmission model focuses on transmitting discrete knowledge and skills of mentoring practices to teachers based on the assumption that they would be able to apply the information in a mentoring context when working with a novice. The theory-and-practice connection model promotes a process of connecting the body of research-based knowledge on mentoring with the actual practice of mentoring. The third model focuses on developing mentoring knowledge through collaborative inquiry that integrates practice-centered conversation in a community of mentors, novices, staff developers and teacher educators. They asserted that the third model offers benefits for all constituents involved in the process. However, they also noted “this model can only reach a small number of mentors and requires
substantive support for restructuring practice and requires time and reallocation of resources” (Wang & Odell, 2001, p.74). Their implication was that an effective model of mentor preparation would integrate elements of the three models while balancing the needs of quality, quantity, and time efficiency with a clear conception of the goals advocated in a quality mentoring program.

Odell and Huling (2000) proposed a framework for quality mentoring that allows for integration of the identified standards throughout the mentoring process. Their framework includes six dimensions: (a) program purposes; (b) school, district, and university cultures and responsibilities; (c) mentor selection and mentor/novice matching; (d) mentor preparation and development; (e) mentor roles and practices; and (f) program administration, implementation, and evaluation. They suggested that the framework could be used holistically or with a focus on one dimension. The current study focused on the dimension of mentor roles and their practices.

One additional approach to mentoring was described in a view extending Vygotsky’s sociocultural vision of learning to the mentoring process (Wink & Putney, 2002). Vygotsky’s (1978) work on learning in children held that learning takes place in a sociocultural context through the interaction of thought, language, and experience. In the learning process, interactions with more capable or experienced others are critical in order for the novice to acquire knowledge beyond the independent level of exploration. These interactions form a type of apprenticeship in which novices develop their language and learning skills.

Wink and Putney (2002) contend that when Vygotsky’s construct of apprenticeship was extended to the concept of mentoring that “Vygotsky’s concept of mentoring is
reciprocal” (p. 166). In this view, the concept of mentoring is not a one-way process. The traditional roles for mentor and apprentice or novice are not fixed, and can shift back and forth in different situations. According to Wink and Putney, “The notion of the more experienced or capable other can alternate depending on the situations and setting” (p. 161). They referred to this concept as “reciprocal mentoring.”

*Descriptions of Mentoring Practice*

There is a growing body of literature that is beginning to address the practices of mentors. In a functional analysis of the nature of assistance offered to novice teachers by support teachers. The participants included 86 first-year teachers, 79 new to system teachers, and nine classroom teachers serving full-time as support teachers. This study reflected the prevailing conception at the time of mentoring as an assistance approach (Odell & Huling, 2000). Odell (1986) framed the mentoring practices of the support teachers as descriptions of assistance offered to first-year teachers. She organized these descriptions of their support practices into categories of support. She identified seven categories for these descriptions of practices. The categories included: (a) system information, (b) resources and materials, (c) instructional, (d) emotional, (e) classroom management, (f) environment, and (g) demonstration teaching. Findings indicated that for first-year teachers, practices providing system information were the most requested; and, mentoring practices of demonstration teaching were the least requested. In this study the first-year teachers valued obtaining resources and materials over the emotional support offered by mentors.

Ganser (1996) used a series of two interviews with K-12 mentors who were working with beginning teachers to identify their roles, benefits, and obstacles in effective
mentoring. The 24 respondents identified 285 mentor roles, which were later collapsed into 20 items. Ganser had mentors identify and then rate the top six of those roles in their work with beginning teachers. Five of those roles echoed four of the same categories of support found in Odell’s study: system information, instructional, emotional, and classroom management. The sixth top role identified by Ganser was meeting with the beginning teacher regularly.

Case studies have also been used as a means to define mentoring practices. Feiman-Nemser (2001) used this approach to take a closer look at identifying mentor roles. In her research on induction she encountered a support teacher/mentor with many years of classroom experience who was articulate about his work with beginning elementary teachers and practiced “educative” mentoring. Feiman-Nemser characterized “educative” mentoring as an approach to mentoring that transcends the traditional mentor foci of support and advice, and focuses on an understanding of teacher learning while reaching for a vision of good teaching. She used interview transcripts in which the support teacher/mentor labeled specific strategies or offered rationales for specific interventions based on this approach. Her research gave rise to a fresh set of terms for describing conceptual constructs of strategies or roles for mentoring. These eight strategies included: (a) finding openings, (b) pinpointing problems, (c) probing novices’ thinking, (d) noticing signs of growth, (e) focusing on the kids, (f) reinforcing an understanding of theory, (g) giving living examples of one person’s ways of teaching, and (h) modeling wondering about teaching.

Feiman-Nemser’s (2001) focus in this approach to mentoring was on practice-centered, inquiry oriented development supported in a collaborative professional culture.
While noting that studies were beginning to address the work of mentors, Feiman-Nemser (2001) indicated that more studies are needed to understand their professional practice and how it influences novices and their teaching. Gold (1996) suggested that a look at mentor’s professional practice should also include an investigation of the nature of support they offer and what rewards they perceived in the role.

Another case study on mentoring defined categories of themes in conversations between five mentors and their student teachers (Stanulis, 1994). The categories included: views about teaching, sources of knowledge, and the nature of reflection incorporated to help student teachers learn to teach. Themes within the categories included: using multiple sources of knowledge to make teaching decisions, discovering your own voice and beliefs about teaching, and helping a novice internalize knowledge and continue to pose questions about teaching practice. Results of the study indicated that cooperating teachers can and do study their practice while engaged in mentoring. They also refined the conception of their role as mentors during the five-month process. The study highlighted the importance for mentors of making their ordinarily tacit knowledge explicit to student teachers.

Wang (2001) used data from two semi-structured interviews, logs of mentor-novice interactions, and documents from mentoring programs and schools systems to study 23 mentors from three countries. He explored the relationship between mentoring context and mentoring practice and found that instructional contexts help shape the differences in mentoring practices. His analysis included percentages of interactions on topics such as pedagogy, curriculum, novices’ needs, and general ideas. One of his implications was the importance of identifying how mentors conceptualized mentoring, and recording their
experiences in conducting mentoring practice. The proposed study asked cooperating teachers to identify their concepts of mentoring practice and offered opportunities for them to record their experiences and practices in mentoring student teachers to teach with technology.

Literature from the field of teacher research complements the call for more research in mentoring to understand professional practice and its relationship to building the knowledge base needed to inform the preparation of novices. Brophy and Alleman (1991) noted that we are long overdue in turning attention in teacher research to developing shared understanding about what constitutes good practice. The practical wisdom of effective teachers continues to be an untapped source for providing insights into the improvement of teaching practice (Feiman-Nemser & Floden, 1986). More explicitly, Connelly, Clandinin, and He (1997) stated “our research clearly shows that to more closely relate ideas about teaching and learning with the practice of teaching and learning, we need to be concerned with what it is that teachers know” (p.674). Providing opportunities for teachers to share their wisdom of practice and the knowledge base supporting that wisdom could be advantageous for researchers, fellow practitioners, and reap benefits for student teachers.

In addition, studies have indicated that as teachers became more involved in research, it expanded their commitment to developing a variety of teaching methods and renewed their desire to stay current with new information (Henson, 1996). This effect could be beneficial for teachers in dealing with the call for integrating technology in their practice, and provide motivation for becoming learners in that process. Lytle and Cochran-Smith (1992) suggested that when teachers’ research is posed as inquiry into practice whether
by individual teachers or communities of teachers it could support change in classrooms and school communities. They also theorized that university-based researchers using texts produced by teachers as data sources could help refine and redefine the domain of teacher knowledge and teacher mentoring. The current study addresses that issue by creating a community of inquiry among cooperating teachers to begin defining and refining mentoring practices in supporting student teachers' use of technology.

In summary, mentoring practices have been studied through logs detailing teacher questions and the nature of assistance offered (Odell, 1986). They have also been studied through interviews (Ganser, 1996; Wang, 2001). Other studies in teacher mentoring development have focused on case studies of individual mentors (Carter, 1988; Feiman-Nemser, 2001; Feiman-Nemser & Beasley, 1997; Stanulis, 1994). In addition, a few studies have explored collaborative groups of teachers and university based teacher educators working in communities to support each other and develop common goals (Dawson & Nonis, 2000; Higgins & Cohen, 1997; Lytle & Cochran Smith, 1992). The next section will explore cooperative inquiry communities as a framework for supporting mentoring practices during the field experiences of student teachers.

Cooperative Inquiry Communities

Communities of inquiry are beginning to emerge as a vehicle for groups of teachers to cooperatively study their practices (Lehman, Warfield, Palm & Wood, 2001; Palincsar, Magnusson, Marano, Ford & Brown, 1998; Perry et al., 1999). This type of cooperative inquiry is based on a collaborative encounter with experience (Reason, 1998). It is situated in the professional practice of the participants and seeks to explore some aspect
of their experience. For teachers, professional practice experiences are closely related to
the concepts and processes of learning. According to Putnam and Borko (2000) “the
learning of teachers is intertwined with their ongoing practice” (p.6).

Cooperative inquiry for teachers shares many dimensions of situated learning
theories. Situated learning perspectives posit that physical and social contexts are an
integral part of an activity and the learning that takes place in that activity (Putnam &
Borko, 2000). How an individual learns a set of knowledge and skills and the context in
which the activities take place are a fundamental part of what is learned. Learning is
conceptualized as coming to know how to participate in the practices and discourse of a
specific community (Lave & Wenger, 1991). The expertise or knowledge of the
community is continually being refined and negotiated through the discourse and
interactions of all community members rather than being viewed as a static set of discrete
practices.

Putnam and Borko (2000) suggested that such discourse communities offer
opportunities to bring together a diverse range of teachers with different types of
knowledge and expertise to provide a rich setting for members to draw upon each other’s
knowledge and create new insights into teaching and learning. They suggested that these
communities could craft knowledge about pedagogical practice and introduce new ways
of thinking about individual practices.

Palincsar et al., (1998) described the process of building a community of practice
among teachers focused on inquiry-based science instruction. They theorized that use of a
community of inquiry into practice in educational settings provides a suitable context for
a professional development model focused on the study and improvement of teacher
practice. Since there was no general agreement concerning what constituted expert practice, a specific challenge posed to the community related to the issue of defining good practice. The approach was based on the assumption that teachers would learn best when they collaborated with each other. The community of inquiry into practice provided a context that fostered learning and development through participation of individual teachers in the activities of the community.

Perry et al., (1999) described a participatory approach to teacher development also based on Lave and Wenger's (1991) community of practice concept. In their study, school district teachers met in monthly three-hour workshops to examine their current practices in literacy assessment and experiment with new assessment strategies in their classrooms. The goal of the project was to engage teachers in conversation with each other to lead them to critically examine and define their practice. The group consisted of 13 district teachers, a district curriculum consultant, and two university teacher/researchers. The group met for 10 sessions. Each session was structured with the same five activities: 10 minutes to free write what was on their minds regarding the class or implementation issues, air time allowing members to speak for two minutes on pertinent topics, focus group conversations on relevant issues or readings, work time for individual or collaborative work on assessment issues, and reporting out for members to discuss their plans for the next session.

Online communication was explored as a vehicle for communication in a professional development project focused on inquiry into mathematics instruction (Lehman et al., 2001). The objectives of the project were to find a means of integrating reform based recommendations into teacher pedagogy and address ways to introduce those reforms to a
wider base of teachers. The study involved eight mathematics teachers and four project staff members. It included monthly face-to-face sessions and online communication. Findings indicated that regular patterns of online participation among the teachers did not develop in the online communication as anticipated. However, a positive finding was that the project personnel were able to promote some levels of online dialogue with individual teachers by posing focused questions based on knowledge of that individual teacher's practice. They recommended more research with online communities to understand better the factors that can lead to the development of successful online inquiry communities.

These projects supported the development of teachers by bringing them together in a community of cooperative inquiry as informed and reflective practitioners. The settings provided a forum where all contributions were valued (Lave & Wenger, 1991) and the focus was on learning situated in the investigation of teacher practice.

The current study drew on these frameworks for cooperative inquiry and positioned them into the field of identifying cooperating teacher practices for supporting student teachers use of technology. It also extended these studies by exploring the use of online communication as a means of extending discourse and interactions beyond face-to-face settings. The next section will focus on the issues of using technology in the form of online communication to support interactions in communities of cooperative inquiry.

Community in Online Environments

Research on communication in online environments has studied both benefits and limitations with this medium. Limitations identified included: frustration with lack of personal interaction (Coombs, 1993; Kindred, 2000; & Ruberg, Moore, & Taylor, 1996);
difficulties with access to or use of equipment (Althaus, 1997; Flanagan, 1999; Ruberg et al., 1996; Shedletsky, 1993); and confusion with understanding multiple series of messages (Kindred, 2000; Ruberg et al., 1996). One researcher noted that this medium might not meet the educational or social needs of some learners (Kindred, 2000).

Many of these same studies also noted the benefits of online interaction: avoidance of common barriers to communication (Coombs, 1993; McComb, 1994; & Ruberg et al., 1996); enhanced discussion and peer interaction (Althaus, 1997; Coombs, 1993; Flanagan, 1999; Kindred, 2000; & Ruberg et al., 1996); and promotion of active involvement in the learning process (Althaus, 1997; Coombs, 1993; Kindred, 2000; McComb, 1994; & Shedletsky, 1993). In addition, studies have confirmed that the text-based context of the medium developed critical thinking skills and encouraged clear articulation of ideas and questions (Kindred, 2000; McComb, 1994). One other positive outcome of online communication was a synergistic effect in that not only did participants learn how to use a new technology, they also became more experienced in online interactions as they negotiated the meanings of concepts and acquired subject matter knowledge (Haythornthwaite, Kazmer & Robins, 2000).

Studies of online environments have also examined the social nature of the electronic medium as a support for communication and found that it is possible to create community and develop strong ties with other online members (Haythornthwaite et al., 2000; Hiltz & Wellman, 1997; Palloff & Pratt, 1999). Particularly for teachers, researchers have suggested that building an online community for learning was one method for breaking through the isolation of the classroom by providing links between teachers and allowing opportunities to share professional advice and adopt new practices (Gordin, et al., 1996).
A strategy for building community in online environments is through the use of discussions (Palloff & Pratt, 1999). Harasim (1990) found three general advantages of online discussion: communications were more reflective than verbal communication, participants were more attentive to the messages of others, and text-based communicators were on more equal social footing with one another. This equality of voice is a salient factor in creating environments for collaborative inquiry with communities of professionals.

These virtual communities represent a new kind of technologically mediated social environment capable of linking people together (Di Petta, 1998). According to Di Petta (1998), virtual communities of professional interests create new social groupings that were not possible before. The barriers of time and physical distance that often limit professional association are removed by meeting in virtual environments. Many traditional approaches for professional development have been associated with a variety of considerations such as arranging travel to gather colleagues in face-to-face settings, locating a convenient meeting space, and finding time in already busy schedules where everyone is available. These considerations slow down the time line for projects and increase the costs of professional development. Technology and use of online communication offers a way of addressing these time and cost issues as well as a means for expanding development opportunities beyond the traditional methods. Online environments can provide increased access to colleagues and support the creation of a collaborative professional culture. “In higher education, on-line environments for teaching and learning are promoted as a way of providing flexible access and addressing the changing needs of students in a technologically sophisticated world.” (Di Petta, p.60).
The current study addresses that challenge of incorporating online communication as a support for a collaborative professional culture among cooperating teachers.

Summary

The integration of technology in education is most effective when firmly rooted in curricular goals that support student learning (Moursund & Bielefeldt, 1999; NCATE, 1997; Thomas, 1998). The key lies in preparing teachers who understand and implement effective uses of technology and have opportunities to develop those skills during their field experiences (Thomas et al., 1996). Student teaching has been identified as a critical component for student teachers in establishing the practices they will use in future settings (Guyton & McIntyre, 1990; Lanier & Little, 1986). Cochran-Smith's (1991a) theory of student teaching based on a relationship of collaborative resonance between the university and the school provides a rich framework for the integration of technology in field experiences as a means for developing both the cooperating teacher and the student teacher. Research from Wang and Odell (2001) suggested that a model of collaborative inquiry could foster practice-based discourse in a community approach to mentoring of student teachers that would benefit mentors, novices, staff developers, and teacher educators.

According to Willis and Mehlinger (1996), Cooper and Bull (1995), and Ertmer et al. (2001), we are still in the process of discovering best practices and effective uses of technology for learning and teaching even as the technology pushes forward and creates new opportunities in new environments. Additional information from Ravitz, Becker, and Wong (2000) suggested that constructivist-oriented practices provided students with
more frequent access to computers and led them to more powerful ways of learning. Using Cochran-Smith's (1991) approach, student-teaching experiences could be viewed as reinvented opportunities for student-teachers, cooperating teachers, and university personnel to engage in research to examine and improve their own practice with technology. This research provides a starting point to begin constructing the knowledge needed to define promising practices with technology.

Using a cooperative inquiry model (Reason, 1998) supported by computer-mediated (online) communication with cooperating teachers weaves a connection between several bodies of research. It draws on the growing research in use of online communication specifically during student teaching experience as a means to extend the communication avenues between the cooperating teachers in the schools and the university (Gordin et al., 1996). It links with the research in teacher education and preparation calling for engaging teachers in building the knowledge base for teaching (Lytle & Cochran-Smith, 1992). In addition, it draws on the research in mentoring to include school-university partnerships to collaboratively reinvent rich opportunities for teaching and learning for student teachers during their field experiences (Cochran-Smith, 1991; Dawson & Nonis, 2000). It also connects with literature on teacher communities as a means of collaboratively constructing knowledge on current practices (Palincsar et al., 1998) and fostering innovation of those practices (Putnam & Borko, 2000).

By combining the call for teacher research (Brophy & Alleman, 1991) in a cooperative inquiry framework (Reason, 1998), that promotes collaborative inquiry on practices (Wang & Odell, 2001) with the medium of online communication (Di Petta, 1998), new opportunities are created to explore and define cooperating teachers' wisdom.
of practice in using technology to support the development of student teachers. These collaborative efforts can lead the way in creating educational programs that enrich and benefit the development of mentoring skills in cooperating teachers as well as the technology skills of both student teachers and cooperating teachers. The current study explores these new opportunities.
CHAPTER 3

METHODOLOGY

This chapter begins with a description of the study’s research design and participants. This will be followed by a discussion of the materials, data collection, and descriptive statistics. Next, the qualitative elements, materials, data collection, and data analysis are discussed. The descriptive elements provide a collective look at the technology context, and technological skill levels of the teachers. The qualitative elements provide an in-depth look at the conceptual perspectives of individual cooperating teachers, how they defined their mentoring toward technology use, and refined their practices over time. Sources of triangulation data are also addressed.

The research questions guiding this study follow.

1. What are the general technology contexts in which the cooperating teachers work, and what are their conceptual perspectives about mentoring?

2. What are the mentoring practices of cooperating teachers in preparing student teachers to teach with technology?

3. In what ways might cooperating teachers refine their own mentoring practice with student teachers to reflect learning from professional development activities for cooperating teachers introducing new technologies and constructivist practices?
Research Design

This study employed research from a qualitative tradition that included descriptive statistics. A mixture of both methodologies can be useful in providing the evidence needed to answer the research questions (Weiss, 1998). The two methods are described separately in this chapter following a discussion of the participants who will be the same population for both methodologies. The Human Subjects protocol for the study was reviewed and approved by the university Office for the Protection of Research Subjects (see Appendix D).

Participants

The 16 cooperating teacher/participants for this study came from a pool of 21 public school teachers working in grades K-12. The teachers in the pool were cooperating teachers who were mentoring student teachers while participating in a series of four workshops delivered in a collaborative school/university project. They were clustered at five public school sites – two elementary schools, two middle schools, and one high school. Principals at each of the schools selected the teachers who participated in the project. The criteria they used for selection included teachers who had been teaching for at least three years and were willing to provide student teachers with opportunities to integrate technology into their curriculum.

Six of the participants elected to receive one graduate credit for participation in these workshops. Monies for the graduate credit were funded by a federal grant promoting the preparation of preservice teachers to teach with technology. The university and school district were partners in the grant. Funding for substitute teachers allowing the
cooperating teachers to participate in the four full-day workshops was equally provided by the school district and the grant. The participants in the workshops were asked to volunteer to participate in this study. Informed consent agreements (see Appendix J) were signed by the participants and the researcher; a copy was given to each participant and originals were stored.

Of the 16 cooperating teachers, seven were selected for case studies. The student teachers of those seven cooperating teachers were asked to volunteer to participate in the study. Informed consent agreements (see Appendix K) were signed by the student teacher participants and the researcher; a copy was given to each student teacher and originals were stored. Altogether, 23 participants were included in this study. All participants were given pseudonyms to guard anonymity.

Workshops

The 16 cooperating teachers were enrolled in a series of four monthly mentoring workshops during the semester they worked with student teachers. Each workshop lasted a full school day and included a half-day on mentoring topics and a half-day on technology topics. The workshops were delivered via a K-12 school district/university partnership. Professionals from the K-12 school district provided instruction on the teachers' roles and responsibilities as mentors. The university professional provided instruction on integrating technology in constructivist contexts. The workshop topics and activities are displayed in Table 1.
<table>
<thead>
<tr>
<th>Workshop</th>
<th>Topic</th>
<th>Activity</th>
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<tbody>
<tr>
<td>First Month</td>
<td>Mentoring</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cognitive styles</td>
<td>Learning style indicator, discussion of different styles in teaching and learning</td>
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<tr>
<td></td>
<td>Technology</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Introduction to Inspiration</td>
<td>Group brainstorming using Inspiration, followed by small group construction of webs on teacher practices in supporting technology use</td>
</tr>
<tr>
<td></td>
<td>Online communication</td>
<td>Introduction to online classroom</td>
</tr>
<tr>
<td>Second Month</td>
<td>Mentoring</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Vision differences</td>
<td>Stepping stones, identifying qualities of personal memorable mentors</td>
</tr>
<tr>
<td></td>
<td>Opinion/evidence</td>
<td>Carousel activity to identify statements as opinion/evidence</td>
</tr>
<tr>
<td></td>
<td>Building trust</td>
<td>Balloon tie in pairs</td>
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<tr>
<td>Technology</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Digital pictures</td>
<td>Newsletter with digital pictures</td>
</tr>
<tr>
<td>Third Month</td>
<td>Mentoring</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Management scenarios</td>
<td>Small group discussions on current issues</td>
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<tr>
<td></td>
<td>Group discussions</td>
<td></td>
</tr>
<tr>
<td>Technology</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Internet resources</td>
<td>Explore WebQuests and online resources</td>
</tr>
<tr>
<td>Final Month</td>
<td>Mentoring</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mentoring presentations</td>
<td>Multimedia presentation of mentored lessons</td>
</tr>
<tr>
<td>Technology</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Digital video</td>
<td>Create short commercial about technology in education</td>
</tr>
</tbody>
</table>
Descriptive Statistics

Instruments and Procedures

Three instruments were used to gather descriptive data from the participants. The three instruments and the procedures for their use are described below.

Self-Evaluation Rubric

The “Staff Use of Technology: Self-Evaluation Rubric” tool (see Appendix B) developed by the Bellingham (Washington) Public Schools (2001) was used at the start of the course to characterize the technology skills of the teachers. This instrument had 14 items related to computer use and was also used with the seven student teachers identified for case studies to compare their technology skill levels with those of their cooperating teachers. In a 1998 version of this tool with 13 identical items, the reliability estimate (coefficient alpha) for the pre-test use of the tool was .90 (Grove, Falba & Barmettler, 2001). The additional 14th item referred to desktop publishing.

The 14 items on this instrument asked the respondents to judge their level of achievement in specific computer competency areas. Areas addressed were: basic computer use, file management, word processing, spreadsheet, database, graphics, email, research/information-searching, desktop publishing, video production, technology presentation, Internet, responsible use/ethics, and technology integration.

Participants responded to each item by rating themselves on four levels. For example, a Level 1 rating in basic computer operations is “I do not use a computer.” A Level 2 rating is “I use the computer to run a few specific pre-loaded programs.” Level 3 rating is “I run two programs simultaneously, and have several windows open at the same time.” A Level 4 rating states “I trouble-shoot successfully when basic problems with my
computer or printer occur. I learn new programs on my own. I teach other basic operations to my students.” According to Johnson (1999), Level 1 responses indicated pre-awareness. Level 2 responses indicated awareness. Level 3 responses indicated mastery, and Level 4 responses indicated advanced use.

The levels on the rubric defined a continuum of increasing levels of technology use, with low numbers indicating low levels of use and high numbers indicating higher levels of use. Level 1 always included no use of the item. Level 2 always included simple personal uses of the item. Level 3 addressed more advanced personal uses of the item, and Level 4 always referred to using the item to teach students.

Teaching Philosophy Survey

Questions J1 and J3 from Becker and Anderson’s (1998) “Your Teaching Philosophy” survey of teaching beliefs (see Appendix C) were used to quantify cooperating teachers’ beliefs about student engaged learning with technology. Each question asked the participants to respond to a scenario using a Likert type scale in which they indicated levels of agreement or disagreement with responses. The scores ranged from a low of 1 to a high of 5. According to Becker and Anderson, the lower the score, the more transmissivist the teaching philosophy. Conversely, the higher the scores indicated more constructivist teaching philosophies. The survey was administered in the third workshop and used to help identify a cross section of participants for further case study.

Final Questionnaire

The final questionnaire instrument (see Appendix E) was designed by the researcher to elicit information on the demographics of the cooperating teacher participants as well
as information concerning their technology use. The questions were drawn from two
sources (Althaus, 1997; Grove et al., 2001). The areas of the survey included questions
about their classrooms, their use of technology, their students' use of technology in the
classroom, their levels of professional development, and the use of online
communication.

Data Analysis Procedures

Scores from participants on the “Staff Use of Technology 2001 Self-Evaluation
Rubric” (see Appendix B) were recorded and used as a means to identify cooperating
teachers' levels of technology use. This instrument was also used to identify student
teachers' levels of technology use. The scores for all 14 items were added and averaged
to produce a single mean score for each participant quantifying their level of technology
use. The possible scores ranged from a low of 1 to a high of 4.

These scores were used in two ways. First, the cooperating teachers' scores were used
with the “Technology Effectiveness Framework” (Jones et al., 1995) grid to identify an
axis score for the technology performance. Second, they were used to compare the
relative levels of technology skills between the cooperating teacher and the student
teacher in the case studies. Scores were averaged across the three levels of elementary
teachers, middle school teachers, and secondary teachers to identify a mean score for the
population. The individual mean scores were compared to the group mean score as a
method for analyzing technology use levels of the participants.

Responses to the “Your Teaching Philosophy” survey (see Appendix C) were
recorded and used as a means to identify cooperating teacher beliefs about active student
involvement in classroom learning experiences (Becker & Anderson, 1998). The
cooperating teacher responses for each section of the two questions were added and averaged together to produce a single score for “learning.” The score range was from 1 to 5 with low scores indicating teaching beliefs that involved students as “passive” learners, while higher scores indicated teaching beliefs that involved the students more actively as “engaged” learners. This score was used with the “Technology Effectiveness Framework” (Jones et al., 1995) grid to identify a score for “learning.”

Data from the final questionnaire (see Appendix E) were recorded and compiled to further characterize the technology use levels of the cooperating teachers as well as provide information on their classroom access to technology and their use of technology with students. Data were also analyzed to determine if the cooperating teachers had experiences of teaching with computers during their student teaching.

Qualitative Methodology

Qualitative research is based on the notion that a perception of reality is constructed through interaction of individuals in their social contexts (Merriam, 1998). Qualitative approaches emphasize the need to get close to the participants and their situations in order to personally understand the nature of the settings, what it means to be in the setting and what the meanings are in that setting (Patton, 1987). The product of a qualitative study is a rich description of what the researcher has learned about the phenomenon under study.

Purpose

In this study, a co-operative inquiry methodology (Reason, 1998) was used to focus on cooperating teacher participation in the collaborative construction of a knowledge
base on practices used to prepare student teachers to teach with technology. According to Reason, in co-operative inquiry all participants are equal members whose thinking contributes to the generation of ideas. The inquiry is situated in the practice of the participants with opportunities for them to become fully immersed in the activities and experiences.

Online communication was used through a university sponsored online course environment as a means for participants to share their experiences and practices. The site is password protected, and contains areas for asynchronous threaded online discussions, private email, and access to reference materials such as the course syllabus and assignment grading criteria. The site also contains a calendar function that can be used by both instructor and students to post notes and assignments.

Materials

Materials for this course included a binder notebook with course readings and supplemental materials, computer floppy disks to save materials created in class and to use in digital cameras, and a copy of *National Educational Standards for Students: Connecting Curriculum and Technology* (International Society for Technology in Education, 2000b) for both cooperating teachers and their student teachers. All materials were purchased with grant funds and provided to the participants.

The Researcher

The researcher, a graduate assistant and full-time doctoral student, was in the additional role of instructor for the course. She had opportunities for informal exchanges, knowledge of the setting having been formerly employed by the school district, and an
ongoing working relationship with many of the project participants. Her role in this study was that of participant-researcher.

Case Studies

Merriam (1998) defined a case study as "an intensive, holistic description and analysis of a single instance, phenomenon, or social unit" (p. 27). According to Patton (1987), "Case studies become particularly useful where one needs to understand some particular problem or situation in great depth, and where one can identify cases rich in information – rich in the sense that a great deal can be learned from a few exemplars of the phenomenon in question." (p. 19). Patton cautions that selection of the individual cases needs to be clearly articulated and made explicit. For this study, purposeful sampling was used to select seven information-rich cases of cooperating teachers and their student teachers. The selections were made during the second week in November. Two cases were selected in each category: elementary, middle school, and secondary teachers. An additional case was selected involving a cooperating teacher who had participated in the previous semester session of the workshops. The "Technology Effectiveness Framework" (Novak et al., 1995) previously described intersecting technology use with engaged learning was used to identify a cross-section of teachers at different levels representing different combinations in the framework. This cross-section provided the opportunity to compare and contrast reported practices while at the same time assuring a manageable number of participants for the case studies.

The student teachers of these seven cases were invited to participate in a semi-structured interview (see Appendix H) to determine what identified practices they found helpful in supporting their use of technology. They were also invited to complete the self-
evaluation rubric used with the cooperating teachers to compare their self-reported level of technology use with those of their cooperating teachers. These multiple views in the case studies of mentoring practices in supporting student teacher use of technology provided in depth understanding of how teachers constructed their practices (Putney, 1997; Putney, Green, Dixon, Duran & Yeager, 2000.)

A multiple case study design was used for analysis in this study (Merriam, 1998). Data were analyzed first within each case to present a holistic picture and describe the contextual variables inherent in each case. Following analysis of the individual cases, a cross-case study design was used to describe patterns emerging across the cases (Merriam, 1998).

Participation in the case study was voluntary. Informed consent agreements (see Appendices J and K) were signed by the participants and the researcher. a copy was given to each participant and originals were stored. All participants were given pseudonyms to guard anonymity.

**Data Collection**

Data collection included a combination of online transcripts, semi-structured interviews, participant observation field notes, and participant artifacts (Janesick, 1998). Seven types of data were collected for the qualitative study.

1. Online transcripts in discussion forums from all sixteen cooperating teachers were gathered throughout the study. The discussions were designed to elicit information on how teachers described, defined, and refined their practice with student teachers. No personal or private messages were used for analysis. Those messages were deleted from the data set.
2. An initial semi-structured interview (Spradley, 1979) was conducted with each of the sixteen cooperating teachers in the first half of the fall semester (see Appendix F). This initial interview was designed to elicit information about teaching experience, beliefs about their role as cooperating teachers, information on their use of technology, and examples of technology mentoring practices with their student teachers. Additional informal questions (Spradley, 1979) probed for any changes or refinements in practices, and elicited information on the types of resources used in preparing student teachers to teach with technology. All interviews were recorded and transcribed verbatim. Copies of all transcriptions were returned to the participants to function as a member check (Lincoln & Cuba, 1985) and insure the accuracy of the information.

3. A second semi-structured interview (Spradley, 1979) was conducted in the latter half of the fall semester (see Appendix G) with seven teachers identified for case studies. It was created to gather specific information on the practices of these cooperating teachers as they mentored their student teachers in the use of technology in their teaching experiences. Additional informal questions (Spradley, 1979) probed for any changes or refinements in practices. All interviews were recorded and transcribed verbatim. Copies of the transcriptions were returned to the participants to function as a member check (Lincoln & Guba, 1985) and insure the accuracy of the information.

4. A semi-structured interview (Spradley, 1979) was conducted with the student teachers of the seven case study teachers during the latter part of the fall semester (see Appendix H). This was designed to obtain information on the technology
practices they used during their student teaching and to identify cooperating
teacher mentoring practices they found helpful in supporting their use of
technology.

5. Dialogues of small group discussions from two workshop sessions were recorded
for analysis. The activity was adapted from a journal writing activity to afford
participants an opportunity to interact with fellow professionals and discuss issues
in their practice in preparing student teachers to teach with technology (Perry et
al., 1999). The workshop participants broke into four small groups and were
directed to share some of their practices in mentoring student teachers to integrate
technology. Only comments from study participants were included in the data set.
Verbatim transcripts from those outside the study were deleted from the data set.
Rephrased references to discussion topics contributed by those outside of the
study that were deleted were added to provide context.

6. Artifacts gathered during class activities were used as data. These items included
computer print outs of a visual mapping exercise used to gather data on learning
activities their student teachers were using in their teaching. The ideas were
generated by the group of participants and recorded by the researcher. The
participants generated another set of artifacts when they created an analogy to
describe the role of a cooperating teacher. Only items from the study participants
were included in this data set.

7. Field notes of spontaneous conversations and events occurring during the class
were used as they pertained to the research questions. Field notes were also taken
during the interviews.
Data Analysis

Online transcripts from the discussion forums were downloaded and stored on disk. Content analysis was used to identify and code information on teacher practice as noted by the participants. Content analysis of the transcripts from the cooperating teacher interviews was also used to identify teacher descriptions of their practice in mentoring student teachers toward technology use. In addition, field notes of spontaneous conversations and events as well as transcripts from the small group discussions during class were analyzed and coded for information on practices.

Analysis "Refers to the systematic examination of something to determine its parts, the relationship among parts, and their relationship to the whole. Analysis is a search for patterns" (Spradley, 1980, p. 85). The search for patterns in the data was done using Spradley's domain analysis. In this approach, the elements of data are clustered into cultural domains. Spradley described these domains as categories of meaning. The domains are composed of three basic elements: the cover term, which is the constructed name for the domain; the included terms which refer to names of all the similar categories inside the domain; and the semantic relationship, which is a function that links the two categories.

For example, in the cultural domain with a cover term of "mentoring for technology use" included terms might include "exploring software resources," "sharing materials," or "modeling lessons." The semantic relationship of "x is a way to do y:" can be shown demonstrated visually. More specifically in this case, "exploring software resources," is a way to "mentor for technology use." For example:
This method of domain analysis was used to identify and categorize practices in preparing student teachers to use technology (Falba et al., 2001; Ganser, 1996; Odell, 1986). The data were examined for relationships to the practices and beliefs identified in the mentoring literature (Carter, 1988; Feiman-Nemser, 2001; Stanulis, 1994).

Transcripts from semi-structured interviews with the student teachers were analyzed for content referring to cooperating teacher mentoring practices. These data verified the use of the cooperating teacher descriptions of practices and indicated the practices that student teachers identified as supportive of their integration of technology in teaching and learning.

**Triangulation**

Triangulation is a heuristic tool for the researcher that adds rigor, depth, and breadth to an investigation (Janesick, 1998). Denzin (1978) identified four types of triangulation: data triangulation, investigator triangulation, theory triangulation, and methodological triangulation. For this study, multiple data sources were used for data triangulation. The multiple sources were used confirm data from other sources (Merriam, 1998). Interview transcripts provided the base for identifying practices. Online transcripts were used to triangulate information in the interviews, and to uncover additional unmentioned
practices. Interview transcripts from the student teachers were used to triangulate the practices mentioned by cooperating teachers and to provide information on the actual student teacher use of technology in teaching. For example, if participants stated in interviews that they used certain types of technology activities with students, corroborating evidence was sought through the final questionnaires, online postings, or interviews with the student teachers.

To summarize how the triangulation was accomplished, the following summary pulls together both the descriptive and qualitative elements. Ten types of data were collected for the study.

1. A Final Questionnaire (see Appendix E) administered to the cooperating teachers was used to provide information concerning their technology context.

2. The “Staff Use of Technology 2001 Self-Evaluation Rubric” (see Appendix B) was used as a means to identify cooperating teachers’ and student teachers levels of technology use. The scores for the cooperating teachers were also used with the “Technology Effectiveness Framework” (Jones et al., 1995) grid to identify a score for “technology performance.”

3. Cooperating teacher responses to questions J1 and J3 from the “Your Teaching Philosophy” survey (see Appendix C) were used with the “Technology Effectiveness Framework” (Jones et al., 1995) grid to identify a score for “learning.”

4. Online transcripts in discussion forums from all sixteen cooperating teachers were gathered throughout the study.
5. An initial semi-structured interview (Spradley, 1979) was conducted with each of the sixteen cooperating teachers in the first half of the fall semester (see Appendix F).

6. A second semi-structured interview (Spradley, 1979) was conducted in the latter half of the fall semester (see Appendix G) with the seven teachers identified for case studies.

7. A semi-structured interview (Spradley, 1979) was conducted with the student teachers of the seven case study teachers during the latter part of the fall semester (see Appendix H).

8. Dialogues of small-group discussions among the cooperating teachers from two workshop sessions were recorded and transcribed for analysis.

9. Artifacts gathered during class activities with the cooperating teachers were used as data.

10. Field notes of spontaneous conversations and events occurring during the class were used as they pertained to the research questions. Field notes were also taken during the interviews with both the cooperating teachers and the student teachers.

The relationship between the types of data collected and the research questions is shown in Table 2.
### Table 2

**Relationship Between Research Questions and Data Collection**

<table>
<thead>
<tr>
<th>Research Questions</th>
<th>Methods of Investigation</th>
<th>Participants Reporting</th>
</tr>
</thead>
</table>
| 1. What are the general technology contexts in which the cooperating teachers work, and what are their conceptual perspectives about mentoring? | final questionnaire  
semi-structured initial interview  
in-class group discussions  
in-class activities  
field notes                                                                 | 16 cooperating teachers  
16 cooperating teachers  
16 cooperating teachers  
16 cooperating teachers  
researcher                                                           |
| 2. What are the mentoring practices of cooperating teachers in preparing student teachers to teach with technology? | technology self-evaluation rubric  
teaching philosophy questions  
semi-structured initial interview  
semi-structured second interview  
online posting  
in-class group discussions  
in-class activities  
student teacher interview  
field notes                                                                 | 16 cooperating teachers  
16 cooperating teachers  
16 cooperating teachers  
7 cooperating teachers  
16 cooperating teachers  
16 cooperating teachers  
7 student teachers  
researcher                                                           |
| 3. In what ways might cooperating teachers refine their own mentoring practice with student teachers to reflect learning from professional development activities for cooperating teachers introducing new technologies and constructivist practices? | semistructured initial interview  
semistructured second interview  
online postings  
in-class group discussions  
field notes                                                                 | 16 cooperating teachers  
7 cooperating teachers  
16 cooperating teachers  
16 cooperating teachers  
researcher                                                           |

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CHAPTER 4

RESULTS

This study examined the mentoring practices of cooperating teachers in supporting student teachers in the use of technology during their student teaching semester. Data were gathered from cooperating teachers and student teachers that were working together during a semester-long student teaching field experience. Three research questions guided the study:

1. What are the general technology contexts in which the cooperating teachers work, and what are their conceptual perspectives about mentoring?

2. What are the mentoring practices of cooperating teachers in preparing student teachers to teach with technology?

3. In what ways might cooperating teachers refine their own mentoring practice with student teachers to reflect learning from professional development activities for cooperating teachers introducing new technologies and constructivist practices?

All of the cooperating teachers in this study participated in a monthly series of workshops presented in a school district/university collaborative setting during the semester they worked with their student teachers. The study took place during the fall semester.

Results for this study present general data gathered from the 16 cooperating teachers. The data from all cooperating teachers were generated during initial semi-structured...
interviews, online postings, small group discussions and in-class activities during the workshops, and through responses on the final questionnaire.

To provide a more holistic picture of the various contexts that can occur during student teaching experiences, case studies were used to illustrate specific portraits. Data from a technology self-evaluation rubric and a teaching philosophy survey administered to all 16 cooperating teachers were used to identify a cross-section of seven cooperating teachers for the case study analysis. Additional data for the case studies were generated through a second interview with the cooperating teacher, as well as an interview with their student teacher. The technology self-evaluation rubric was also administered to the student teachers as a means to compare the technology skill levels of the cooperating teachers and the student teachers.

Each case study provides a holistic and specific picture of a bounded case. Merriam (1998) described a bounded case as "a unit around which there are boundaries" (p. 27). In this study the units for each case are comprised of a cooperating teacher and their student teacher. Data for each case are presented as specific pictures. Each picture is organized to address the three research questions.

Results are presented in four parts. Each part presents data from two perspectives. The first perspective presents a general picture of data gathered from all 16 cooperating teachers. The second perspective presents the specific picture with data drawn from the seven case studies.

Part I presents the descriptions of the participants. It includes three sections. The first section provides general descriptions of all 16 cooperating teachers. In the second
section, the case study selection process is discussed. The third section presents
descriptions of the seven specific case studies.

Part II addresses the first research question. It is composed in two sections. The first
section presents results from a general perspective. The second section presents results
from the specific case studies.

Part III addresses the second research question. It includes two sections. The first
section presents results from a general perspective including all 16 cooperating teachers.
The second section presents specific results from the seven mentor/student teacher case
studies.

Part IV addresses the third research question. It also includes two sections. The first
section presents general results and the second section presents the specific results from
the case studies.

Part I: Description of Participants

General Descriptions

Descriptive statistics for the cooperating teachers were compiled from survey data
using the computer software Statistical Product and Service Solutions, Version 10.0.5 for
Windows. Of the 16 teachers, nine (56%) were female and seven (44%) were male.
Participants were equally divided between elementary (K-5) and secondary (6-12) levels.
At the secondary level, four of the cooperating teachers taught at the middle school level,
and four taught at the high school level. Altogether, the teachers worked at five schools:
two elementary schools, two middle schools, and one high school.
At the elementary level, one of the schools followed a year-round schedule that had five different attendance tracks. This posed a unique situation in pairing student teachers and cooperating teachers since the assigned cooperating teachers were scheduled for three-week track breaks during the student-teaching semester. To address this situation, teachers on other tracks still in session were designated as "track-break alternate" teachers. While the assigned cooperating teacher was on track break, the student teachers spent three weeks in the classrooms of the alternate teachers. Of the seven cooperating teachers in the study from this school, three were designated "track-break alternate" teachers and worked with student teachers during a three-week period. While the other elementary school also followed a year-round schedule, the participating teacher's track coincided with the student teacher's schedule, so no "track-break alternate" teacher was needed. The middle schools and high school all followed traditional schedules.

Descriptive information on the cooperating teachers obtained from the final survey is displayed in Table 3. The information is presented in an order of ascending grade levels, with cooperating teachers representing a range from kindergarten through twelfth grade. The years of teaching experience ranged from 3 to 26, with a mean of 9.4 years. The number of previous student teachers for the group ranged from 0 to 6, with a majority of the cooperating teachers, 10 (63%), indicating that this was their first student teacher. In addition, six (37%) of the teachers indicated that they had earned an advanced degree.

Additional descriptions of this population of cooperating teachers included information about their own student teaching experiences. Research has indicated that teachers tend to teach the way they were taught based on their firsthand experiences as students observing teaching practice (Cuban, 1986). Additionally, Cuban notes that
during student teaching, novice teachers can be placed in classrooms where, for the most part, cooperating teachers only occasionally use technological innovations such as computers. Thus, Cuban suggests there may be few educational experiences in the

Table 3

*Cooperating Teachers’ Descriptive Data*

<table>
<thead>
<tr>
<th>Cooperating Teacher</th>
<th>Grade/Subject</th>
<th>Previous Student Teachers</th>
<th>Years Teaching</th>
<th>Highest Degree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ms. Sacco</td>
<td>K</td>
<td>0</td>
<td>3</td>
<td>B.A.</td>
</tr>
<tr>
<td>Mr. Sanchez*</td>
<td>3</td>
<td>0</td>
<td>4</td>
<td>B.S.</td>
</tr>
<tr>
<td>Ms. Snyder</td>
<td>3</td>
<td>0</td>
<td>4</td>
<td>B.A.</td>
</tr>
<tr>
<td>Mr. Seger*</td>
<td>3-5, Science</td>
<td>0</td>
<td>5</td>
<td>B.A.</td>
</tr>
<tr>
<td>Ms. Soto</td>
<td>4</td>
<td>0</td>
<td>5</td>
<td>B.S.</td>
</tr>
<tr>
<td>Ms. Sanders*</td>
<td>5</td>
<td>5</td>
<td>20</td>
<td>M.Ed.</td>
</tr>
<tr>
<td>Ms. Schafer</td>
<td>5</td>
<td>0</td>
<td>11</td>
<td>M.A.</td>
</tr>
<tr>
<td>Ms. Solmon</td>
<td>5</td>
<td>0</td>
<td>8</td>
<td>B.A.</td>
</tr>
<tr>
<td>Ms. Sorens</td>
<td>7, US History</td>
<td>0</td>
<td>3</td>
<td>B.A.</td>
</tr>
<tr>
<td>Ms. Shipp</td>
<td>8-English</td>
<td>4</td>
<td>22</td>
<td>B.A.</td>
</tr>
<tr>
<td>Mr. Somers</td>
<td>8, Geography</td>
<td>0</td>
<td>6</td>
<td>B.A.</td>
</tr>
<tr>
<td>Ms. South</td>
<td>8, Geography</td>
<td>3</td>
<td>14</td>
<td>M.A.</td>
</tr>
<tr>
<td>Mr. Stewart</td>
<td>9-12, Biology</td>
<td>0</td>
<td>3</td>
<td>B.S.</td>
</tr>
<tr>
<td>Mr. Sotelo</td>
<td>9-12, Biology</td>
<td>2</td>
<td>8</td>
<td>M.A.</td>
</tr>
<tr>
<td>Mr. Sowell</td>
<td>9-12, Lang. Arts</td>
<td>2</td>
<td>26</td>
<td>M.A.</td>
</tr>
<tr>
<td>Mr. Sinclair</td>
<td>10-12, English</td>
<td>1</td>
<td>8</td>
<td>M.A.</td>
</tr>
</tbody>
</table>

*Note.* * denotes track break alternate teacher

preparation of teachers to nurture the use of new technologies. In the present study it seems applicable to investigate the student teaching experiences with technology that help to shape teacher practice. Therefore, one important contextual issue was whether or
not they had an opportunity to use or teach with technology during their own student
teaching experiences. On the final questionnaire, they were asked specifically about the
presence and use of technology during their student teaching. The data reporting
technology contexts during their student teaching experiences are shown in Table 4.

Table 4

Cooperating Teachers Reported Technology Context During Their Student Teaching

<table>
<thead>
<tr>
<th>Cooperating Teacher</th>
<th>Computers in the classroom</th>
<th>Master teacher modeled technology lesson</th>
<th>Taught a lesson using computers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ms. Sacco</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mr. Sanchez*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ms. Snyder</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mr. Seger*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ms. Soto</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Ms. Sanders*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ms. Schafer</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ms. Solmon</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ms. Sorens</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Ms. Shipp</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mr. Somers</td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Ms. South</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mr. Stewart</td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Mr. Sotelo</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mr. Sowell</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mr. Sinclair</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note. * denotes track break alternate teacher
Eight of the teachers (50%) indicated that there were computers in the classroom during their student teaching. Of those teachers only one (6%), Mr. Stewart, indicated that his cooperating teacher taught a lesson using technology, and two (13%), Mr. Stewart and Mr. Somers, indicated that they taught a lesson using a computer. Thus, for the majority of cooperating teachers in this study, modeling lessons using computer-based technology was a departure in teaching practice from the way they were taught.

*Case-Study Selections*

The study design originally included identification of six cooperating teachers and their student teachers for case studies. Each case was comprised of a cooperating teacher and the student teacher. Retrospectively, one additional case study was added resulting in seven case studies. Data in this section are from the seven cooperating teachers and their student teachers.

*Technology Effectiveness Framework for Identifying Case Studies*

To identify a cross-section of case studies involving teachers at various levels of technology use and with different approaches to teaching, a “Technology Effectiveness Framework” (Jones, et al., 1995) was used to sort the cases for selection. The framework proposes that the intersection of two criteria – technology performance and learning – helps define the effectiveness of technology in student learning. Technology performance ranges from low to high, and learning refers to student learning which ranges from passive to engaged. Identification of the case studies involved using this technology effectiveness grid intersecting technology performance scores with learning scores to identify a cross-section of teachers representing different combinations in the framework. In addition the sample selection criteria included a range of grade levels: two teachers
from the elementary level, two teachers from middle school level, and two teachers form the high school level. The additional case study was from the middle school level.

The “Staff Use of Technology 2001 Self-Evaluation Rubric” (see Appendix B) was used as the criterion for the “technology performance” score. For purposes of this research, technology use refers to computer use. Scores from that rubric were recorded and averaged, resulting in a technology use score for each participant. The possible score range was from 1 to 4. Lower scores indicated a low level of use of computers. Higher scores indicated a higher level of technology use as well as indicating instruction of students in technology use.

Questions J1 and J3 about teaching philosophies from Becker and Anderson’s (1998) “Your Teaching Philosophy” survey of teaching beliefs (see Appendix E) were used as criteria for the axis of learning. Becker and Anderson constructed the questions to identify teaching philosophies ranging from “transmissive” in which teaching was equated with telling and students were passive in the learning process, to “constructivist” in which teaching involved students actively engaged in the learning process. Scores from those survey questions were recorded and averaged, resulting in a “learning” score for each participant. The possible score range was from 1 to 5. Lower scores indicated a more traditional transmissive teaching philosophy in which students were indicated as passive learners. Higher scores indicated a more constructivist-compatible teaching philosophy in which students were actively engaged in learning activities. The scores for participants on both of those measures are displayed in Table 5.
**Table 5**

*Cooperating Teachers’ Engaged Learning and Technology Performance Scores*

<table>
<thead>
<tr>
<th>Cooperating teacher</th>
<th>Technology performance score * (^a) (range 1-4)</th>
<th>Learning score (^b) (range 1-5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ms. Sacco</td>
<td>2.57</td>
<td>3.13</td>
</tr>
<tr>
<td>Mr. Sanchez*</td>
<td>3.43</td>
<td>2.75</td>
</tr>
<tr>
<td>Ms. Snyder</td>
<td>3.07</td>
<td>2.50</td>
</tr>
<tr>
<td>Mr. Seger*</td>
<td>3.50</td>
<td>3.00</td>
</tr>
<tr>
<td>Ms. Soto</td>
<td>2.92</td>
<td>2.25</td>
</tr>
<tr>
<td>Ms. Sanders*</td>
<td>2.50</td>
<td>3.88</td>
</tr>
<tr>
<td>Ms. Schafer</td>
<td>3.21</td>
<td>3.38</td>
</tr>
<tr>
<td>Ms. Solmon</td>
<td>3.00</td>
<td>3.38</td>
</tr>
<tr>
<td>Ms. Sorens</td>
<td>2.93</td>
<td>2.75</td>
</tr>
<tr>
<td>Ms. Shipp</td>
<td>3.36</td>
<td>3.13</td>
</tr>
<tr>
<td>Mr. Somers</td>
<td>3.29</td>
<td>4.00</td>
</tr>
<tr>
<td>Ms. South</td>
<td>3.14</td>
<td>3.63</td>
</tr>
<tr>
<td>Mr. Stewart</td>
<td>2.71</td>
<td>2.75</td>
</tr>
<tr>
<td>Mr. Sotelo</td>
<td>2.57</td>
<td>3.13</td>
</tr>
<tr>
<td>Mr. Sowell</td>
<td>2.00</td>
<td>3.88</td>
</tr>
<tr>
<td>Mr. Sinclair</td>
<td>2.71</td>
<td>3.50</td>
</tr>
<tr>
<td>Group Mean</td>
<td>2.93</td>
<td>3.19</td>
</tr>
</tbody>
</table>

*Note.* * denotes track break alternate teacher  
\(^a\) "Staff Use of Technology Self Evaluation Rubric" used to compute technology performance score  
\(^b\) "Your Teaching Philosophy" survey used to compute learning score.
Scores for the cooperating teachers on “technology performance” ranged from 2.00 to 3.50 with an average score for the group of 2.93. Scores for “learning” ranged from 2.25 to 4.00 with an average score for the group of 3.19.

After determining the scores for the participants, one other factor was considered in selection of the case studies. It was determined to eliminate the track-break alternate teachers from the selection process for the case study. This was due to their more limited involvement with the student teachers and the lessened opportunity for those cooperating teachers to engage in technology mentoring practices. This narrowed the field for case selection to 13 cooperating teachers. The score placements for those teachers are shown in Figure 1.

In selecting the participants, it was noted that the scores of the participants extended toward the higher levels of technology use and toward slightly higher levels of engaged learning. If the traditional, average grid midlines for technology use (2.5) and for engaged learning (3.0) were used, it would result in no cases in the quadrant defining low technology use and low engaged learning. In order to adjust for this bias and define four quadrants of learners for case selection, the class averages for both technology use (2.93) of the cooperating teachers and engaged learning (3.19) were used to establish new midlines and redefine the quadrants for selection. With the adjusted midlines for selection, six cases were identified representing a cross section of the participants.

The six case participants chosen originally for the case studies were:
Ms. Soto, low engaged learning and mid technology use, elementary level;
Ms. Sorens, low engaged learning and mid technology use, middle school;
Mr. Sotelo, mid engaged learning and low technology use, high school;
Figure 1. Matrix of participant scores for technology performance and learning

- Indicates selected cases
Ms. Solmon, mid engaged learning and mid technology use, elementary:

Mr. Sowell, high engaged learning and low technology use, high school; and

Mr. Somers, high engaged learning, and high technology use, middle school.

The six cases originally identified for the study did not include a cooperating teacher who had participated in the pilot session of the school district/university program that was conducted in the previous semester. However, it was decided retrospectively that inclusion of such a case would provide potentially rich information on mentoring practices because mentoring practices were addressed in the pilot session. An examination of the participants indicated three participants fit the criterion of prior participation in the program. One case was eliminated because the prior participant did not have a student teacher in the first session. A second case was eliminated because the student teacher was hired as a long-term substitute teacher half way through the semester. The third case, Ms. South, met both the requirements of prior participation with a student teacher and a current full-time student teacher. Therefore, she was added as the seventh case-study participant. Ms. South was described as high-engaged learning and mid-technology use, middle school level.

Once the seven case study cooperating teachers were identified, permission was sought from their student teachers to participate in the study. After permission was obtained, the student teachers were given the "Staff Use of Technology 2001 Self-Evaluation Rubric" (see Appendix B). Their scores along with a comparison of their cooperating teachers' scores are summarized in Table 6. The scores for the student teachers ranged from 2.43 to 3.57 with an average score for the group of 2.73. The scores
for the 16 cooperating teachers ranged from 2.00 to 3.29 with an average score for the group of 2.93.

Each case study begins with an overview of the two participants in each case, the cooperating teacher and the student teacher, depicting the school setting for the case. Then data for the first research question will be presented. This will include descriptions of the technology contextual factors and information on mentoring conceptions of the cooperating teacher. This will be followed by information addressing the second research question that describes specific examples of the support practices for mentoring student teachers toward technology use. Finally, each case will conclude with a section addressing the third research question concerning any changes in beliefs or practices of

<table>
<thead>
<tr>
<th>Student Teacher</th>
<th>Technology score</th>
<th>Cooperating teacher</th>
<th>Technology score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ms. Jeffers</td>
<td>2.43</td>
<td>Ms. Soto</td>
<td>2.92</td>
</tr>
<tr>
<td>Mr. James</td>
<td>2.57</td>
<td>Ms. Solmon</td>
<td>3.00</td>
</tr>
<tr>
<td>Ms. Jenks</td>
<td>2.71</td>
<td>Mr. Somers</td>
<td>3.29</td>
</tr>
<tr>
<td>Mr. Jarvis</td>
<td>2.57</td>
<td>Ms. Sorens</td>
<td>2.93</td>
</tr>
<tr>
<td>Ms. Johan</td>
<td>2.43</td>
<td>Mr. Sotelo</td>
<td>2.57</td>
</tr>
<tr>
<td>Mr. Jensen</td>
<td>2.50</td>
<td>Mr. Sowell</td>
<td>2.00</td>
</tr>
<tr>
<td>Mr. Jurek</td>
<td>3.57</td>
<td>Ms. South</td>
<td>3.14</td>
</tr>
<tr>
<td>Group Average (7)</td>
<td>2.73</td>
<td>Group Average (16)</td>
<td>2.93</td>
</tr>
</tbody>
</table>

Note. "Staff Use of Technology Self Evaluation Rubric" used to compute technology score
cooperating teachers that occurred during the study. The pseudonyms for all cooperating teachers begin with the letter “s.” The pseudonyms for all student teachers begin with the letter “j.” Data from both participants will be woven together in the case studies as a means to triangulate information.

Case 1: Ms. Soto and Ms. Jeffers, Elementary School, With Alternate Mentor, Ms. Sanders

Overview

Ms. Soto was the fourth grade cooperating teacher and had been teaching for five years. Ms. Jeffers was her first student teacher. The elementary school setting for this case followed a year-round calendar. With five different track schedules, the schedule for this case included a three-week track-out break for the cooperating teacher at the end of the semester. The student teacher worked with a track break alternate cooperating teacher during these three weeks. The track-break-alternate teacher, Ms. Sanders, taught fifth grade and had 20 years of teaching experience.

General Technology Context

Ms. Soto noted on the final questionnaire that her classroom was temporarily housed in a portable building for the school year while her permanent classroom was being renovated. In this portable classroom, she had three computers with no Internet access. During the interview, she commented that the three computers were connected to the Internet in her permanent classroom. Thus, using online communication or doing online research during this study was cumbersome and necessitated a trip to another teacher's classroom during planning periods. Ms. Soto stated that using technology for demonstrations and presentations was also more challenging as the presentation devices
were housed on rolling carts: "It's hard out here in the portable because you can't roll anything out here because of the stairs."

However, she did note on the final questionnaire that students used the computer daily in her classroom. Ms. Soto also reported that she took her students to the computer lab weekly, where she conducted lessons involving activities such as Internet searches and multimedia projects. In addition to her computer at home, she had a district provided laptop that she used at school for teaching activities, and used away from school for lesson research and planning.

Scores on the "Staff Use of Technology 2001 Self-Evaluation Rubric" (see Appendix D) indicated that Ms. Soto reported average levels of technology use (M=2.92) compared to all of the other cooperating teachers in this study (M=2.93). Ms. Jeffers' average score on the rubric (M=2.43) indicated that her self-reported technology skill levels were lower than those reported by Ms. Soto. Her technology score was also below average for the group of student teachers (M=2.73). Ms. Jeffers did not have ready access to computers outside of the school setting, and according to Ms. Soto: "She does not have a computer at home, so she came in not knowing a lot."

Even though Ms. Jeffers had little prior experience with computer technology, during the interview she affirmed that she was able to teach with a computer. She noted:

We used the computer lab for research at times, for different things. We were researching ... Columbus Day. And one thing they really enjoyed was [using] the computer lab for the writing process...they did the clusters on Inspiration (1988-2000)...then a week later, they typed up their rough draft on the computer.
She also mentioned that she had the students use a graphics program to make bookmarks. When probed for further detail, she said: “It was actually really simple … and I did that for myself as well as them because I wanted to start simple as far as creating things, because I wanted to make sure I was competent.”

**Conceptual Perspectives About Mentoring**

In stating her beliefs on her role as a cooperating teacher, Ms. Soto shared in an interview: “I believe that I am supposed to be somebody who kind of guides her through the procedures.” Ms. Soto’s approach to mentoring also moved beyond the traditional notion of emotional support in mentoring and offered opportunities for Ms. Jeffers to connect the information she learned at the university with her classroom practice. Ms. Soto noted: “I have all kinds of things that she’s been using and then [she’s] bringing in her own things from [the university].”

She articulated her role as guide as someone who shows the way but does not require strict imitation. She gave several examples supporting a philosophy of educative mentoring (Feiman-Nemser, 2001.) In the first interview, she said: “It’s been really nice to be …a mentor without demanding that she do every single thing my way.” This approach allowed opportunities for Ms. Jeffers to find her own way, rather than merely adopt Ms. Soto’s practice. In a later interview Ms. Soto reiterated this view and remarked: “I’m not going to be the person that says, ‘You must do this’…because that’s not helping her learn and grow.” This illustrated Ms. Soto’s vision reflecting an element of educative mentoring, which promoted an understanding of teacher learning and development and supported a notion that novices learn in and from their practice. Ms. Soto also reflected this philosophy of mentoring as she noticed signs of growth in Ms.
Jeffers’ skills. She said, “She was so capable at the end that she was just doing all the
lesson plans and entering the grades and just handing it to me.” In the final interview, Ms.
Soto shared her feelings on her role as a mentor: “I just feel that to be able to share those
things with somebody and to know that in a month, she’s going to go out with all of the
things that I have plus her own [knowledge], how much stronger is she already than I was
when I started.”

*Mentoring Practices*

In supporting her beliefs of her mentor role as a guide, Ms. Soto focused on strategies
to guide her student teacher’s development of technology skills by showing her the
procedures to access the resources provided by the school system: “She and I went down
to the lab after school and...went through all the programs and what each one entailed so
that if she had any questions we could work out the bugs before she actually taught the
kids.” Ms. Soto also showed her the binders kept in the lab with resources for lesson
planning and instruction, and the school procedures for computer generated report cards
and noted, “She helped me with report cards.” In her interview, Ms. Jeffers commented
on this modeling of report card procedures: “She did it, but I was with her while she was
doing it. It’s awesome. It takes two hours to do 30 students’ report cards and that’s very
good.”

Ms. Jeffers offered that Ms. Soto was most helpful in showing how to use the grading
program and sharing lesson plan templates: “She showed me what she had and I liked it,
so she had one for me...It’s just so much easier.” Ms. Soto also illustrated this episode in
greater detail in the online forum. She wrote:
She was handwriting her lesson plans for the first couple of weeks and had been watching me put mine onto a template in the computer and printing mine out. After a few weeks of watching me do this we decided that she needed to be printing hers on the computer as well. We sat down after school one afternoon and she learned how to use the computer for lesson plans. She learned how to import graphics, change fonts, and font size, etc. Now she is able to plan on her own, type and print her own plans and go back and make necessary adjustments without having to rewrite everything.

Ms. Jeffers found it helpful that Ms. Soto shared additional ways to use technology for communication with parents: “She has another template ...and she showed me how she did it, of a letter home that she sends out to parents every week.” Ms. Soto added that she actually had Ms. Jeffers “do a couple of the letters.”

Ms. Soto believed it was important to model asking for help with technology, so she invited the educational computing strategist at the school to come in and teach lessons. She took Ms. Jeffers with her as she consulted other teachers for ideas and advice on how to present technology integrated lessons. During an interview, Ms. Soto shared her process for seeking advice from fellow teachers for planning technology-integrated lessons:

Usually I will go and find somebody...who’s either specializing in it or does a lot...and say, ‘OK, this is what I’m thinking of doing. What do you think? What would you do? What do you think is the best way to go about it?’...Just to maybe get some different ideas, see different ways to do it...and then I just basically gather my information and set it up and try it, and see what happens.
When asked if she modeled this practice with Ms. Jeffers, she replied: “Oh, [yes] because I bring her with me.”

During an interview Ms. Soto referred to the support she offered in helping her student teacher learn to use technology as a resource for professional learning. She remarked. “If she had a question about a lesson. I would have her go look on the Internet for resources.” Ms. Soto mentioned that she would also print out email messages containing Internet resources and share those with Ms. Jeffers.

In addition to modeling how to obtain resources from both print and online sources, as the grade level chair, Ms. Soto modeled for Ms. Jeffers how to share resources and strategies when other teachers came for information. She mentioned that there were many new teachers in fourth grade at her school in need of collegial support. She commented. “I have a really big open door policy…every morning I have people coming in here…. I’ve tried really hard to have materials available and just be there to ask questions.” Ms. Jeffers was present for those before school sessions and was thus exposed to the collegiality aspect of teaching and learning.

As noted earlier. Ms. Soto spent time one-on-one with Ms. Jeffers exploring software programs. She revisited these programs with Ms. Jeffers as the student teacher prepared to integrate technology to support content area objectives. The students were studying the science concept of water cycles. During an interview. Ms. Soto described the guiding process she used to mentor Ms. Jeffers toward technology use:

What we did was [Ms. Jeffers] wanted to do something on KidPix (1989-2001). So, we went down [to the computer lab] and we worked out what was in there...because there’s a lot in that program. She took a science concept that we
were learning in science and she had the kids do a picture and do a little journal about what exactly they were doing in science so that they could use the stamps and the free drawing and the typewriter and all those things...They did one of those walking forum[s]...to see it in color. So, they walked around and saw everybody's [work].

This lesson demonstrated the connection to standards-based learning with science concepts. It supported a constructivist philosophy of active, student-centered learning as students were actively engaged in the construction of their knowledge of the water cycle. The approach afforded an opportunity for students to examine the topic in greater depth as they used new tools to express their meaning of the key concept of a cycle in science. The walking forum at the end of the lesson offered students a chance to share their knowledge with others.

Ms. Soto's mentoring with this lesson echoed an educative mentoring philosophy. It helped Ms. Jeffers in developing a practice that is responsive to the needs of the students to be actively engaged in knowledge construction, and reflects what is known about student learning.

Refinement of Practices

When asked during the final interview if the workshops had any impact on her mentoring with Ms. Jeffers, Ms. Soto replied:

It reiterated the importance of technology and how much it is being used... your lesson plans, your report cards, your progress reports, your letters home, just every little thing is done on the computer...It just made me feel more comfortable...
and more aware, and just easier...to talk to her [about technology use] and easier
for the both of us to realize...we’re using technology now.

While this statement refers to professional productivity practices with technology, it also
indicates that it opened an opportunity for a dialog about teaching that included use of
technology. In previous passages, Ms. Soto had revealed that the dialogue included
mentoring practices that supported technology use in teaching activities.

When asked if she was able to integrate any of the activities from the workshop into
her practice, Ms. Soto mentioned a lesson she patterned after a workshop activity using
Inspiration (1988-2000). In that workshop, the software was introduced and used to
brainstorm and then web mentoring practices. In Ms. Soto’s lesson, she used the software
as a tool to practice for the state Writing Proficiency Test. In this performance
assessment, the students are required to write an article in which they state an opinion and
use a web to form their response. Ms. Soto described how she used the software to
develop their ideas: “They brainstorm it on their paper, and then they take the paper with
them to the lab, and then they do it in Inspiration (1988-2000)...Then we do our outlines
through Inspiration (1988-2000).”

In another example of how she refined her practice, Ms. Soto referred to a lesson she
and Ms. Jeffers did with the digital camera after it was used in another workshop. She
said:

I did take digital pictures of them and showed them how it worked and printed it
out so they got to see that.... We actually had this cool idea to do one of those
things that we did last time [in the workshop], and then we ran out of time and we
didn’t get to do it.”

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While noting how time constraints can be a limiting factor in execution of lesson plans, Ms. Soto’s quote does indicate that there are ideas for future refined practices with technology. When asked if she had any advice for other cooperating teachers in helping student teachers learn to integrate technology, she articulated, “Don’t be afraid to let them just do it…. Hold them capable and be there as a guide and help.” In viewing them as capable with technology she explained, “They’ve already done two practicums and they’ve been exposed.”

*Case 2: Ms. Solmon and Mr. James, Elementary School, With Alternate Mentor, Mr. Seger*

**Overview**

Ms. Solmon was a fifth grade cooperating teacher and had been teaching for eight years. This was her first year at this school. Mr. James was her first student teacher. The elementary school setting for this case followed a year-round calendar. With five different track schedules at the school, the schedule for this case included a three-week track break for the cooperating teacher during the middle of the semester. The student teacher worked with a track-break alternate cooperating teacher during the three-week track-break period. The track break alternate teacher, Mr. Seger, taught science to grades three through five, and had five years of teaching experience. Mr. Seger was working on a master’s degree in educational computing.

**General Technology Context**

Ms. Solmon noted on her final questionnaire that her classroom was temporarily housed in a portable building for the school year while her permanent classroom was being renovated. In this portable classroom, she reported that there were five computers with no Internet access. Thus, using online communication or doing online research...
during this study was cumbersome and necessitated a trip to another teacher’s classroom during planning periods. As in the previous case, there were stairs leading into the portable. Using computer technology for demonstrations and presentations was more challenging because the presentation devices were housed on rolling carts and had to be carried up the stairs. Despite these limitations, Ms. Solmon did note on the final questionnaire that students used the computer daily in her classroom. She also reported that she took her students to the computer lab weekly, where she conducted lessons involving activities such as Internet searches, multimedia slide shows, and word processing. She indicated that she had a computer at home that she used for school related work.

In an online post, Ms. Solmon shared her frustrations in dealing with computer platform issues in teaching. She wrote, “I am very literate on the PCs. However, I find the Macs are very difficult to master.” Midway through the semester, she brought her PC from home into the classroom to help with her lesson preparation.

Scores on the “Staff Use of Technology 2001 Self-Evaluation Rubric” (see Appendix D) showed that Ms. Solmon reported slightly above average levels of technology use (M=3.00) compared to all of the other cooperating teachers in this study (M=2.93). Mr. James average score on the rubric (M=2.57) indicated that his self-reported technology skill levels were lower than Ms. Soto’s levels. His technology score was also below average for the group of student teachers (M=2.73).

Mr. James indicated that he had a PC platform computer at home which he would use “every now and then” for school-related work. He was most appreciative when Ms.
Solmon brought in her PC from home. He commented, "When she brought it in, it made my life a lot easier."

Conceptual Perspectives About Mentoring

In the first interview, Ms. Solmon shared her beliefs about her role as a mentor. She articulated:

My role with him, first of all, is to teach him how to maintain discipline. The next thing is to ... expose him to some of the things... that are required to be successful in the school district, planning wise the things that will keep everything running smoothly in the paperwork department. And a third thing is making sure that he uses all of the technology and the supplies around him to give the kids that well-rounded lesson.

While this statement reflects a heavy focus on management and system information. Ms. Solmon noted that the ultimate goal of teaching was to impact the students. She talked about providing him with materials and showing him how to find other resources for teaching. She specifically mentioned resources available on the Internet as well as resources in the school. She noted, "Some are on web sites on the computer... but certain things are available in the library: things for him, not necessarily for the students, but things for him to teach his lesson."

As the interview progressed and Ms. Solmon was questioned in more detail about her approaches to mentoring, she began to reveal some tenets of educative mentoring. She noted that while it was important for student teachers to develop some management procedures, they also needed an opportunity to develop procedures that reflected their own way of doing things. She explained, "They take everything in, as well they should,
and they take the procedures and the rules that the supervising teacher has … and they structure it in a way that makes them comfortable.” She also affirmed the principle of focusing on the kids in her statement. “You have to present [knowledge] in many different ways, because if you don’t do that then you’re going to lose a lot of kids by the way side.”

In addition, Ms. Solmon referred to an approach that supports the strategy of finding an opening that can lead to a productive conversation about teaching. In the following passage, she related how a cooperating teacher can set a tone that creates “openings” for growth and problem resolution. She shared, “It helps especially when they’re learning the classroom, to have somebody who they can say to ‘Well, that didn’t go quite the way I thought. What can I do, or I’m having problems with the discipline.’” Thus even though Ms. Solmon originally expressed a very pragmatic philosophy toward her role as a cooperating teacher, when probed more deeply she intimated the thoughtful way in which she went about her work of mentoring her student teacher.

Mentoring Practices

True to her belief that good management underlies good teaching, Ms. Solmon focused first on data management practices with technology. She said, “As we went along, I tried to show him how to input with the (1992-2001), but also lesson plans… he took what I had and he adapted it.” Mr. James also commented on this one-on-one support in learning that particular piece of software in his statement: “[Ms. Solmon] and I worked on it together and finally I just picked up and I explored a little bit.” Mr. James explained further how he used the information in that program with individual students. He articulated, “I also used it for conferencing. If I noticed a student wasn’t working
well, I’d come over and show him or her their grades and it would show up in the percentages and give them their final grade.”

As mentioned earlier, Ms. Solmon brought in her computer from home that had specific software she used for creating spelling worksheet assignments. She showed Mr. James how to use the software. He commented: “We have three spelling groups in our class… You type in each of your lists and … you make a word sort, secret code, … anagrams, just a whole bunch of different [activities].”

When asked about her mentoring practices in encouraging Mr. James to use technology in his teaching practices, Ms. Solmon would reply with passages that described Mr. James’ activities with little reference to her mentoring practices. For example: “[Mr. James] did a lesson on ‘All About Me,’ and they had to create a slide show and that’s what they’re in the process of doing. They made bookmarks, and we’ve used many other applications in AppleWorks (1991-2000) and KidPix (1989-2001) (1989-2001).” Upon further examination of the data, the following passage suggested a possible reason for the lack of focus on her actual mentoring practices:

I encouraged him [to consult with the computer strategist] because I was so Macintosh illiterate at the beginning of the year, we had to ask how you do this or what’s going on with that, because I found that I couldn’t answer those questions. So, that’s why I encouraged him… I can’t troubleshoot [problems with the computers] like I used to do.

It might be that her inexperience with the new computer platform inhibited her ability to show Mr. James some of the many software possibilities she reported she had used in the past. This rationale received support from statements made by Mr. James.
interview when he was asked what his cooperating teacher did to support his use of technology during student teaching. He replied: “Well, I don’t know if she did because I basically just went out and got all of the [technology] on my own.”

By themselves, these two statements would leave one with the impression that Ms. Solmon engaged in few technology mentoring practices. However, further probing with both parties revealed some interesting findings. In other responses, Mr. James noted about his use of technology in student teaching:

I just did it on my own, but she supported me in whatever I had to do... I had a really good experience.... [Ms. Solmon] helped me if I had any questions or if I needed anything. She would really be there for me and assist me and find the answer if I couldn’t find it.

He also mentioned that she was most helpful in “the planning part, and a few times on the actual teaching.” Ms. Solmon, too, talked about her support practices that encouraged the initiatives of the student teacher and resulted in benefits for him, her, and the students. She said that she uses a master planning chart for the year that lists all the standards-based objectives for her students. In the following passage she talks about the development of a technology infused activity and the learning that took place on all levels:

We were talking about getting their interest in writing... [Mr. James] suggested that we get the Quick Pads and we both kind of suggested it. We went to an inservice and we learned how to use them, and he brought the Quick Pads in.... We only have five computers that we can use in here, but all of a sudden now, we’re able to
use 30 Quick Pads and the kids just really took off with it. Implementing it, it turned out to be very useful technology-wise for making their writing better.

Both she and her student teacher learned much about integrating technology in this lesson, and it appears the students benefited as well as they developed their skills in writing.

While Ms. Solmon may have had limited personal resources due to her lack of expertise with a different platform, she was able to compensate by supporting Mr. James in seeking the resources he needed for teaching. She also credited Mr. James’ work with the track break alternate teacher, Mr. Seger, for helping support Mr. James’ use of technology in teaching. She said:

When I went on track break two weeks after being in school. [Mr. James] student taught in there [with Mr. Seger] for three weeks. So then he got familiar with the fact that Mr. Seger knew how to do the presentations, and things like that … he didn’t hesitate to ask for help.

Refinement of Practices

Ms. Solmon provided several rich examples of how both information from the workshops and reciprocal mentoring from her student teacher helped support changes in both her practices and her beliefs about mentoring. When asked if she was able to implement any new ideas from the workshops into her practice with her student teacher, Ms. Solmon mentioned that she was able to share information from the workshop on WebQuests with her student teacher. She also shared a description of that practice in an online posting. She wrote:
My student teacher was completing a lesson on States and Capitals. When I came back from the November class, I was armed! I told him about the site called WebQuest. During his computer lesson we introduced it to the students and they found so much information! It was very informative and he, the students and I all benefited from the website.

Ms. Solmon related that she refined her own practice with mentoring from her student teacher. During the last week of student teaching, Mr. James was out observing other teachers. Ms. Solmon had observed him using the ELMO projection device during his lessons, and decided to try it on her own. As she was trying to set up the device, Mr. James returned to the room. Ms. Solmon narrated:

He had to show me how you use it. This is the way this goes and then we spent about 5 minutes trying to turn [things] around because I'm left handed and he's right handed (laughter). Finally, I had to move all kinds of desks just so I could do certain things with it. But, he was very helpful, showing me how to use that technology.

As she shared what she learned from the workshops, she remarked that they "helped me [with] the knowledge that he's growing and I'm growing." In an online posting toward the end of the class, she articulated the refined beliefs she had developed over the course of the study. Her beliefs about her role as cooperating teacher reflected a growth beyond merely passing along classroom management strategies and technical advice. She articulated a beginning understanding of educative mentoring that is based on a sharp vision of good teaching and supports opportunities that promote teacher and student learning. She wrote:
Some things I find better for him to find out on his own. I let him experiment with his studies, his theories, his off-the-wall ideas...his right-on-point ideas... his "let me experiment with this because the technology is here" ideas, and so on. I do this because he maintains discipline and the kids are learning...Even though things do not progress as I think they should sometimes, they continue to progress, so I allow him to make his revelations, realizations, and mistakes...If I tell him how to do something exactly as I do it, he may not rise to his full potential, only to mine. This would be an injustice to anyone who has the strength, the drive, and the dedication to do this most difficult profession. My job as a supervising teacher is to guide and learn, as I guide and learn from my students. I let him experiment, theorize, implement, etc. while providing input when necessary or asked for. I also learn many things from watching him. I hope this has allowed him to find the reason he wanted to be a teacher in the first place.

Ms. Solmon succinctly summed up how the workshops contributed to the refinement of her mentoring practice in the statement: "Those classes taught me that sometimes when you let go, you might actually learn something yourself."

Case 3: Mr. Somers and Ms. Jenks, Middle School

Overview

The cooperating teacher, Mr. Somers, taught eighth grade geography. He had been teaching for six years. Prior to his teaching career, he had worked in retail for ten years. Ms. Jenks was his first student teacher. The middle school where they worked followed a regular nine-month school calendar. A computer lab with twenty Internet connected computers was located adjacent to the classroom.
General Technology Context

Mr. Somers had seven computers in his classroom that were all connected to the Internet. This provided ready access to email communication and online research. He noted that he used the computer daily for school-related work, and weekly for instructional purposes. He also had a school district laptop which he used both in the classroom for teaching activities and away from school for lesson research and planning. He described his instructional activities with technology as introductory presentations on new material, using webbing software to project ideas that students generated on selected topics, and using digital video software to present video segments.

Mr. Somers noted that students used the classroom computers several times a month, and that they used the computers in a lab on a monthly basis. His reported student activities with computers covered two areas. In one area, students created brochures in basic word processing documents. In the other area, students used software that promoted cooperative-learning activities, such as working in teams to reach a goal, or engaging in role-playing to discuss problems and formulate decisions.

Scores on the “Staff Use of Technology 2001 Self-Evaluation Rubric” (see Appendix D) indicated that Mr. Somers reported above average levels of technology use (M=3.29) compared to all of the other cooperating teachers in this study (M=2.93). Ms. Jenks’ average score on the rubric (M=2.71) shows that her self-reported technology skill levels were lower than Mr. Somers’ skills. Her technology score was average for the group of student teachers (M=2.73).

During the interview, Ms. Jenks mentioned that she had a computer at home that she used for preparing lessons and presentations. She noted that her home computer was a
different platform than the one used at school; but to her this was not problematic. She used email to electronically carry her work back and forth. She said:

I sent... lesson plans that I would work on at home, and then I’d convert them when I’d get here. It was a very convenient way of getting things from home to school without having the hassle of papers, or losing it and vice versa, because I would send things from here to the house that I could work on and then send it back.

Mr. Somers used email for communication and mentoring activities, too. In his follow-up interview he commented: “We communicated via email over weekends, or if she was working on a lesson plan at night she could send it to me at home and I could send her suggestions.”

While transporting text documents was not difficult, Ms. Jenks did share that documents with graphics, such as those used in presentations, posed a challenge. She commented: “I could type in the text, but, I couldn’t really import anything into it, and so it was very frustrating.” To help address this issue, Mr. Somers checked with the on-site computing strategist, and they devised a solution to support Ms. Jenks in solving the problem. In the words of Ms. Jenks, “They had me check out the laptop and that made it much easier.” Ms. Jenks checked out the laptop on several occasions for periods ranging from one day to two weeks.

In discussing the context that supported his use of technology in the classroom, Mr. Somers specifically commented on three factors that he believed were significant. First, he noted the increased availability of access in both his room and that of Ms. Shipp, who was next door. He said, “We both have more computers than most classrooms and that’s because we’re in the magnet program, and when the magnet program started we were
given five computers with magnet money.” Second, Mr. Somers identified the support of the building administrator. He said: “Over the past three years, the thing that has made a significant difference in the use of technology in the building is that our administrator, [the principal], strongly believes in technology.” Finally he identified the supporting role of the on site educational computing strategist (ECS). He shared: “We have the best ECS in the district... her number one priority is making technology [available] that students can use.” These factors of access to technology, administrative support, and technical support helped shape the context for this case.

**Conceptual Perspectives About Mentoring**

Mr. Somers used a metaphor to describe his beliefs about his role as a cooperating teacher during an interview. He remarked: “I kind of think of a shepherd, just lead them along sometimes and sometimes you’ve got to poke them with a stick and sometimes you’ve got to rescue them, if necessary.” Mr. Somers also espoused several tenets of educative mentoring in his beliefs. First, he understood the importance of tending to Ms. Jenks’ questions and concerns. For example:

[Ms. Jenks] came in the first day before school started with a lot of questions. She’d had two very different practicum experiences, and she was just full of questions. So, I let her ask the questions. Sometimes, I didn’t have the answers.

He also held a vision of helping Ms. Jenks develop a style that focused on the students and was responsive to their needs. In discussing this approach, he said:

There are just so many different dynamics... every group of students is different. I have five groups and there’s no two exactly alike. You don’t get the same questions asked every period; you don’t get the same responses to your questions.
In an educative mentoring approach, a focus is on identifying opportunities that support meaningful teacher learning in the everyday practice of supporting student learning. Mr. Somers related an incident that evoked this vision of teacher learning in the service of student learning, and signaled growth on the part of Ms. Jenks. He noted the growth in her problem solving abilities as he described a technology-integrated lesson in which there were unforeseen technical problems:

Part way through yesterday, after a couple of classes, we started having trouble with the CD-ROM drive. It was running really slow and skipping; and so we ended up changing computers.... She just picked up really well and had the teams tell her what decisions they had already made on paper so she could input those real quickly. Then at the end of the day she moved the trips from the first computer onto the network and saved them to her computer so that ...we could move on ...and not have to re-do everything. So that was her solution and that was fine. It was probably what I would have ended up doing, but I hadn’t thought about it. So, she did a good job of problem solving on her own.

Mr. Somers believed it was important to help student teachers “learn how to think on their feet.” He clarified that belief further in the statement:

There are just so many things, that unwritten curriculum that you cannot plan for. Someone comes in and needs something right in the middle of a lesson, or there’s a fire drill, or the overhead projector bulb burns out. You [must know] how to improvise and pick things up and go with it.
He remarked that those were regular occurrences in the life of a teacher, and he believed it was important to help student teachers learn how to modify and adapt to those situations.

*Mentoring Practices*

Field notes from the third workshop session recorded that Mr. Somers shared with fellow cooperating teachers his practice for exploring software resources with his student teacher. Instead of just directing Ms. Jenks to a particular program, he stressed that it was important to show her one-on-one how to use the software. He mentioned that he actually took the CD-ROM out of the box and showed Ms. Jenks how to access it. Then he went through the steps in the program and gave examples of how he connected the features to specific curricular objectives. In his second interview, he supported that practice in his comment: "I tried to show her what technology we had and used it to demonstrate ... some of the things we're capable of here at [the school]." Ms. Jenks corroborated this practice. She said: "He showed me what he had and I went through and decided to try certain things, and he was very supportive on anything that I wanted to try."

In his second interview, Mr. Somers stated, "We are an online school," referring to school communications and bulletins, adding that Ms. Jenks "Had access to that since day one." He familiarized her with the grade book program and how he used it to print out attendance sheets. Previously, he commented on the use of technology and online communication for creating and modifying lessons plans. His earlier comments recounted how he familiarized Ms. Jenks with use of the school computer network to store and transfer student work as she problem-solved the situation with a faulty CD-ROM drive.
Mr. Somers communicated a vision for technology use, and established an expectation of its use by Ms. Jenks. He said:

[I] showed her early on that I'm very open to using technology... and then encouraged her and gave her support and made suggestions, but tried to make it wide open so that she could do what she wanted to.

Ms. Jenks' comment about his support for whatever she wanted to try tended to validate his implementation of that vision by encouraging and supporting her experimentation with new approaches for technology use.

Refinement of Practices

As he talked about his beliefs about how student teachers learn to teach, Mr. Somers stated in the first interview: "Sometimes, you've got to let them fail." In a later comment, Mr. Somers showed refinement in that belief about working with student teachers. He said: "Having them have a lesson that isn't successful doesn't make them a failure or you a failure. It's a learning opportunity, and it should be a safe place to have those failures."

Mr. Somers said that he had learned some things about refining his practice using technology from his student teacher. He shared a specific vignette in which he not only learned a new approach for using technology, but also deepened his understanding of how knowledge is constructed during student centered learning activities. He had given Ms. Jenks a piece of recently acquired software. The software was a different title in a series with which he was already familiar, so he had not previewed it. He had five-copy site licenses on the other titles in the series, which meant the students could work in teams on five different computers to negotiate decisions and progress through the activities. The software he gave Ms. Jenks was a single copy, meaning it could only be
used on one computer. He did not realize this difference until the following week when Ms. Jenks prepared for the lesson. Mr. Somers narrated that he had “come in over the weekend and arranged the computers in the room” the way he had used them in the past. When Ms. Jenks pointed out that there was only a single copy available, Mr. Somers quickly realized that they had to use a different approach. In his words:

The way I had been thinking we would use it, we didn’t have the kind of copies to do that. So we had to use a multi-team rotation on one computer…. We ended up projecting it with the cart in front and kind of letting each team do their own thing, but we did it in front of everyone so they could hear what decisions they made, which made some other teams change their decision before they got there.

So, it was a great dynamic, and it was a wonderful experience.

When asked if the workshops had any impact on his mentoring approaches in helping his student teacher use technology, Mr. Somers gave a positive response. He said, “Yes, not one single workshop did I come back and not say, ‘Oh, we’ve got to do this, or why don’t we try this.’ and incorporate it.” Mr. Somers found that the workshops gave him new ideas and helped increase his comfort level with particular tools, such as the digital still camera and a digital video camera. He noted, “I felt more comfortable with some of the skills [such as] using the digital camera. I hadn’t done much in class. I feel more comfortable using the digital camera now.”

During the final interview, Mr. Somers was asked if he had any advice to give to other cooperating teachers. The following statement lends credence to how his original mentoring belief of “letting them fail” was refined to a more educative and supportive viewpoint. He shared:
I would just say, give them their wings and let them try something even if you're not confident that it's going to work or it hasn't worked for you. Because, sometimes, if they're enthusiastic enough they're going to overcome some hurdles. So, give them lots of suggestions, but also, just give them the support.

**Case 4: Ms. Sorens and Mr. Jarvis, Middle School**

*Overview*

Ms. Sorens was a seventh grade United States History teacher who had been teaching for three years. Mr. Jarvis was her first student teacher. Ms. Sorens had participated in a prior session of this school district/university program. However, she did not have a student teacher during that session. The middle school setting for this case followed a regular nine-month school calendar. Ms. Sorens had access to two open computer labs with thirty Internet connected computers. In order to gain access to the labs, she would check the availability of the labs and reserve one for class periods as needed.

*General Technology Context*

Ms. Sorens had seven computers in her classroom, only one of which was connected to the Internet. She used that computer to access email communication and daily school bulletins. She also used it for online research. Ms. Sorens noted that she used the computer daily for school-related work and weekly for instructional purposes. She also had a school district laptop which she used both in the classroom for teaching activities and away from school for lesson research and planning. In addition, she had a computer at home that she used for school-related work. She described her instructional activities with technology as introductory presentations for student note taking, game-format
presentations for review of material, and software using time lines to introduce important dates for historical topics.

On the final questionnaire, Ms. Sorens noted that students used the classroom computers several times a month and the lab computers once or twice a semester. Her reported student activities with the computers included Internet searches on historical topics, and use of programs developing skills in literacy. She also reported that her students had created presentations on the computers.

Scores on the “Staff Use of Technology 2001 Self-Evaluation Rubric” (see Appendix D) indicated that Ms. Sorens reported average levels of technology use (M=2.93) compared to all of the other cooperating teachers in this study (M=2.93). Mr. Jarvis’ average score on the rubric (M=2.57) showed that his self-reported technology skill levels were lower than Ms. Sorens’ reported skills. His technology score was also below average for the group of student teachers (M=2.73).

During the interview, Mr. Jarvis mentioned that he had a computer at home that he used for lesson plans. He said, “I have a computer at home, so I used my Microsoft at home. I also used the Internet at home. I’ve gotten some information off the Internet for some of my lesson plans.” While he noted that he had access to the Internet and the school-district email account that was established for all of the student teachers, he shared that he did not use it. He commented, “I have an account. I should have logged onto it. I never have.” When probed further about the use of email, he acknowledged that it was a valuable tool for communication. He noted, “If something comes up on [email] that I need to know, then [Ms. Sorens], my cooperating teacher always tells me.” He expressed a desire to begin using email, “I need to get in there, because that’s how the teachers
communicate." However, he also shared that a major factor affecting his email and technology use during student teaching was the lack of time in an already busy schedule. He summed up that issue in the following statement:

I just didn’t have enough time. I needed more time. It’s overwhelming the amount of activities there are in student teaching anyway; and then when you add that technology thing, which is really necessary, all the student teachers need to get involved in technology… it’s just something else to do.

**Conceptual Perspectives About Mentoring**

Ms. Sorens described her approach to mentoring in her statement, “Cooperating together, that’s what a cooperating teacher is.” She further explained her rationale for that cooperative concept in her comment, “Instead of “I”, here’s what I would do. I have to say here’s what we should do.” Ms. Sorens also talked about a type of educative mentoring approach that supports the student teacher in finding his way of doing things while developing a practice that is responsive to the needs of the students. During her first interview she noted:

I’m better in tune with what I’m supposed to be doing, and how I’m supposed to be working with him, and it’s working out a lot better. I give him materials and I give him some information and then he takes and uses what he thinks would benefit the students a little bit better.

Ms. Sorens commented that her concept of mentoring was based on “continuing little things.” For example, she shared her thoughts on taking time for brief reflections at the end of the day. She articulated:
We try and set aside 10 minutes after school and say, "How do you think that went?" And "What can you do different for next period?" It’s nice to be able to have that time. At least, four times a week we do that, have a little pow-wow meeting.

This passage supports elements of an educative approach to mentoring in taking time to foster an inquiring stance about teaching and continually strive for improvement in practice.

*Mentoring Practices*

In this particular case, Mr. Jarvis identified a schism in beliefs between he and Ms. Sorens as they started the semester. In referring to technology use during student teaching, Mr. Jarvis stated, “I was under the impression that I was going to be taught everything and [Ms. Sorens] was under the impression that I already knew.” Ms. Sorens also noted this discrepancy in her first interview. She said, “I don’t think that he’s very comfortable with technology.”

In her second interview, Ms. Sorens talked about how she addressed that situation. She commented, “For the most part, he hasn’t incorporated technology as much as I do, only because he’s unfamiliar with it. So, we had to start where he was comfortable.” Through interviews and online correspondence she painted a picture of the support practices she used to mentor Mr. Jarvis toward technology use in his professional practice. In an early online correspondence, Ms. Sorens outlined the initial support she offered to help Mr. Jarvis with this task. She wrote:

I talked with my student teacher about the different things we/he could do with technology. As we were talking, we compiled a list of ideas, a few of them are: -
using the [E]asy [G]rade [P]ro. - using the Internet to find information for the students. - using the computer labs for the students to create their own [P]ower [P]oint. - creating a [P]ower [P]oint for the students to take notes and gain a better understanding of history through pictures, symbols and maps...[Mr. Jarvis] has started using a few of these ideas and is in the process of creating a [P]ower [P]oint on the Vikings.

The following examples describe the steps she used to build his technology skills in the three areas she noted: data management, student centered learning activities, and classroom presentations.

In this first example, Ms. Sorens described the approach she used to start with Mr. Jarvis' level of comfort and begin building the connection with technology in professional practice involving data management activities. As she talked about the grading software that was used at her school for both attendance and grades, she shared the sequential steps she used:

We had to start simple. We started with, "OK here's a computer print out of the attendance. I want you to keep it on the paper. Now, we're going to move to the grade book on the computer and we're going to start simple here." And I just kept building and building as far as the grade book is concerned.

Ms. Sorens explained the persistence and encouragement she used in her approach to help support Mr. Jarvis in the growth of his skills. During an interview she described it as:

Constant reminding, not really nagging, but just constant encouragement to say, "You know, you need to get this done and we can do it." I think most student
teachers need to be encouraged, and need to hear the good, need to hear the
positive.

This statement provides support for additional elements of Ms. Sorens' educative-
mentoring approach of understanding teacher learning, and attending to the novice's
present need for positive reinforcement and encouragement to learn in and from their
practice. Mr. Jarvis also commented on this encouragement to use technology, and
reframed it as a type of motivation. In the following statement, he shares his point of
view:

If it wasn't [sic] for her, I wouldn't have done it. She gave me the kick. She
motivated me to do it ... I didn't want to do it because I was bogged down with
writing lesson plans and correcting papers and direct instruction and... you get all
that ... put together and I'm not real efficient at it, not yet. I'm starting to get
there.

The second example focuses on Ms. Sorens' vision of supporting Mr. Jarvis in
developing a lesson that used technology in a computer-lab setting. Although the vision
of the original concept conveyed in the online transcript was to encourage Mr. Jarvis to
develop a lesson in which classroom students would use the computer lab to create
presentations, the actual lesson focused on different skills. In the words of Ms. Sorens,
"We actually took the students down to the computer lab and they were able to get on the
Internet to look up Benjamin Franklin and his accomplishments."

During the interview, Ms. Sorens shared how she established an expectation for the
lesson when she said, "I want you to take the students down [to the lab] to use the
computers." She realized that he lacked a framework for developing a lesson and guided
him by providing books of lesson ideas using the Internet. Mr. Jarvis talked about how she supported him in the development of that lesson and helped refine his original plan and suggested extending it over two days. He said:

She showed me everything; she even showed me the Internet activity. I didn’t come up with that at all. She suggested it to me, and then I wrote a lesson plan about it. She … said that it was too difficult, so I went back and re-wrote it. made it easier; because we went for two days. The first day we went they … got an idea on how to get on, how to navigate; and then the second day … was a more advanced activity, where they were independently working and experimenting with it on their own…. Some of those students have spent their life on the computers and others [have] barely touched a mouse.

Mr. Jarvis also discussed the support he received during the implementation of the lesson. He remarked: “When we went to the lab… [Ms. Sorens] was there with me, because just me and … the Title 1 Instructor in the lab wouldn’t have been enough. There were a lot of students that needed help.”

In the third example, Ms. Sorens talked about the sequential steps she used to support Mr. Jarvis in the preparation of a classroom presentation on the Vikings. She noted that she started by first having him teach with one of her presentations to become familiar with the process of delivering a computer-aided presentation. She shared:

I had created a [presentation] on the explorers that I let him use, just so that he could get familiar with … how I set up the computer to the projector, and … how I go through the [presentation]. And then we went to creating his own.
Ms. Sorens delineated her steps in supporting Mr. Jarvis' presentation. First, she gave him one-on-one instruction with the presentation software. Mr. Jarvis corroborated this step in his interview. He noted, "She showed me the basics of PowerPoint (1983-2000) and not only how to use it, but how to create one." Second, Ms. Sorens showed him how to create a graphic to include in the presentation. Mr. Jarvis verified this step with his statement. "She showed me how to create the tree maps for that one activity and I probably wouldn't have been able to find that without her I should say." Finally, as the presentation began to take shape, Ms. Sorens got help from the on-site educational computing strategist (ECS). She spoke highly of the support provided by the strategist:

We have such an awesome ECS, she allowed him to check out a laptop so that he could take that home, and create the PowerPoint (1983-2000); and she also put together a booklet that described how PowerPoint (1983-2000) works, and how to set up a ... presentation. And then of course she came out and went through more of the steps with him.

Mr. Jarvis also talked about this ECS support. He noted, "She gave me a laptop and I was able to take it home because I didn't have PowerPoint (1983-2000) on my computer."

Refinement of Practices

During an interview, Ms. Sorens discussed how her beliefs about her role as a cooperating teacher evolved as a result of activities and discussions with other cooperating teachers in the workshops. She said:

Well, at the very beginning, I thought it was different. I thought I was just supposed to say, "OK, here [are] my ideas, take my ideas and use them." And that is ... not the case ....At first, I guess I thought it was like being a supervisor, and that's not a
very correct opinion. Because I was just saying, "OK, here's this information, go do it." Instead of saying, "Here's some information, what do you think about it? You plan some."

During the second interview, Ms. Sorens further discussed this refinement of her beliefs about mentoring. When asked to comment on how the information presented in the workshop impacted her actual practice with her student teacher, Ms. Sorens remarked:

You know that last workshop really helped ... doing that rock activity where we had to think about someone who we thought was a really good mentor. I was thinking on that day that he's never going to say that about me... so I had to re-think; and I think that's what helped on Friday, having that conversation with him and just talking to him about those little things and actually being a mentor instead of a supervisor telling him what to do. So, that did help a lot.

In addition, she commented that the collegiality with other cooperating teachers in the workshop classes helped shape and refine her practice with her student teacher. She stated, "I've been picking up things in the classes, especially in the handouts that they give, and hearing other teachers talk about their student teachers." Ms. Sorens also noted that the collegiality promoted in the workshops offered her an opportunity "to share my experiences and say what can I do to better myself as a mentor; what can I do to help him become a better teacher?" This statement clearly shows the challenge she posed to herself to become a better mentor.
Case 5: Mr. Sotelo and Ms. Johans, High School

Overview

Mr. Sotelo, the cooperating teacher, taught high school biology and chemistry and was the chair of the department at his school. He had been teaching for eight years and Ms. Johans was his third student teacher. The high school where they worked followed a regular nine-month school calendar. In addition to the sections of biology and chemistry that he taught, Mr. Sotelo also had a section of Principles of Science for the first time this year due to a school-wide decision that all teachers should have contact with incoming freshmen.

General Technology Context

Mr. Sotelo had one computer in his classroom that was connected to the Internet. There was also an Internet connected computer in the workroom behind the classroom. Mr. Sotelo disclosed that he used email communication regularly as the Department Chair. He included Ms. Johans in those department communications. He stated:

She was treated as part of the department. So I told her since I’m the Chair, I put her in my files so that she always got emails too, along with all the student teachers.... They emailed back, too. So we did communicate that way.

Mr. Sotelo described his instructional activities with technology as presentations on content area topics, preparation of graphic organizers as study aids, and use of FlexCams for projection of materials. He also created a computer-aided presentation for Parent Night, as he believed it was important “to show them that it’s here.”

During the first interview, Mr. Sotelo noted that there were unusual circumstances this particular semester affecting access to computer labs for student work with
technology. The high school had recently been selected to house a technology magnet program. In order to prepare for the new programs, all of the computer labs were closed for the semester to allow for the necessary upgrades and network rehabilitation. In addition, he mentioned, “We had a lot of technical difficulties with the computer...the servers were down a lot and we had a hard time even implementing some days.” Ms. Johans also commented on these limitations in her interview. She said: “My technology was limited to the computer I have in my classroom, an LCD projector and a TV/VCR, and overhead projector.” She went on to add:

The labs weren’t available and I had quite a few resources from college classes. You know all your books came with CDs and they have great activities that would actually have, I think, applied very well for me. But if you don’t get a lab, you can’t do that.

So, in describing student technology activities, Mr. Sotelo shared what he had done in the previous year. He noted that students had used simulation sites on the Internet for content area topics such as the process of cell division. He also indicated that he had used these simulations as a station in class “and then I have questions for them to answer.”

Scores on the “Staff Use of Technology 2001 Self-Evaluation Rubric” (see Appendix D) indicated that Mr. Sotelo reported below average levels of technology use (M=2.57) compared to all of the other cooperating teachers in this study (M=2.93). Ms. Johans’ average score on the rubric (M=2.43) indicated that her self-reported technology skill levels were slightly lower than Mr. Sotelo’s reported skills. Her technology score was also below average for the group of student teachers (M=2.73).
During the interview, Ms. Johans mentioned that she had a computer at home that she used for preparing lessons and presentations. She noted that her home computer was the same platform as the one used at school.

**Conceptual Perspectives About Mentoring**

During the first interview, Mr. Sotelo talked about his beliefs concerning his role as a mentor. He shared, “Actually, what I think and what I know I didn’t get when I was a student teacher, is techniques – teaching techniques.” He also believed it was important to provide her with practical information on assessment and grading. He mentioned, “I’ve given her probably overwhelming amounts of things on ways to grade.” Hand in hand with the practical information on grading, Mr. Sotelo believed his role involved “teaching them how to interpret assessments, and the different types that are out there.”

At first glance, Mr. Sotelo’s conception of his mentoring role appeared to be based on offering technical advice (Little, 1990). However, as the interview progressed, he shared some specific approaches that reflected a stance of educative mentoring (Feiman-Nemser, 2001). For example, he mentioned that he believed his role involved attending to present concerns and interacting with Ms. Johans to promote growth in planning. He said it involved “being there to bounce off ideas, which she does when she’s kind of lost.” He also shared an example of educative mentoring that focused on enabling novices to learn in and from their practice to support student learning. He gave the following example as he talked about helping her learn how to use graphic organizers in teaching:

I showed her how to do it. I took sample a topic and I actually went over it with her, because they are hard when you’re in a class with forty kids, and that’s when she tried to use it when we had forty kids the first time. Unless you know what to
get from the kid, you're not going to be able to fill it out properly, and that's kind of what I tried to show her was how you get the feedback that you want to get the results that you need.

Mr. Sotelo offered an opportunity for Ms. Johans to find her own way of doing things rather than merely adopting his style. When talking about setting up a grade book template, Mr. Sotelo noted:

Actually, I have a template, but then she wanted to try her own template, so I let her do that and it's a little more cumbersome than mine, but that's fine because she learned and I learned ... a different way.... You know I really didn't want to be too strict because at least she was doing it and we got it done on time.

This passage also reflects Mr. Sotelo's adaptability in being able to address the present concern of establishing a record keeping system, without losing site of the long-term goal of empowering the student teacher while creating a workable system that would support the expeditious completion of teaching requirements.

Mr. Sotelo exhibited educative mentoring practice as he noticed signs of growth in Ms. Johans' work. He articulated:

She's good with the flex cam.... She pulls things from the Internet, and she and the other student teacher work together, which is good because that's part of, once you get the job, of [learning] to work with the people in the department, which is not always easy.

Mr. Sotelo recognized the technology skills she brought to the experience. He commented, "Actually, she's really good with the technology. I didn't use nearly that
much technology only because I didn’t have the resources to do it. Now that we have the LCD in there, she uses it a lot.”

*Mentoring Practices*

In addition to modeling network communication and sharing department information via email with Ms. Johans, Mr. Sotelo shared other practices he used to support her use of technology. Woven throughout these examples are passages that reflect the reciprocal nature of mentoring in this particular case. At the beginning of the year, he focused on productivity practices to help with data management. He mentioned, “I showed her how we set up the grade book program, [and] we set up all the files to save things in for all PowerPoints (1983-2000).” He further clarified:

I told her this isn’t the way it has to be, this is just the way since I have to live with it for the rest of the year that I’d prefer it to be. And I think she picked up some things, and she taught me some things, too as far as files [and] easier ways to keep things.

During an interview, Ms. Johans shared how his modeling of technology use in professional practice situations was helpful for her. She noted:

He uses the online communication; he introduced me to the [grading] thing. So, watching him do these things and integrate them into his lesson plans and his daily activities. I was able to then move that all and take it on myself.

Mr. Sotelo showed her how to create graphic organizers with computer software to help students learn the vocabulary and procedures in the content area. He talked about his steps for mentoring Ms. Johans in their use:
Sometimes I do...graphic organizers. She'd never used them before...She told me.

"You know, I find these really awkward to work with." So I showed her how...we use them. I modeled them for her to the class, and then I showed her how to make her own by using the computer to make them fit her lesson.

Ms. Johans also commented on learning to use the graphic organizers. She shared:

I'm not as comfortable with them. It's a foreign thing. I get really nervous before I use them. I always find them to be very helpful and to be very productive, and always get what I want out of them, but I get really nervous before I use them. So, that was definitely a guided discovery.

In addition to modeling practices, Mr. Sotelo spent one-on-one time showing Ms. Johans particular pieces of technological equipment she could use in her teaching. He said, "We used the flex cam and I...showed her how to use that. Right away she was on it and we used it." He mentioned that, "We did do the digital camera. We did it in the PowerPoint (1983-2000) for Open House.... She put in some pictures and she designed some slides, I designed some slides, we did it together but separately."

Ms. Johans also commented on the individual instruction and just in time learning with the equipment. She remarked:

I have a pretty good knowledge of technology and I feel pretty secure and comfortable with it. Generally, I just needed a couple of minutes, and the little things, the little quirks I didn't know, he would show me as we went.

Mr. Sotelo also modeled for Ms. Johans how to use other teachers as resources. He mentioned that he had her refer to other department teachers as she developed topics for
her lessons. He talked about how they used the educational computing strategist to solve problems:

We did utilize the ECS for some problems we had with the actual computer.

Figuring out how we could get it to work better. And actually, we both found out why our T-Views weren’t working …so we’re happy we finally got that.

One other support practice Mr. Sotelo mentioned was simply taking time to talk and work together. He said, “She learned a little bit and I learned a little bit just from talking and actually sitting down together and doing it on the computer.”

Ms. Johans acknowledged the support for technology use that he provided. She remarked, “He made the technology available for my use and it was easy then to use, instead of making it difficult.” She added, “He’s very good at giving feedback constructively, in all aspects of teaching.”

Refinement of Practices

When first asked if the workshops were beneficial for his work with his student teacher, Mr. Sotelo replied, “These seminars …aren’t really helping me now, but they will help me next time, if I get another [student teacher] at some point.” He went on to add that some of the information he learned in the workshops could have been used to guide previous lessons. He stated, “Now we have that information, but now they’re on other things and it’s hard to come back and share.”

However, in the first interview, Mr. Sotelo did note that he had put into practice one of the technology activities that was presented at the workshops. The following reference is to a group brainstorming activity that was done in the workshop using Inspiration (1988-2000) software. Mr. Sotelo commented, “I could do actually what you did, I’ve
tried and I like it, it’s just a little awkward...you’re typing it in as you’re going over it. The only thing is, when you use an LCD projector, it’s so dark in the rooms.” During the second interview, Mr. Sotelo showed that he still had that idea and had given more thought as to how it could be used in the future. He articulated:

I’m going to actually use what you did more if I can get my TV to work. It’s just sitting there doing that brainstorming with the lightning bolt and just coming up with data...after you do a lab.... have kids tell you right and left. Then you can discuss it and reorganize it and arrange it...the next day, you can pass it out and tell them this is what we discussed yesterday.... I can format it in a way that hopefully, they will be able to learn from.

This passage underscores previous research, which established that time and access to functional equipment are important factors in supporting technology use in teaching (Sandholtz et al., 1997; Sheingold & Hadley, 1990; U. S. Congress, 1995). Time is needed not only to learn the technology, but also to develop ideas for student-centered use that can be shared with student teachers. Access to functional equipment is required to support the creative projects that emerge as teachers develop those ideas.

Case 6: Mr. Sowell and Mr. Jensen, High School

Overview

Mr. Sowell, the cooperating teacher, taught high school English and Forensics and was the department chair. He had been teaching for 26 years and Mr. Jensen was his third student teacher. The high school where they worked followed a regular nine-month school calendar. This was the same high school setting previously noted in Case 5. Thus,
all of the computer labs were closed for the semester to allow for the necessary upgrades and network rehabilitation in preparation for the technology magnet program.

*General Technology Context*

Mr. Sowell had one computer in his classroom that was connected to the Internet. There was also an Internet connected computer in the workroom behind the classroom. During an interview, Mr. Sowell remarked that he used email communication regularly as the Department Chair. While the student teacher, Mr. Jensen, was not added to the department communication list, Mr. Sowell noted that he did share the communications with him.

At the first workshop, Mr. Sowell indicated that he was just beginning to use technology. In the first interview, he shared, “As with the students, I’m in a learning process.” During the interviews, he also noted that he had not used technology for lesson presentations. While he was eager to learn about technology during the workshops, in the first interview he voiced his concerns about its use. He commented: “I kind of enjoy technology, and I see a future of course with it, because that’s where it’s going. But, I think people must be careful not to let technology take us over.” He was also concerned about its use specifically in the classroom. He noted, “Technology does have its place as back up. I don’t believe that it should be the whole lesson, because I think that helps make the student lazy, in many ways.” He went on to add:

I think it should be there to help reinforce, because students do learn in different ways, they need different stimulations, not just listening to me or others, and not just movies. They do need other stimulations, so it’s a good tool for that, for helping to vary the lessons.
Taken together, these statements suggest that Mr. Sowell was dealing with issues similar to those identified in the "entry" stage of technology use (Sandholtz, et al., 1997). Research has identified that in this stage, teachers often express reservations about "whether the new technology would ever 'fit in'" (Sandholtz, et al., 1997, p.37). Mr. Sowell expressed deep concern for knowing his students individually to help support the learning process. He said, "I try to find out about their background, and try to know them as people." He was struggling with the belief that use of technology might take away the personal element in teaching. He said, "Technology is great, but don't lose the human element."

While he had reservations about technology use in the classroom, Mr. Sowell acknowledged that he used email "quite frequently" in his work as department chair. During the interview he remarked, "I finally this last weekend broke down and have email at home." On the final questionnaire he indicated that in addition to using his home computer for email, he also used it for school related work. On the questionnaire he also indicated that in previous years he had students use the computer lab once or twice a semester. He described those lessons as drill and practice activities for building skills in literacy.

Scores on the "Staff Use of Technology 2001 Self-Evaluation Rubric" (see Appendix D) indicated that Mr. Sowell reported the lowest average level of technology use (M=2.00) compared to all of the other cooperating teachers in this study (M=2.93). Mr. Jensen's average score on the rubric (M=2.50) indicated that his self-reported technology skill levels were higher than Mr. Sowell's skills; however, his technology score was below average for the group of student teachers (M=2.73). Mr. Jensen noted that he had a
computer at home that he used for email and to search the Internet for lesson plans or resource sites.

*Conceptual Perspectives About Mentoring*

When asked about his mentoring beliefs, Mr. Sowell described his role as: “To hopefully set a good example; to show them how things are done, supposed to be done; but then allow them to have their own freedom.” He believed that his student teacher learned by “having him observe not just me, but other teaching styles.” He manifested an element of educative mentoring in his focus of allowing Mr. Jensen to find his own way of doing things, “but then letting him have the freedom to adapt his performance skills.”

Additional insight into Mr. Sowell’s mentoring approach surfaced during an activity in the workshops. In the activity, the cooperating teachers were asked to create an analogy. They were given the writing prompt of “Being a cooperating teacher is like...” and asked to complete the sentence with supporting details for their beliefs. Mr. Sowell wrote that being a cooperating teacher was like being married. His three supporting details were: (a) [you are] different personalities working toward the same goal, (b) you experience high and low points, and (c) you fight and make up. During the first interview, Mr. Sowell referred to that analogy and noted, “[Mr. Jensen] and I at times have disagreed with things. And he’s even gotten mad at me. And I say, please do. Get mad and then prove me wrong.” He viewed this as one way of spurring growth and offering a challenge to improve Mr. Jensen’s practice. He went on to add that he found that he grew professionally as a result of working with student teachers. He commented: “You can teach old dogs new tricks. I’m learning from [Mr. Jensen]. He has some really super great lessons.”
During an interview, Mr. Jensen commented on Mr. Sowell's mentoring approach, which included a willingness to learn especially about technology. He said:

I think his just being willing to learn from me was encouraging because I do have some skills that I like to use, and that was good; and his willingness to say “OK, you can do that Internet lesson” even though I hadn’t prepared, that was encouraging to me that he wanted to see the technology used and he knew it was an emphasis.

*Mentoring Practices*

When asked what practices he used to support Mr. Jensen in helping him integrate technology into lessons, Mr. Sowell replied:

Basically, we just kind of discussed what the purpose was of the lesson that we were planning, and then what was available to help us achieve this purpose. One lesson that we did do was when I was doing “The Crucible,” [Mr. Jensen] went on the website and found some information concerning “The Crucible” and did a ...presentation of some of the characters, the costumes, the things of the day.

However, in this particular case, the support practices for encouraging student teacher use of technology are best summed up by the student teacher, Mr. Jensen. During the interview, when asked what practices Mr. Sowell used to support him in planning and use of technology, he replied:

He really left a lot of it up to me. He showed me the computer and his set up for [school email], and I’ve been using his [email] account for that daily bulletin and that kind of thing...He also used me as a resource to help him with some basic file management ...and that kind of thing. So, it was kind of a two-way street.
Mr. Jensen mentioned that he used other teachers as resources to help set up the equipment for a class presentation. He related:

Actually that was another teacher that showed me how to hook everything up. somebody that has done it a lot. It’s a first year teacher … she’s down the hall. And then [another teacher] who’s across the hall … uses it sometimes too so she helped me set it up the first time.

During an interview, Mr. Sowell talked about Mr. Jensen’s use of technology for writing lesson plans. He commented:

The first couple of weeks he did them on the computer, until he got himself organized and he just went into manually writing them… pretty much I guess. mimicking mine. Although I gave him the option, I think he wanted to be on the same page with me.

Mr. Sowell mentioned that he does his grades by hand rather than using the computer because “I’m not quite that trusting.” Mr. Jensen mentioned that he was fine with doing grades by hand but added, “I think when I’m on my own, it will probably be some combination of hand written and computer.”

Refinement of Practices

While acknowledging that he was still a beginner in using technology, after the workshop in which WebQuests were introduced to the cooperating teachers, Mr. Sowell did note some future plans for integrating those into his practice. He said, “I found some good ones. “The Great Gatsby,” I’m going to use that one when I get to it in my American Lit[erature] class. There was one on mythology, also. I’ll use that when my freshmen get to that.”
When asked if the workshops had any impact on his mentoring of his student teacher to teach with technology, he replied, "Definitely, yes. I found I loved the presentations and the other teachers' concepts of it for sharing very helpful."

Case 7: Ms. South and Mr. Jurek, Middle School

Overview

Ms. South, the cooperating teacher, taught eighth grade World Geography. She had been teaching for 14 years and Mr. Jurek was her fourth student teacher. Ms. South had participated in a prior session of this school district/university program with a student teacher. The middle school setting for this case followed a regular nine-month school calendar. Ms. South had access to two open computer labs with thirty Internet connected computers. In order to gain access to the labs, she would check the availability of the labs and reserve one for class periods as needed. During the first interview, Ms. South talked about the student population at the school. She said:

The reading grade level is low here, more because we're 78% Hispanic; but I don't think it's necessarily the culture as much as it is that many of them have not been in the country that long. Even though they may have the knowledge of the language verbally, they don't have the knowledge of the language for reading and writing.

She articulated that this that this impacted her approach to teaching and introduction of new material: "I try to paraphrase it, bring it down to an experience that they can associate it with." So she tried to structure experiences where the students "can physically, actively get involved in their learning situation."
General Technology Context

Ms. South had seven computers in her classroom, only one of which was connected to the Internet. She used that computer to access email communication and daily school bulletins. She also used it for online research. Ms. South noted that she used the computer daily for school related work and weekly for instructional purposes. She also had a school district laptop which she used both in the classroom for teaching activities and away from school for lesson research and planning. In addition, she had a computer at home that she used for school related work. She described her instructional activities with technology as presentations on content area topics, using software for displaying graphic organizers on selected topics, and introductions to subject area software.

Ms. South noted that students used the classroom computers several times a month and that they used the computers in a lab once or twice a semester. Her reported student activities included creating thinking maps and word processing to type reports.

Scores on the "Staff Use of Technology 2001 Self-Evaluation Rubric" (see Appendix D) indicated that Ms. South reported above average levels of technology use (M=3.14) compared to all of the other cooperating teachers in this study (M=2.93). Mr. Jurek's average score on the rubric (M=3.57) showed that his self-reported technology skill levels were higher than Ms. South's reported skills. His technology score was the highest score reported for the student teachers and well above average for the group (M=2.73).

During the interview, Mr. Jurek mentioned that he had two computers at home and used both for school related work. He also said, "I used to work as an architect, and so I know a little bit about graphics [software]. So, I don’t feel scared about using
[technology].” He went on to add that he didn’t consider himself “computer advanced.” but he did “have a background to know basic things.”

In discussing the factors that supported her use of technology in the classroom, Ms. South mentioned four factors. First she noted the support of the ECS. She said: “She’s so good...She’s always there for us, no matter what it is, whenever we have a trouble spot or something.” The second and third factors involved the support from the school administration, both in supporting the teachers’ work and in supplying access to technology. She commented: “Our administration is very supportive of student teachers...[and] very supportive of technology...as you can see with as many computers [as I have in the room].” Finally, Ms. South talked about the factor of the vision for the school. She remarked:

I love being at a school that’s trying to be innovative in a less innovative area.

We’re in a handicapped area, we really are, and I think the school is trying to really be creative and come up with programs that can help people.

Conceptual Perspectives About Mentoring

During the first interview, Ms. South described her role as a mentor. She said, “I think my role is to allow him to be the best teacher he can be.” Later in the interview she added: “I think my role is not only to guide them in their teaching, but I think I have a role to help them move on to get a teaching job.” Thus, her long-term vision reached beyond simply developing teaching strategies, and focused on a goal of helping student teachers find a job to continue their development as teachers.

Ms. South also revealed several tenets of educative mentoring in her approaches. She believed it was important to help Mr. Jurek find his own way of doing things. She
encouraged him to observe other teachers in the building to become aware of different approaches for teaching. She stated:

Some teachers have a lot of noise going on and a lot of things going on in their classroom, and it works for them, it just doesn’t work for me. That doesn’t mean that won’t work for my student teacher, and I point those things out to him. My way is not the only way. So you can adapt whatever works for you and your personality.

Ms. South also talked about an educative mentoring strategy of finding an opening to pinpoint specific problems in teaching. She remarked, “I’m not going to point out everything he’s doing wrong. But, I’m going to, at the teachable moment, point out those things that he needs to work on.” In addition, she talked about the importance of probing novice’s thinking to help them learn from their practice. She said she used “more open-ended questions and getting them to think it through for themselves instead of just telling them.”

One other mentoring concept Ms. South believed was important was an understanding of teacher learning and supporting novices in dealing with those unsuccessful lessons that all teachers have. She said:

I think they need positive support. I guess I can’t stress the word positive enough because sometimes they can be really down on themselves if they don’t do a good job of teaching. Something that they had planned to do just flopped. Sometimes we can put a lot of effort into something and it just didn’t work. The kids didn’t get it.
As she talked, she suggested that the support could explore “different ways to teach [the concept] and be creative and come up with different methods” for those unsuccessful lessons.

One final element of an educative mentoring belief that Ms. South espoused was modeling for her student teacher that teachers are constantly learning in and from their practice. She gave the following example:

I was talking to my student teacher about teaching with modules.... I had that presented in a couple of workshops I was in, and I thought I’ll have to try that. I’ve never tried it. I have some ideas of how it works in other classes, but I haven’t really got a firm idea of how to implement it in geography. Anyway, I suggested that to him and I told him to be creative and try to come up with some ideas.

Ms. South stated her belief that the opportunities for continued learning in practice also applied to her role in mentoring a student teacher with her words: “I have felt that by trying to give guidance to my student teacher, I’m the one that’s benefiting. I have learned so much.”

*Mentoring Practices*

During the first interview, Ms. South mentioned that one of the first things she did was to find out what her student teacher knew in relation to technology. She articulated: “I asked him what he knew to try to see where he’s from. What did he know, what is he comfortable with...what does he use?” She added that Mr. Jurek “was very computer technology literate.” So, she began her support by offering him a challenge: “I told him that I’d like him to do one use of technology a week somewhere in his lessons.” She
noted in an online posting that "he has accepted this challenge." In his interview, Mr. Jurek delineated the results of that challenge:

I taught several different things that included technology. We taught lessons on researching using the Internet as a tool. For some projects they used word processing ...and we also included in that graphics they could use...to jazz it up.... We used different software ... where they used the computer in class and also in the computer lab. We did [computer presentations], so we used a variety of technology.

Ms. South explained how she showed Mr. Jurek system information, such as how to access the school communications via email, and how to set up and use the grading program and attendance. In talking about his introduction to the grading program, Mr. Jurek commented. "She...first introduced me to the program at the beginning; and I had seen it before from my practicums, but I had never used it." He added that it took "probably just 10 to 15 minutes" for Ms. South to show him how to use the program.

Then Mr. Jurek described how she established an expectation for its use. He said:

She explained and showed me how to set it up. The first period of the day, she said "OK, this is what you're going to do. You get the cards, you add them to the list, you go through and do this and this."

He mentioned that he was glad to have the support to learn how to set up this type of record keeping at the beginning of the year rather than viewing it mid-year when it was already established.

In online correspondence, Ms. South shared another practice she used in helping Mr. Jurek to explore the software available at the school. She wrote:
[Mr. Jurek] and I have discussed what software is available for use with our students...Together we went to the computer lab and looked in the notebooks at all the software we have on site. We discussed what software we could use that would enhance our curriculum and help the students to understand the material.

We decided to use Inspiration (1988-2000) in the next unit.

She added that she didn’t just show the software, but also discussed how it could be used to connect to student learning. In order to support Mr. Jurek’s development with that next unit, she also supplied the means for him to explore the software. She remarked: “He took my laptop home, worked on it, learned Inspiration (1988-2000) and then came back ready to do Inspiration.”

Ms. South shared that she also used modeling practices to help Mr. Jurek learn how to present material. During the second interview she revealed:

I teach the first period of the day so they can kind of see where I’m going and how I would handle that subject matter or content matter. They’re not required to do as I do, but it just gives them an idea.

Mr. Jurek commented on this modeling support as well as the encouragement that Ms. South offered in experimenting with teaching approaches integrating technology. He stated:

I think that she encouraged it was good. I think that’s important ...because especially as a student teacher, all the material is new to you.... Sometimes, you’re trying to ...not necessarily learn the information because a lot of it you probably know, but learn how you’re going to present it. She encouraged using those other
outlets to help you learn to teach in a variety of ways, so you don't do the same thing everyday.

Mr. Jurek added, "Getting it told to you and seeing it modeled I think are two different things."

**Refinement of Practices**

In an online posting, Ms. South talked about how the workshops had led to a refinement in her beliefs about her mentoring practice as well as her personal practice. As she reflected on an article she read as part of the workshops, she shared:

I have had 4 student teachers in the last 9 years. The first two experiences were not as effective as the last two. Why?, because...I have received training in how to be an effective cooperating teacher and not just be a model and give suggestions.... The cooperating teacher needs to impart wisdo[m] of practice to help the student teacher develop an ability to think back about teaching decisions and think forward to reasons why [he] is making instructional choices.... I have found that I am a better teacher since I have been a cooperative teacher. Not only have I learned from my student teacher but I have needed to analyze why I teach like I do and what changes [I] would make to have my teaching be more effective.

In a later online posting, Ms. South expressed how she had put the questioning strategy into practice with her student teacher. She was relating an incident in which Mr. Jurek had sent home progress reports using the grading software. Ms. South noticed that some reports indicated there were many missing assignments, resulting in many students receiving a failing grade. She related:
When I brought this to [Mr. Jurek’s] attention I asked him if he had any thoughts as to why or what could be done. Through using the questions he came up with his own conclusions [about] what needed to be done. He spoke to students individually and gave them until Wednesday to turn in late work.

During the second interview, Ms. South expressed how valuable the workshops had been for her in helping her gain a deeper understanding of her role in working with student teachers. She articulated: “It helps me in knowing things I should be encouraging them to do, and being more careful in the approach that you’re taking to get them to do it.”

Part II: Research Question One

The first research question was: what are the general technology contexts in which the cooperating teachers work, and what are their conceptual perspectives about mentoring? This section will address the question using the following method. First a brief review of the literature will orient the reader to the focus for this question. Next the technology context will be addressed first from the general perspective of all cooperating teachers, then from the specific context of the multi-case studies. Finally the conceptual perspectives will be addressed first by the general perspective of the group, then by the specific perspective from the multi-case analysis.

Research has identified that technology practice is affected by general contextual factors that influence teachers’ use of technology (Ertmer, et al., 2001). Mentoring literature has also indicated that mentors’ conceptualization of their mentoring practice affected their interactions and work with novices (Feiman-Nemser, 2001, Wang, 2001).
In order to provide a picture of the mentoring practices of the cooperating teachers in preparing student teachers to teach with technology, it is helpful to address underlying components that affect cooperating teachers’ practice. Each teacher practices in a unique context. The underlying components of the general technology context and conceptual perspectives are addressed in this section.

Data Analysis

Descriptive statistics on the general technology context were compiled from the final questionnaire using the computer software Statistical Product and Service Solutions, Version 10.0.5, 1999. Content analysis from interview data, online postings, and in-class group discussions, identified passages and phrases that supported additional analysis of the conceptual perspectives. For example, phrases such as “he has a preconceived idea of learning how to teach,” and “they’ve been a student probably their whole lives, so that would probably be one way,” were identified in the “How students learn to teach” category of “From prior knowledge as a student.”

General Technology Context

General Perspective From All Cooperating Teachers

Reported technology context. Items drawn from the final questionnaire and interview transcripts were used to gather data depicting the technology context of the cooperating teachers. The data are displayed in Table 7. All of the teachers had at least one computer in their room, and twelve (75%) indicated having at least two or more computers in the classroom. Of those classroom computers, the teachers were asked to identify how many had Internet access. Four of the teachers (25%) indicated no Internet access in their room. All of these teachers were temporarily housed in portable
Table 7

*Reported Technology Context of Cooperating Teachers*

<table>
<thead>
<tr>
<th>Cooperating teacher</th>
<th>Access to computers</th>
<th>Personal professional use of computers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Computers in classroom</td>
<td>Internet computers in classroom</td>
</tr>
<tr>
<td>Sacco</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Sanchez*</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Snyder</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Seger*</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Soto</td>
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<td>0</td>
</tr>
<tr>
<td>Sanders*</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Schafer</td>
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<td>0</td>
</tr>
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<td>Solmon</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>Sorens</td>
<td>7</td>
<td>1</td>
</tr>
<tr>
<td>Shipp</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>Somers</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>South</td>
<td>7</td>
<td>1</td>
</tr>
<tr>
<td>Stewart</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Sotelo</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Sowell</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Sinclair</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

*Note. '2+ monthly indicates usage of several times a month. * denotes track break alternate teacher

classrooms for the school year while their regular classrooms were being renovated. They noted that they had Internet access in their regular classrooms, but no access in the
portable classrooms. Plans were underway to bring wireless networking to those portables, but at the time of this study, the service was not available.

Teachers were asked if they had a laptop provided by the school district. Seven (63%) of the teachers had laptops and all of them indicated that they used them away from school for lesson research and planning. The laptops provided convenient access to technology and the portability provided more opportunities for growth of technology skills (Falba et al., 2001).

Item nine on the final survey asked the teachers to indicate how often they used computers for instructional purposes. The responses to this item included seven categories: daily, weekly, several times a month, monthly, once or twice a semester, never, and no computer in my room. Thirteen (81%) reported at least weekly use of technology for instruction.

Additionally, during the first interview, teachers were asked about their use of technology in teaching. Data from those transcripts were coded to identify different types of uses including lesson plans and grading on the computer. Data from the transcripts also indicated that all of the cooperating teachers used email for professional communication. Participants at four of the five schools stated that online systems were used for school wide communication. Mr. Sinclair noted, “We have our school wide email system. They’re trying to cut down on the paper usage, and doing a pretty good job actually.”

*Reported student use of computers.* To further explore the technology context, coded data from the transcripts were used to identify how the cooperating teachers integrated technology into student learning activities. Becker, Ravitz, and Wong (1999) framed
student computers use by identifying different types of software used for learning activities. They used ten categories of software descriptions to identify patterns of use. For this study, eight of those categories were used to explicate how teachers used technology in their lessons. The pattern of use reported among the cooperating teachers for those eight categories is shown in Table 8. The category of “Skill practice games” was combined with the category of “CD-ROM” as it characterized use of technology for activities other than word-processing. The cooperating teachers reported no use of spreadsheets or databases, so that category was not included in the table.

There were some consistencies across the categories of use. Thirteen of the teachers (81%) reported higher levels of student use of multimedia. Twelve of the teachers (75%) reported use of the World Wide Web, CD-ROMs, and word processing with students. Lower levels of student use were also consistent in four categories. Five of the teachers (31%) indicated student use presentations. Four teachers (25%) reported use of computer simulations. three teachers (19%) indicated use of graphics software and email with students.

Specific Perspective from Multi-Case Analysis

Case study data on general contexts supporting technology use provided an opportunity to explore the general technology context in more depth. The second interview with the cooperating teacher coupled with the student teacher interview provided information on other contextual factors concerning technology use during student teaching. Multi-case comparison revealed similarities in these factors.

First, the general perspective reported how the cooperating teachers used technology in teaching. The specific case studies reported information on the additional
Table 8

*Cooperating Teacher Reported Student Use of Computers*

<table>
<thead>
<tr>
<th>Cooperating Teacher</th>
<th>Word Process</th>
<th>CD-ROM</th>
<th>WWW</th>
<th>Simulation/Exploratory Environment</th>
<th>Graphics</th>
<th>Presentation</th>
<th>Multimedia</th>
<th>Email</th>
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<tr>
<td>Ms. Sacco</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<td>X</td>
<td>X</td>
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</tr>
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<td>Ms. Snyder</td>
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<td></td>
<td></td>
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<tr>
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<td>Ms. Solmon</td>
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<td>X</td>
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<td></td>
</tr>
<tr>
<td>Ms. Sorens</td>
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<td>X</td>
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<td>X</td>
<td></td>
<td></td>
</tr>
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<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ms. South</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Mr. Stewart</td>
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<td></td>
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<td></td>
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<td></td>
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<td>75%</td>
<td>25%</td>
<td>19%</td>
<td>31%</td>
<td>81%</td>
<td>19%</td>
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</tbody>
</table>

*Note.* * denotes track break alternate teacher
factor of how student teachers used technology in teaching. Another factor included reported use of on-site computer strategists as resources for the student teachers. A third factor that emerged was the issue of administrative support for student teachers and technology. Data from contextual factors reported on the cooperating teacher questionnaire along with the additional factors from the case studies are displayed in Table 9. Multi-case analysis suggests three primary findings, and one secondary finding. In the primary findings, first, support from on-site educational computing strategists (ECS) was noted as a resource in the general technology context supporting student teachers’ use of technology. Second, placement of more than one computer in the classroom supported increased opportunities to develop lessons for student use of technology. Finally, regular or ready access to a computer lab also supported more instructional uses of technology for active student learning. A secondary finding indicated the importance of administrative support.

Support from on-site computer strategist. In this study, all of the cases noted support from the on-site educational computing strategist (ECS) during the student teaching experience. While all cooperating teachers in the case study reported using the ECS for support, their reports showed varying levels in this support. They cited instances in which the ECS provided planning support and additional resources, instructional support by modeling technology lesson with students, and technical problem solving with equipment. Ms. Sorens noted a very active support role in the planning phase by providing additional resources:

[The ECS] allowed him to check out a laptop so that he could take that home, create the PowerPoint; and she also put together a booklet that described how
Table 9

Technology Context for Case Studies

<table>
<thead>
<tr>
<th>Technology Context</th>
<th>Case 1</th>
<th>Case 2</th>
<th>Case 3</th>
<th>Case 4</th>
<th>Case 5</th>
<th>Case 6</th>
<th>Case 7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data from questionnaire</td>
<td>Ms. Soto, Ms. Jeffers</td>
<td>Ms. Solomon, Mr. James</td>
<td>Mr. Somers, Ms. Jenks</td>
<td>Ms. Sorens, Mr. Jarvis</td>
<td>Mr. Sotelo, Ms. Johans</td>
<td>Mr. Sowell, Mr. Jensen</td>
<td>Ms. South, Mr. Jurek</td>
</tr>
<tr>
<td>Number of classroom computers</td>
<td>3</td>
<td>5</td>
<td>7</td>
<td>7</td>
<td>1</td>
<td>1</td>
<td>7</td>
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<tr>
<td>Internet classroom computers</td>
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<td>yes</td>
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<tr>
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<td>yes</td>
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<tr>
<td>Reported student use in classroom daily</td>
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<td>daily</td>
<td>2+ monthly</td>
<td>2+ monthly</td>
<td>never</td>
<td>2+ monthly</td>
<td>2+ monthly</td>
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<tr>
<td>Reported lab use weekly</td>
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<td>weekly</td>
<td>monthly</td>
<td>1-2/semester</td>
<td>none this semester</td>
<td>none this semester</td>
<td>1-2/semester</td>
</tr>
</tbody>
</table>

Data from interviews and online postings

<table>
<thead>
<tr>
<th></th>
<th>Case 1</th>
<th>Case 2</th>
<th>Case 3</th>
<th>Case 4</th>
<th>Case 5</th>
<th>Case 6</th>
<th>Case 7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reported administrative support</td>
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<td>yes</td>
<td>-</td>
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<td>-</td>
<td>yes</td>
</tr>
<tr>
<td>Reported on-site personnel support</td>
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<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
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<tr>
<td>Reported student teacher use of computer presentation for lessons</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
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<tr>
<td>Reported student teacher lessons with student computer use</td>
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<td>multiple</td>
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<td>one</td>
<td>no</td>
<td>no</td>
<td>multiple</td>
</tr>
</tbody>
</table>

Note: - not reported
PowerPoint works, and how to set up a PowerPoint presentation; and then of course she came out and went through more of the steps with him.

Ms. Soto also reported an active role for the ECS in modeling lessons with students. She said, “I had her come in for a couple lessons in the beginning just so [Ms. Jeffers] could see the role of the ECS and what you could ask.” In referring to the ECS’s role in supporting student learning, Ms. Soto added:

[The ECS] plays a huge role for all of us. So, we use her all the time. and she’s not like this person that doesn’t exist at our school. So, I … wanted her to come in [for Ms. Jeffers to] see how she interacts with the kids and that the kids know her.

In both of these instances, the ECS played an active role in directly supporting the student teachers.

Mr. Sotelo indicated that they referred to the ECS in the capacity of technical problem solving with equipment rather than support for teaching and learning. He said, “We did go to the ECS about the T-Views and things like that, but not actually for curriculum planning…. We did utilize the ECS for some problems we had with the actual computer.”

*More than one computer in the classroom.* In this study, four of the five student teachers with three or more computers in their classroom reported more lessons in which the students used the classroom computers during learning activities. For example, Mr. Somers talked about how the additional computers and the accompanying additional copies of software made it easier for students to use technology for reference. He said, “I have six copies of Encarta so the students have that available to use it anytime in the
room." He went on to give an example of how he structured his planning to allow for individual student use of computers. He delineated:

I may plan a week where six or seven of the students aren't doing what the rest of the class is doing and they each get a day on the computer, because I have enough computers that we can rotate the whole class through the period in the course of a week. So, everyone has to do the same amount of work during the week, they're just not necessarily doing it all on the same day.

Ms. South and her student teacher, Mr. Jurek, shared how they were able to use the additional computers in their classrooms during lessons. Mr. Jurek said, "Most of the times I used technology with the students...I modeled it as a class before we went to the lab or before they worked in class." He also spoke of situations in which students used the same software in both lab and classrooms situation. He explained, "We used different software... where they used the computer in class and also in the computer lab." In an interview, Ms. South provided some supporting information on one of those classroom work situations. In discussing a lesson in which Mr. Jurek introduced students to the Internet, she explained, "We did part of it in class while we were modeling it, and then the next day we went into the computer lab and they had to do it on their own."

**Lab access.** Multiple use of lessons in which student teachers' had classroom students use computers was reported by four of the five teachers who indicated access to a computer lab. For example, in the case with Ms. Solmon and Mr. James, Mr. James talked about several activities he did with the students in the computer lab. First, he mentioned, "In the computer lab...we go on the Internet." He also spoke of another lab
activity. He said, “In the computer lab, we did a lot of KidPix (1989-2001) to get familiarized with the computer.”

In other cases, as previously mentioned, Mr. Jurek referred to his use of the lab for student activities. In the case study, Ms. Soto and Ms. Jeffers also mentioned their use of KidPix (1989-2001) in the lab to help Ms. Jeffers and the students become comfortable with technology use.

Student teachers in the two cases with no lab access reported that they did not develop lessons that involved student use of computers due to the lack of access. Both of those cases were located at the school in which normally available labs were unavailable due to district refurbishing. In the case with Mr. Sotelo and Ms. Johans, Ms. Johans responded to the fact that no computer labs were available. She noted, “So, my technology was limited to the computer I have in my classroom, an LCD projector, a TV/VCR, [and] and overhead projector. Those were my limitations.”

In the case with Mr. Sowell and Mr. Jensen, Mr. Jensen noted, “There’s only one computer in the class and we didn’t have the kids on the computer at all.” During the interview, he also responded to the questions about factors that inhibited his use of technology (See Appendix G) and referred to how the lack of access to the lab inhibited his planning and use of technology. He said:

Well, to me, the fact that there’s only one computer for all of the kids to use and teacher to use. If we wanted to do PowerPoint presentations. I can imagine having the kids all do paper outlines and then giving them time to work one by one in class. But that’s very time consuming and it would be at least a month before everybody had a chance to enter their data, and they’d have to all have disks.
In these cases, both student teachers noted that lack of access to the lab and only a single computer in the classroom limited or inhibited their use of technology in teaching.

*Secondary finding of administrative support.* Teachers in two of the cases reported during the interviews that administrative support for technology use was a critical element in supporting cooperating teachers in their use of technology, and in their work with student teachers. The teachers explained that administrators supported them through encouragement, recognition, and increased hardware in the classrooms. This question of administrative support was not directly addressed in the interview questions, but surfaced as cooperating teachers shared information on factors that increased their use of technology in teaching.

During the first interview, Mr. Somers noted: “Over the past three years, the thing that has made a significant difference in the use of technology in the building is that our administrator, [the principal], strongly believes in technology.” He added that her support helped arrange for the additional computers in his classroom. He also mentioned that the principal was instrumental in approaching the grant director about becoming part of this school/district university collaborative project for professional development. He said, “[The principal] talked to [the grant director] about including our school in this second year of Project THREAD.”

Ms. South also mentioned support from her principal that included work with student teachers as well as work with technology. She commented, “Our administration is very supportive of student teachers....very supportive of technology. Well as you can see with ...how many computers [on campus].” Ms. South also noted that the principal took a personal interest in the student teachers. She remarked, “The principal invited [Mr.
Jeffers] to come up ...so they could sit down and talk. So he went up there and visited with him. So, yes, our administration is wonderful.”

Both of these cases indicated how administrative support influenced technology context and use. By providing increased access to classroom computers, both administrators made it easier for teachers to use technology with students.

*Conceptual Perspectives About Mentoring*

The framework for this study was grounded in sociocultural perspectives of learning. In this perspective, support from an experienced person is critical for a novice to learn at a level beyond her or his independent ability (Vygotsky, 1978). In addition, according to Bransford, et al., (2000), children come to a learning task with preconceptions and initial understandings about how the world operates, and this prior knowledge provides a foundation for building new knowledge. Bransford, et al. operated on the assumption that knowledge about learning in children also applies to teachers. In this study, the cooperating teachers were the learners with preconceptions about their role as mentors and the student teaching experience. These preconceptions helped shape their beliefs about their roles as mentors.

*General Perspectives on Conceptual Perspectives on Mentoring*

*Conceptual beliefs on learning to teach.* In order to identify their meanings of their role as cooperating teachers, the participants were asked in the first interview how they believed student teachers learned to teach. As shown in Table 10, there were some consistencies in those beliefs across the population of cooperating teachers. All of the teachers (100%) identified that student teachers learned by doing, by actually getting in front of the students and teaching. For example Ms. Shipp noted:
You don’t learn until you get into the trenches. I don’t think there’s any other way to say it because you can read about it, you can observe it, you can watch movies on it; but, until you actually get in there, get your feet wet, experience it, that’s the only way they’re going to learn.

The majority of the cooperating teachers echoed this view that cooperating teachers need to stand back and let the student teachers “spread their wings” or “learn by experience.” Some teachers noted this phenomenon of learning by doing from a trial and error perspective, as in the case of Ms. Schafer. She remarked, “If you just watch, you’re not going to learn, because you need to get out there and make your own mistakes.”

However Mr. Somers offered a more supportive perspective. “For the first two or three weeks, we kind of team-taught. Sometimes, I’d open my mouth and I’d hear her voice, and I’d look around and she would finish saying what I was thinking.” He noted that he and his student teacher worked well together and had similar styles of teaching, so it was easy for him to let her assume teaching responsibilities.

A majority of the cooperating teachers stated that they believed student teachers learned to teach by observing. Fourteen (88%) specifically stated observing their cooperating teacher, ten (63%) specifically mentioned observing other teachers. Mr. Seger commented, “I think that they use a lot of different things. I think through observation...of other teachers and their master teacher.” Ms. Sacco, too, noted, “I think just being in the room, seeing another teacher, taking notes on how they do these things. It goes back to modeling.”

The value in taking time for reflection and questioning after lessons was recognized by 11 (69%) of the teachers. Ms. Sorens noted, “Sometimes, it’s hard to talk
Table 10

Cooperating Teachers' Stated Beliefs About How Student Teachers Learn to Teach

<table>
<thead>
<tr>
<th>Cooperating Teacher</th>
<th>From prior knowledge as a student</th>
<th>By observing the cooperating teacher</th>
<th>By observing other teachers, other classes</th>
<th>By doing, imitating other teachers</th>
<th>By applying university course work</th>
<th>By reflecting after lessons</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ms. Sacco</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Mr. Sanchez*</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ms. Snyder</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mr. Seger*</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Ms. Soto</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ms. Sanders*</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Ms. Schafer</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ms. Solmon</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ms. Sorens</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ms. Shipp</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mr. Somers</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ms. South</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mr. Stewart</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mr. Sotelo</td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mr. Sowell</td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mr. Sinclair</td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Total</td>
<td>19%</td>
<td>88%</td>
<td>63%</td>
<td>100%</td>
<td>31%</td>
<td>69%</td>
</tr>
</tbody>
</table>

Note. * denotes track break alternate teacher.
every single day about how he’s doing and how he thinks it went...but we try and set
aside 10 minutes after school and say how do you think that went?” Another less
proactive viewpoint was offered by Mr. Sinclair. “For the most part, I wait for them to
ask me. ‘What do you think?’ and I’ll tell them what I thought.”

Five of the cooperating teachers (31%) mentioned that students learned to teach by
applying their university course work. For example, Ms. Sacco stated, “One third of what
they come with is from their university training.” Ms. Shafer also mentioned the impact
of the knowledge acquired in the methods courses. She explained, “You’re going to learn
a lot of methods in class, and now you need to take what you’ve learned in those classes
and put them into practice.”

Only three of the cooperating teachers (19%) mentioned that student teachers’ prior
experiences and observations as students affected how they learned to teach. Mr. Sanchez
described that prior knowledge during his interview. He said: “Well, I don’t know
whether this is fortunate or unfortunate, but I think most people teach how they were
taught; or at least they start off teaching how they were taught.” Mr. Delgado also
referred to their prior experience as a student as a way of learning to teach. He
mentioned, “They’ve been a student probably their whole lives, so that would be one
way: what they like from a teacher, what they don’t like from a teacher. So, they learn
that way.”

*Conceptual beliefs about mentoring.* Sociocultural perspectives of learning posit that
teachers’ knowledge is situated in the practice and culture of teaching (Brown, Collins, &
Duguid, 1989), and that knowledge is shaped by the interactions and social experiences
in classrooms and school contexts (Carter, 1990). These experiences help form the beliefs
teachers have about their roles as teachers. Thus, the beliefs about and approaches to mentoring will vary from teacher to teacher. According to Wang (2001) little is known about the conceptual differences among mentors who work in different contexts. One way of exploring these conceptual differences is by looking at the types of support a cooperating teacher believes is needed by a student teacher.

This concept of support for beginning teachers has been identified as a central theme underlying mentoring practices (Gold, 1996). Data addressing this concept were drawn from the questions in the first interview in which teachers were asked what they believed student teachers needed from cooperating teachers. Odell (1986) identified seven categories of support in a functional analysis of assistance to new and new to system teachers. The categories included: (a) system information, (b) resources and materials, (c) instructional, (d) emotional, (e) classroom management, (f) environment, and (g) demonstration teaching. These categories were used to analyze the beliefs of the cooperating teachers about the types of support needed by student teachers as shown in Table 11.

The results indicated that all of the cooperating teachers believed that emotional support was important for their student teachers. This support included observations such as allowing them to be comfortable with asking questions and sharing their reflections on lessons. Ms. Saunders characterized this type of emotional support as an opportunity to reflect on growth in teaching. She commented:

We will have dialogue so they can tell me what is successful for them, what is not successful for them and then what they need from me ... a growing period ... through personal self-assessments, personal self-evaluation. But, not only are they
Table 11

Cooperating Teachers’ Reported Beliefs about Support Needed by Student Teachers

<table>
<thead>
<tr>
<th>Teacher</th>
<th>System Information</th>
<th>Resources/Materials</th>
<th>Environment</th>
<th>Instructional</th>
<th>Classroom Management</th>
<th>Emotional</th>
<th>Demonstration Teaching</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sacco</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Sanchez*</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Snyder</td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Seger*</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Soto</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Sanders*</td>
<td></td>
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</tr>
<tr>
<td>Schafer</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Solmon</td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<tr>
<td>Sorens</td>
<td></td>
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<td>Shipp</td>
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<td>Somers</td>
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<td></td>
</tr>
<tr>
<td>South</td>
<td>X</td>
<td>X</td>
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<td></td>
<td></td>
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<tr>
<td>Stewart</td>
<td>X</td>
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<tr>
<td>Sotelo</td>
<td>X</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Sowell</td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sinclair</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>63%</td>
<td>75%</td>
<td>25%</td>
<td>69%</td>
<td>56%</td>
<td>100%</td>
<td>100%</td>
</tr>
</tbody>
</table>

Note. * denotes track break alternate teacher.

self-assessing, we’re doing it together, because we’re growing together.

Ms. Snyder characterized the support as reassurance. She noted: “I think they need reassurance that they’re capable of doing this.” Mr. Seger framed the support as a comfortable relationship that supported communication. He said: “He came to me whenever he had a questions, and I think that’s important too that the cooperating teacher
and the [student] teacher has that relationship where they can be open with communication and work together.’’

All cooperating teachers also believed that demonstration of teaching practice was critical for student teachers. Ms. Shipp stated it most succinctly when she said, ‘‘That’s the key. model for them.’’ Ms. Shafer included more detail as she delineated:

I felt that we were supposed to serve as a guide to help them find the resources, to model lessons for them, and then to help them plan on their own, to eventually wean them off of you so that they can plan their own effective lessons, use different strategies, teach them assessment tools, things like that.

Only four (25%) of the cooperating teachers mentioned environmental types of support, which included items such as how to organize or arrange the physical setting of the classroom. Of the 16 teachers, nine (56%) mentioned the classroom management types of support such as giving guidance related to discipline or planning and scheduling the school day.

In addition to Odell’s (1986) framework of support practices, several of the cooperating teachers mentioned that they believed their work as mentors would also include learning on their part. Mr. Sanchez noted, ‘‘I think we’ll be learning together. I think that’s going to be a lot of it.’’ Ms. Sacco also referred to learning together and constructing a shared knowledge base. She noted, ‘‘In addition, she’s shown me a lot too that I either forget or haven’t thought about. You know our knowledge base is then shared.’’
Specific Perspective from Multi-Case Analysis

Conceptual perspectives in the case studies were addressed in two ways. First, Odell’s (1986) seven categories of support were used to address their beliefs on the support needed by student teachers. Second, six of Feiman-Nemser’s (2001) strategies for educative mentoring were used as a framework for analyzing mentoring beliefs. Data from the case studies of the reported conceptual perspectives supporting technology use from these two perspectives are displayed in Table 12.

The data addressing categories of support is closely aligned with the data from the group presented earlier in this chapter. All agreed on the need for demonstration teaching and emotional support. The next highest belief cited by six of the teachers was the need for resources and materials. Five of the teachers noted instructional and system information support. Just over half (4) mentioned classroom management, and the least mentioned was environment. These findings are consistent with the data on beliefs of support for the general group.

Analysis of the comparison across cases on the area of conceptual perspectives on mentoring using Feiman-Nemser’s (2001) educative mentoring approaches suggests one finding for encouraging technology use in teaching. Practices that support technology use revealed conceptual perspectives that moved beyond emotional support and technical advice and attempted to help novices learn a conceptual approach to teaching.

Situated in the specific practice of their classrooms, cooperating teachers tried to help student teachers develop professional-practice skills that could be applied in new situations. In this study, the majority of case study cooperating teachers indicated a trend
Table 12

Reported Conceptual Perspectives of Cooperating Teachers on Helping Novices Learn to Teach

<table>
<thead>
<tr>
<th>Conceptual perspectives on mentoring</th>
<th>Case 1 Ms. Soto, Ms. Jeffers</th>
<th>Case 2 Ms. Solmon, Mr. James</th>
<th>Case 3 Mr. Somers, Ms. Jenks</th>
<th>Case 4 Ms. Sorens, Mr. Jarvis</th>
<th>Case 5 Mr. Sotelo, Ms. Johans</th>
<th>Case 6 Mr. Sowell, Mr. Jensen</th>
<th>Case 7 Ms. South, Mr. Jurek</th>
</tr>
</thead>
<tbody>
<tr>
<td>Support beliefs</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>System information</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Resources/materials</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Instructional</td>
<td>x</td>
<td></td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Emotional</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Classroom management</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Environment</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Demonstration teaching</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
</tbody>
</table>

| Mentoring beliefs                  |                             |                             |                             |                             |                             |                             |                             |
| Help them find their own way       | x                           | x                           | x                           | x                           | x                           | x                           | x                           |
| Help them learn in and from practice |                             |                             |                             |                             |                             |                             | x                           |
| Notice signs of growth             | x                           |                             |                             |                             |                             |                             | x                           |
| Find openings for reflection       |                             |                             | x                           |                             |                             |                             | x                           |
| Attend to questions and concerns   | x                           | x                           |                             |                             |                             |                             |                             |
| Focus on the students              |                             |                             |                             |                             |                             |                             | x                           |
toward developing a conceptual approach to teaching as they agreed on three strategies for developing teaching practices.

First, all seven of the case-study cooperating teachers noted that they tried to help student teachers find their own way of doing things. They didn’t demand that student teachers do things their way, but tried to encourage them to develop their own skills that reflected their way of doing things. They characterized this strategy on many levels. Mr. Sowell defined it as “letting him have the freedom to adapt his performance skills.” Ms. South articulated, “My way is not the only way...you can adapt whatever works for you and your personality.” Perhaps the best characterization came from Ms. Solmon in her online posting as she wrote:

My student teacher is an older...non-traditional student with a wealth of past experiences he has brought to the classroom. If I tell him how to do something exactly as I do it, he may not rise to his full potential, only to mine.

In this posting she showed an understanding of the prior knowledge that student teachers bring to the situation (Bransford et al., 2000), and how that prior knowledge helps define their own work in the teaching profession.

A second strategy noted by five of the cooperating teachers was helping the student teachers learn in and from their practice. For example, Mr. Somers articulated that he wanted his student teacher to be able to think on her feet and adjust to the ever-changing contexts introduced during a typical school day. In another example, Ms. Soto characterized learning in practice as learning to question your practice as a reflection tool. She said, I encourage her to question herself, question me, question the children, question everything.... So that when she goes out into her...
own classroom...she [is] prepared and ...able to ask for help and give help and know that she’s good at what she does.

A final strategy for developing a conceptual approach to teaching that was mentioned by five of the case study teachers was the importance of focusing on the students as lessons were planned and content area was addressed in learning activities. For example, in discussing use of graphic organizers in teaching. Mr. Sotelo noted that it wasn’t the tool that was important; it was using the tool to help students learn. He articulated:

Unless you know what to get from the [student], you’re not going to be able to fill it out properly, and that’s ...what I tried to show her was how you get the feedback that you want to get the results that you need.

Ms. Solmon also spoke about the importance of focusing on the students in the teaching process. In discussing the use of technology in the student teaching experience she stated that her perspective was:

Making sure that he uses all of the technology and supplies around him to give the kids that well-rounded lesson because you can present the knowledge, but you have to present it in many different ways, because if you don’t do that then you’re going to lose a lot of kids by the way side.

She showed her support for integrating technology in the learning process and noted that the focus should be on student learning.
Part III: Research Question Two

This section addresses the second research question: What are the mentoring practices of cooperating teachers in preparing student teachers to teach with technology? First, a brief review of the literature will help orient the reader to the question. Next the data analysis will be explained. Then the results will be presented first from the general perspective, followed by the specific perspective from the multi-case analysis.

Prior research has indicated that we know little about the practices of cooperating teachers and how they do their work with student teachers (Cochran-Smith, 1991a). Researchers have suggested that the wisdom of practice of teachers derived from their actual practice is an untapped source for providing insights into the improvement of teaching (Feiman-Nemser & Floden, 1986). More recent research revealed that when technology was woven into the field experience, student teachers were more apt to integrate technology in their instruction (Thomas et al., 1996). However, little is know about the practices of cooperating teachers in mentoring student teachers to integrate technology. Data from this study were examined to begin identifying those practices.

Data Analysis

Spradley’s (1980) domain analysis was used to analyze the practices of cooperating teachers in mentoring their student teachers to use technology. This approach was used to uncover the patterns of practice and their relationships among those practices in a group. The technique organizes the elements of practices or activities into domains. These domains are categories of meaning that include phrases or statements of similar content from a variety of participants.
To identify these domains, content analysis was used to identify all respondent’s phrases from interviews, small group discussions, and online postings that addressed specific instances of practices with their student teachers. The specific instances identified the “included term” participants used to identify their practice. These phrases of included terms were categorized into meaningful clusters. Spradley’s (1980) model for domain analysis was then used to code these clusters or patterns of practices into cover terms. For example, all the phrases relating to showing how to do grading on the computer were grouped together under the cover term of “show grading programs.” The analysis employed the semantic relationship of strict inclusion in the form of “X is kind of Y” where X was the cover term and Y represented mentoring practice. For example, “showing grading programs is a kind of mentoring practice.” All together, 30 cover terms were constructed from the data using the semantic relationship of strict inclusion for mentoring practices in preparing student teachers to teach with technology.

Following Spradley’s (1980) method, the next step in the analysis is to organize the cover terms into some type of organizational structure that shows how the parts are related in a “whole” picture. Spradley (1980) articulated that “cultural meaning arises, in part, from the way things are organized. the way they are related to one another. This organization can be represented by means of a taxonomy” (p.112). He described a taxonomy as “A set of categories organized on the basis of a single semantic relationship” (p. 112). A taxonomy shows the relationship among all the cover terms and reveals all the parts of the whole.
Mentoring Practices

In constructing a taxonomy for technology mentoring practices, comparison of the cover terms with Odell's (1986) descriptions of categories of mentoring support revealed some similarities with six of her seven categories. Three of the categories were very similar: (a) system information, (b) resources and materials, and (c) instructional. Three of the categories were somewhat similar and could be modified to address the current data. One of the categories, environment, which Odell described as "helping teachers by arranging, organizing, or analyzing the physical setting of the classroom" (p. 27) received little support in the current data set and was not used for analysis.

The category of "Demonstration Teaching" which Odell (1986) described as "teaching while new teacher observes (preceded by conference to identify focus of observation and followed by analysis conference)" (p. 27), was reframed to include modeling different types of lessons and different approaches to teaching such as team teaching. The category was renamed "Modeling Practices" for this analysis.

The category of "Emotional Support", which Odell (1986) described as "offering new teachers support through empathic listening and by sharing experiences," was broadened in this analysis to a category titled "Support and Challenge" (p. 27). In this broadened category, the issues of empathic listening were still addressed, while the issue of challenge was added to include establishing expectations and posing challenges to increase professional practice with technology. In a later work, Odell and Huling (2000) identified support and challenge as components in the mentoring process.
Odell's (1986) category of classroom management which was defined as "giving guidance and ideas related to discipline or to scheduling, planning, and organizing the school day" (p. 27), was reframed to address management of data practices such as keeping track of grades on the computer and using lesson plan templates to archive lessons for future use. This led to a redefinition of the classroom management category as "Productivity Practices." Figure 2 reveals the taxonomic analysis of mentoring practices reported by all cooperating teachers in supporting student teacher use of technology in teaching and graphically displays the findings for the second question.

The domain of "System Information Practices" included items that addressed the equipment and system procedures available at each school. While many of the system procedures for collection of data such as student attendance were uniform across the district, items involving hardware and software resources reflected slight variations from school to school. However, since the school district was moving in the direction of standardizing these resources, it was determined to address these items under the domain of system information. For example, under the cover term of "exploring software resources," Ms. South noted in her online correspondence. "Together we went to the computer lab and looked in the notebooks at all the software we have on site." Ms. Soto, an elementary teacher, also referred to these software notebooks in the computer lab during her interview when she spoke about showing her student teacher the resources in the computer lab. She said, "Some of the [material] is in these binders."

The domain of "Resources/Materials Practices" included tangible materials that were provided to student teachers to help with their lesson planning, and resources such as other teachers that they could use for planning and implementation of lessons. For
Figure 2. Taxonomy of Mentoring Practices of Cooperating Teachers

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example, under the cover term of “guide to additional resources for learning.” Ms. Solmon mentioned that she introduced her student teacher to the WebQuest site as a resource for a lesson he was planning. Both, Ms. Soto and Ms. Shafer remarked that they shared websites they found helpful with their student teachers.

Items included in the domain of “Instructional Practices” included activities that supported the student teachers’ use of technology for instruction. For example, under the cover term of “discuss curriculum connections.” Ms. Sorens wrote in an online posting that she helped her student teacher compile a list of ideas on the different things he could do with technology. She specifically mentioned using technology for creating instructional presentations, and having the students create presentations. Mr. Sotelo mentioned that he showed his student teacher how to create graphic organizers to support classroom instruction.

Under the domain of “Productivity Practices” were items that referred to technology use to support the data gathering, data management, and professional communication practices in teaching. For example, under the cover term of “show file management,” Mr. Sinclair and Mr. Somers commented that they showed their student teacher where to save files on the school system network. Mr. Sinclair also noted that he showed his student teacher how he wanted the attendance files for his classroom maintained. Ms. South said that she showed her student teacher how to create and save new files for each student.

The domain of “Modeling Practices” included items in which cooperating teachers demonstrated lessons and modeled how to critique and reflect on those lessons for improvement. On interesting inclusion in this category is the cover term of “team-teach.”
Both Mr. Somers and Ms. Soto mentioned this practice. Mr. Somers mentioned that the practice evolved early on during the student teaching experience as his student teacher became an active participant in the teaching process. Ms. Soto referred to this approach as a way to model management strategies during a lesson. She used it as her student teacher attempted her first lesson in the computer lab in order to support her by addressing and modeling student management practices in a computer lab situation.

The final domain of “Support and Challenge Practices: included items that supported and challenged student teachers in the use of technology in the learning process, and also challenged the cooperating teachers to learn more about mentoring and technology. For example, under the cover term of “Challenge yourself.” Mr. Somers, Mr. Sotelo, and Ms. Sanchez noted that they had tried new activities with the digital camera and had shared that knowledge with their student teacher. Ms. South also discussed new approaches to teaching and mentoring that led her to reflect on her teaching and analyze what she could do to become more effective.

Specific Perspective from Multi-Case Analysis

Mentoring Practices

The Taxonomy of Mentoring Practices of Cooperating Teachers presented earlier in this chapter was used to analyze practices across the cases. Data for the practices are displayed in Table 13.

Data show that at least two or more of the case study teachers reported using all of the practices in the taxonomy. Multi-case analysis suggests five trends in support practices. First was the trend of showing student teachers specific examples of software use rather than merely telling about technology use. Second was the active modeling of technology
Table 13

Reported Mentoring Practices of Case Study Teachers

<table>
<thead>
<tr>
<th>Mentoring practices</th>
<th>Case 1 Ms. Soto, Ms. Jeffers</th>
<th>Case 2 Ms. Solmon, Mr. James</th>
<th>Case 3 Mr. Somers, Ms. Jenks</th>
<th>Case 4 Ms. Sorens, Mr. Jarvis</th>
<th>Case 5 Mr. Sotelo, Ms. Johans</th>
<th>Case 6 Mr. Sowell, Mr. Jensen</th>
<th>Case 7 Ms. South, Mr. Jurek</th>
</tr>
</thead>
<tbody>
<tr>
<td>System Information</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Explore hardware resources</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Explore software resources</td>
<td></td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Access computer lab</td>
<td></td>
<td></td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Showing school data collection</td>
<td></td>
<td></td>
<td></td>
<td>x</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Resources/Materials</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lend hardware for home use</td>
<td></td>
<td></td>
<td></td>
<td>x</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lend software for lesson preparation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Guide to other resources for learning</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Giving materials and templates</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Refer to ECS as a resource</td>
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<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Refer to other teachers</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Productivity</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Show grading program</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Demonstrate lesson plans on computer</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Share templates</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Show file management</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Model network communication</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
</tbody>
</table>

(table continues)
<table>
<thead>
<tr>
<th>Mentoring practices</th>
<th>Case 1 Ms. Soto, Ms. Jeffers</th>
<th>Case 2 Ms. Salmon, Mr. James</th>
<th>Case 3 Mr. Somers, Ms. Jenks</th>
<th>Case 4 Ms. Sorens, Mr. Jarvis</th>
<th>Case 5 Mr. Sotelo, Ms. Julians</th>
<th>Case 6 Mr. Sowell, Mr. Jensen</th>
<th>Case 7 Ms. South, Mr. Jurek</th>
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</thead>
<tbody>
<tr>
<td>Instructional</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Discuss curriculum connections</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Suggestions for integration</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Show software one-on-one</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Allow practice time</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Show other technologies</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>x</td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Modeling</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>x</td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Model presentations</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Model active student activities</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Team-teach</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Reflect after lessons</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Support and Challenge</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Communicate a vision</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Establish expectations</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lend support on lessons</td>
<td></td>
<td></td>
<td></td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Encourage use</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Pose Challenges</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Challenge yourself</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>
use in professional practice. A third trend involved discussion and reflection on technology use with content area topics. A fourth trend encouraged technology use and included referring to other avenues of personnel support in the process. Finally, these teachers communicated a vision for technology use, established expectations, and modeled how to handle the continual challenge teachers face in improving their practice.

In the first trend of showing rather than telling, the case study teachers reported using one-on-one practices such as showing software, school data collection practices, grading programs, and lesson plans on the computer. They also provided students with resources for planning as well as templates for presentations and lesson plans; and allowed the student teachers time and opportunities to practice with the software. For example, in the case with Ms. South and Mr. Jurek, Mr. Jurek explained how Ms. South introduced him to the school grading program with one-on-one assistance and explained how she used it. He said, “She explained and showed me how to set it up.” He also noted, “She showed me different things she’s used the program for because you can use it to keep track of parent contacts, notes on students, and stuff like that.”

Ms. Soto provided one-on-one assistance for Ms. Jeffers with software in the school computer lab. She said,

She and I went down to the lab after school and kind of went through all the programs and what each one entailed so that if she had any questions we could work out the bugs before she actually taught the kids.

Ms. Soto explained that she did this to help increase Ms. Jeffers’ comfort level with the software so that she would feel comfortable using it to plan and teach lessons.
Jeffers, too, noted the benefits of this practice. As she talked about practices she found helpful, she said:

Just taking the time out and giving me the one-on-one, because that's what it takes; and practice, giving me the time to practice, because the one-on-one is good because then I can feel free to just ask any questions that will come up.

Ms. Soto noted that she shared templates she used in planning. She mentioned, “I had a template and actually gave her a copy of the template so that she could go in and use it.” She also revealed that she shared templates of parent letters and field trip permission forms.

In the second trend of active modeling of technology use in professional practice, these teachers modeled presentations, student-centered learning activities, and use of email for professional communication. In the case with Mr. Somers and Ms. Jenks, Ms Jenks described how Mr. Somers modeled presentations using technology. She explained,

At the beginning of the year, his introductory pre-test he started that. He had a PowerPoint that goes with it for the correction purposes, and I followed that model. He would give the pre-test, give the information, teach it over several days and then follow it up with a PowerPoint with the words and the pictures.

Ms. Soto talked about how she modeled technology use in student centered learning activities. She described how she modeled use of software to support student learning in the writing process for Ms. Jeffers. She articulated:

They brainstorm it on their paper, and then they take the paper with them to the lab. and then they do it in Inspiration (1988-2000) and that gives them a chance to work with Inspiration, to get practice with the keyboard and ... also to be able to

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read clearly what they wrote, because we’re going to be doing this throughout the week and if you ask them on Wednesday what they wrote on Monday, then they don’t always know.

Mr. Sotelo mentioned his use of email for communication and noted that he tried to model that for Ms. Johans. He said, “I think professional communication via email is very important, and modeling that for her, and letting her see especially how a department Chair uses it.” He also articulated that he included Ms. Johans in the department email list and that she read and sent email to him and other members on the list. Mr. Sowell also mentioned that he modeled the use of email for school communication. He said, “I’d get the daily bulletin, the daily attendance addendum, and all that was on the computer.”

The third trend of discussion and reflection on technology use with content are topics included discussions of curriculum connections, suggestions for technology integration, and reflection after those lessons. Ms. Soto discussed how she connected curricular topics with technology use. In this example, she explains how she helped Ms. Jeffers make a connection between a software program she wanted to use and a content area topic. She explicated:

She wanted to do something on KidPix. So, we went down there and we worked out what was in there, because that’s a big program.... She took a ...concept that we were learning in science and she had the kids do a picture and do a little journal about what exactly they were doing in science.

Ms. South talked about an approach where the content area was considered first and technology was integrated in the presentation. She was referring to themes in geography.
and remarked, "I suggested that he do Inspiration (1988-2000) when we did the five themes."

Reflection on lessons was also a topic mentioned by many of the case study teachers. The reflection was not limited to technology-integrated lessons, but covered the broad range of teaching activities. Ms. Sorens noted, “We try and set aside ten minutes after school and say “How do you think that went?”” Ms. Soto shared that she took notes during lessons to help with later reflections. She said, “At the end of a lesson I didn’t run up to her and say, ‘Well this was good and that was good.’ I wrote down a lot of things because I wanted to get with her after.”

A fourth trend of encouraging technology use and including other avenues of support involved helping the student teachers learn to use the ECS and other teachers as resources in planning and presentation. Ms. Solmon commented:

I encouraged him [to consult with the ECS] because I was so Macintosh illiterate at the beginning of the year. We had to ask how you do this or what’s going on with that because I found that I couldn’t answer those questions.

Ms. South shared that she encouraged contacting other teachers for different ways of teaching lessons. She reported that she told her student teacher, “Go check with that teacher and how they do that.” She went on to add, “Then we’ll set up maybe even an observation of that teacher so [Mr. Jurek] can see that.”

The final trend involved communication of a vision for technology use, establishing expectations, and modeling how to handle the continual challenge teachers face in improving their practice. For example, Mr. Somers communicated a vision and encouraged technology use. He said:
[I] showed her early on that I’m very open to using technology... and then encouraged her and gave her support and made suggestions, but tried to make it wide open so that she could do what she wanted to.

Ms. South established expectations for technology use. She let Mr. Jurek know that he was responsible for entering new student data in the database. In the beginning of the semester she “asked him what he knew to try to see where he’s from.” In this early assessment she discovered that “[Mr. Jurek] was very computer literate.” So she posed a challenge to him: “I told him that I’d like him to do one use of technology a week somewhere in his lessons.” She noted in online correspondence that Mr. Jurek “has accepted this challenge.”

These teachers also modeled the continual challenge they pose to themselves as means for improving their practice. Ms. Solmon reported on her challenge of learning to use a new computer platform so she could integrate computer activities in her lessons. Ms. Sorens noted that her challenge was to become a better mentor: “To share my experiences and say what can I do to better myself as a mentor, what can I do to help him become a better teacher?”

A final observation in the multi-case analysis was that six of the cooperating teachers reported using at least 15 or more of the identified practices in mentoring their student teachers toward technology use. Mr. Sowell, however was an exception to that trend and indicated using 5 of the 30 practices listed. He reported the lowest average score (2.0) on the Staff Technology Self-Evaluation Rubric (see Appendix B). During the first workshop, field notes indicated that he stated he was just beginning to use technology.
While he appeared eager to learn about technology during the workshops, in an interview he remarked, "I think people must be careful not to let technology take us over."

**Student Teacher Requests for Practices**

In an effort to identify any further mentoring practices that might be helpful, the student teachers were asked during interviews to identify any practices they would have liked their cooperating teacher to do to support their use of technology. References to requested practices were obtained from the student teachers' interviews. The references were grouped into meaningful clusters and Spradley's (1980) domain analysis was used to code these clusters into cover terms. The semantic relationship of function was used for the coding in which "X is a way to support student teacher use of technology." The cover terms constructed from the data, and the correspondence to the student teacher identifying the term are displayed in Table 14.

All student teachers noted the desirable use of one-on-one instruction for not only showing a piece of software but also discussing how it could be used in teaching. Ms. Jenks articulated, "Very much the baby step, step by step, walk me through, show me how the program is working." A majority of four (57%) of the student teachers also commented that they would like suggestions for ways to integrate technology in teaching. Ms. Johan commented, "As a student teacher, my world is very limited to what I've been experienced to....[Use] your experience to help me gain some understanding [of] what I'm supposed to be doing with this technology."

Eight of the nine areas noted by the student teachers are contained in the "Taxonomy of Mentoring Practices of Cooperating Teachers" (Figure 2). The one area mentioned by
Table 14

*Practices Requested by Student Teachers to Support Their Use of Technology*

<table>
<thead>
<tr>
<th>Student Teacher Requested Practices</th>
<th>Jeffers</th>
<th>James</th>
<th>Jenks</th>
<th>Jarvis</th>
<th>Johan</th>
<th>Jensen</th>
<th>Jurek</th>
</tr>
</thead>
<tbody>
<tr>
<td>One-on-one instruction with software</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Suggestions for ways to integrate</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Practice time with software</td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
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<tr>
<td>Management strategies for student use</td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
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</tr>
<tr>
<td>Model use of technology</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Opportunities to teach with technology</td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Show additional content area software</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Show equipment that’s available for use</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>Share effective activities</td>
<td></td>
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<td>X</td>
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</tbody>
</table>

student teachers that was not mentioned by cooperating teachers was the "management strategies for student use" practice. However, the management strategies could be subsumed in the “Modeling Practices” domain that includes modeling the management of active, student centered learning activities.

**Part IV: Research Question Three**

This section addresses the third research question: In what ways might cooperating teachers refine their own mentoring practice with student teachers to reflect learning from professional development activities for cooperating teachers introducing new technologies and constructivist practices? First the data analysis methods will be
presented. Then the general perspective will be presented followed by the specific perspective from the multi-case analysis.

Data Analysis

To address the question of the ways cooperating teachers might refine their own mentoring practice with student teachers to reflect learning from professional development activities introducing new technologies and constructivist practices, the data from interviews and online transcripts were examined for excerpts addressing this area. During interviews, teachers were probed to determine if the workshops had any impact on their mentoring practice with their student teachers. Ms. Soto stated that the workshops “reiterated the importance of technology and how much it is being used.” However, others commented that integrating ideas from the workshops and refining their practice would take time. Several commented that they would be better mentors the next time around. Mr. Sotelo noted, “These seminars that we’re having aren’t really helping me now, but... if I get another [student teacher] at some point, I know I’ll be better than I was this time.”

Spradley’s (1980) domain analysis was used to search for patterns in the data referring to refinements in teachers’ practice. The semantic relationship of means-end was used for the analysis where “X is a way to do Y.” More specifically in this analysis, “X is a way to refine mentoring practice.” As the data were analyzed for refinements in mentoring practice, componential analysis revealed a new domain of refinement in practice. Spradley (1980) defined componential analysis as “The systematic search for the attributes (components of meaning) associated with cultural categories” (p. 131). He noted that this type of analysis often revealed contrasts in the units of meaning. During
the interviews, when teachers were asked if the workshops had any effect on their practice, they talked not only about what their mentoring practice with student teachers, but also about how the workshops had spurred ideas for refinement or expansion of future classroom practices with technology. This contrast revealed that teachers had assigned a new unit of meaning to the cultural domain of refining practice. They had looked beyond their practice as mentors and identified ways in which the workshops had impacted the planning in their personal classroom practice. Thus, the analysis was expanded to include this category that emerged from the data, and the semantic relationship was modified to "X is a way to refine practice."

**General Perspective of All Cooperating Teachers**

The refinements cooperating teachers identified can be categorized in three main areas: (a) refinement of beliefs in mentoring practice, (b) refinement of technology practices in modeling lessons for student teachers, and (c) refinement or expansion of ideas for future student-centered technology practice.

**Refinements**

*Refinements of beliefs in mentoring practice.* Several cooperating teachers noted refinement in their mentoring practices with student teachers. These refinements surfaced both in interviews and in online messages. During the first interview, Ms. Sorens was reflecting on a conversation she had with her student teacher the day after a workshop. She commented:

Thinking back and doing that rock activity where we had to think about someone who we thought was a really good mentor. I was thinking on that day that he’s never going to say that about me.... So I had to re-think, and I think that’s what
helped on Friday, having that conversation with him and just talking to him about those little things and actually being a mentor instead of a supervisor telling him what to do.

In this passage, Ms. Sorens demonstrates how an activity in the workshop helped to change her beliefs about mentoring practice.

Also in the case studies, Mr. Somers talked about how he had refined his idea of learning to teach as “Sometimes, you’ve got to let them fail.” to a more educative “Having them have a lesson that isn’t successful doesn’t make them a failure or you a failure.” He went on to describe it as an opportunity to learn more about how to teach.

Refinement of technology practices in modeling lessons for student teachers.

The category of refining technology practice for student teachers receives support in the data. In an early workshop, the cooperating teachers were introduced to Inspiration (1988-2000) software. This is a visual mapping program that can be used to gather and organize ideas and concepts. In the workshop, participants were placed in groups for an active student-centered lesson in which they were to generate a list of practices cooperating teachers could use to support student teacher integration of technology. They then had to organize their list into some type of meaningful categories. At the end of the lesson, each group shared their information to the class using a presentation device. After that class, Ms. Schafer posted a message in the online forum noting her inclusion of the software in a planned lesson with her student teacher:

This past week I was concluding a unit on exploration with my students. One of the assessment items for this unit will be an [In]spiration web where students can use the computer to create a graphic organizer of their information.... A follow up
activity will be for the students to create a comparison and contrast web comparing 2 explorers."

In a follow up posting, Ms. Shafer noted that she had introduced her student teacher to the software: "He and I have gone over the program together, but we need to do some fine tuning before he will be comfortable enough to teach this lesson."

Ms. Snyder also mentioned a refinement in modeling technology practices with her student teacher. In an interview after a workshop in which cooperating teachers were shown how to use the digital camera to take pictures and then insert those pictures into a simple slide show, she shared the following:

We’re going to have the kids go to computer lab today. We’re going to have them use KidPix (1989-2001) and create a small paragraph and instead of putting a word, they’re going to put a picture or something, and then we’re going to put their name on it and do something quick in a slide show, kind of like we learned in that workshop.

Other examples surfaced in the cross case analysis as teachers told of new ways they were using technology in their classrooms as a result of activities they participated in during the workshops.

Refinement of ideas for future student-centered technology practice. While noting that integration of workshop activities into their current practice was difficult because the student teachers were at the stage of full time teaching and the cooperating teachers were essentially out of the classroom, several did comment on ideas they had generated based on workshop sessions. After a workshop in which the cooperating teachers were introduced to WebQuests as a means of doing focused Internet research in specific
content areas. Mr. Sinclair mentioned, “I found a couple of good ones last session that I’d like to try with my honors class next semester. Make that a project for them.”

In the interviews, Mr. Sowell also mentioned his plans for using a WebQuest with his classes next semester. Mr. Sotelo provided an example of how the refinement of ideas for technology use develops over time and with reflection. In the first interview he shared his idea for integrating a new practice with Inspiration (1988-2000) he had learned in the workshop as he talked about using the software to gather student ideas. In the second interview, he revisited the idea and talked about he had developed it further. He planned to take their ideas and reorganize them into a study sheet that he could hand back to them the following day so that they could see how they were generating their own knowledge on content area topics.

Specific Perspective from Multi-Case Analysis

The comparison of refinements in mentoring practice across the case studies is displayed in Table 15. The data from the case studies supported the three previous categories defined for refining practice. Five of the seven teachers indicated that the workshops helped them refine their beliefs in mentoring practice. Three indicated that the workshops helped them refine the lessons they modeled for their student teachers, and three indicated that the workshops introduced them to new ideas for future practice. Refinements from work with student teachers. However, further analysis across the data suggests two additional trends for refining their practice during student teaching. These findings suggest refinements in practice that resulted from work with their student teachers. First, teachers indicated they learned something from their student teachers.
Table 15

Cross-Case Analysis of Reported Refinements in Practice

<table>
<thead>
<tr>
<th>Reported refinements</th>
<th>Case 1</th>
<th>Case 2</th>
<th>Case 3</th>
<th>Case 4</th>
<th>Case 5</th>
<th>Case 6</th>
<th>Case 7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beliefs in mentoring practice</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
<td>x</td>
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<tr>
<td>Modeling technology lessons</td>
<td>x</td>
<td></td>
<td>x</td>
<td>x</td>
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<td></td>
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<tr>
<td>Ideas for future practice</td>
<td>x</td>
<td>x</td>
<td></td>
<td>x</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Learned from student teacher</td>
<td>x</td>
<td>x</td>
<td></td>
<td>x</td>
<td>x</td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Reciprocal mentoring</td>
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</tbody>
</table>
Second, in addition to simply learning from their student teachers, two of the teachers shared incidents in which they were mentored by their student teacher.

Five of the seven teachers indicated they learned something from their student teachers. The case study teachers did not classify themselves as experts who knew all the answers, but as learners in pursuit of knowledge who were willing to experiment with new lessons and new approaches to old lessons. As experienced others, they modeled for their student teachers that learning is continual with opportunities for trials, errors, and reflection on those experiences. Ms. Solmon commented, "I think I learn more through him because...when he says he doesn't understand something, we both kind of learn. I'm learning from him." Mr. Sotelo remarked, "You know, I have picked up some things from [Ms. Johans] as far as content.” Mr. Sowell also commented that he learned from his student teacher. He shared, “You can teach old dogs new tricks. I’m learning from [Mr. Jensen]. He has some really super great lessons.”

Finally, Mr. Somers shared the knowledge he gained as his student teacher problem-solved her way through a cooperative learning technology lesson. He noted that as the students were forced to share one computer in rotation for group work, he became aware of new dynamics in learning. He articulated:

We ended up projecting it with the cart in front and kind of letting each team do their own thing, but we did it in front of everyone so they could hear what decisions they made, which made some other teams change their decision before they got there. So, it was a great dynamic, and it was a wonderful experience.

Second, in addition to simply learning from their student teachers, two of the teachers shared incidents in which they were mentored in technology use by their student teacher.
Ms. South shared her experience in being mentored as she learned new features in a software program. She said,

He knows PowerPoint (1983-2000) so much better. I have my book right there. when I do something in PowerPoint I have to look it up in my book.... He was teaching me how to put some things on PowerPoint that I didn’t know. And I knew it was in that book somewhere, but he knew right where to go and find it and so he showed it to me.... It’s not demeaning to him that you don’t know it. He’ll go ahead and teach you, and so. I learn a lot from him.

Ms. Solmon also shared an experience in which she was mentored by her student teacher in the use of new equipment. She had observed him using the equipment in lessons with students and decided to try it with the students. As she was struggling in front of the class trying to use the equipment, Mr. James came in the room. She narrated how he mentored her through the process of using the technology:

He had to show me how you use it. This is the way this goes and then we spent about five minutes trying to turn [things] around because I’m left handed and he’s right handed (laughter). Finally. I had to move all kinds of desks just so I could do certain things with it. But, he was very helpful, showing me how to use that technology.

Both of these teachers were comfortable with a reciprocal mentoring approach to student teaching and commented on the technology skills they learned from their student teachers.
CHAPTER 5

DISCUSSION

The following sections include a discussion of salient findings for the present study. This includes a discussion of findings as they relate to the literature. Following this discussion, the implications of findings, study limitations, and recommendations for future research are addressed.

Few studies in the mentoring literature specifically address how cooperating teachers mentor student teachers toward technology use, and little research in the field of technology and teacher education addresses mentoring practices of cooperating teachers to support technology use by student teachers. Thus combining these two areas offers an opportunity for a fresh look at both practices.

This research describes how use of a school district/university partnership was reshaped as a professional development opportunity (Ganser, 1996) to provide technology-using placements that address the need for preparing knowledgeable teachers for 21st century classrooms. The current study examines the technology context and the conceptual perspectives of the cooperating teachers. It describes the mentoring practices of cooperating teachers as they prepared student teachers to integrate technology into their professional practice, and delineates ways in which the cooperating teachers refined their practice as a result of professional development activities and their work with student teachers.
Discussion of Findings

Question One

This section addresses the first research question. What are the general technology contexts and conceptual perspectives in which the cooperating teachers mentored student teachers?

General Technology Context

Technology access. In this study, 12 of the 16 cooperating teachers had two or more computers in their classroom, and also had access to a computer lab for student use. The four high school teachers who had only one computer in their classroom reported no access to a computer lab during the semester due to school closure for rehabilitation of those labs.

In the multi-case analysis involving seven cases, the five student teachers in the schools with lab access all reported teaching lessons in which they used technology for presentation of material, as well as lessons in which students used computers. The two student teachers working in the school with no lab access and only one computer in the classroom reported that they were able to teach lessons in which they used technology for presentation of content area topics. However, these student teachers noted that they were not able to plan or teach any lessons in which students used computers. Thus, in this study, access to a computer lab or multiple computers in the classroom appeared to be a salient factor in supporting student teacher use of technology in which students used computers. This is consistent with the literature citing access to computers as a factor in promoting teacher use of technology for student learning (Sheingold & Hadley, 1990).
Another facet of access that emerged from this study was the availability of laptop computers for student teachers to check out for home use in the preparation of lessons. Recent literature has found that laptops provided teachers with convenient access to technology allowing opportunities to bridge barriers of time and access to accelerate their development of technology skills (Falba et al., 2001). In the present study, three of the case-study student teachers reported checking out laptop computers for home use that enabled them to explore software for teaching and prepare presentations for lessons. The literature has begun to document access to laptops as a support resource for teachers (e.g. Ronnkvist et al., 2000). The present study extends those findings to the student teaching experience and suggests that access to laptops for home use by student teachers supports their skill development and use of technology in teaching practices.

Technology use in student teaching. In the area of preparing teachers for future practice, research has indicated that teachers tend to teach the way they were taught (Cuban, 1986; Lortie, 1977). Student teaching has been cited as a critical component in the preparation of preservice teachers as a means of establishing practices they will use in future settings (Evertson, 1990; Feiman-Nemser, 1983; Guyton & McIntyre, 1990; Lanier & Little, 1986; Strudler, McKinney, Jones, & Quinn, 1999). In this study, the cooperating teachers were asked to indicate if they had a cooperating teacher who modeled technology use during their student teaching. While seven of the sixteen indicated that there were computers in the classroom, only one indicated that his cooperating teacher modeled a lesson with technology. Two of the sixteen cooperating teachers noted that they had taught a lesson using a computer during their student teaching.
In this study, a majority of fifteen of the cooperating teachers, including six of the case study teachers, reported modeling technology use in teaching. In addition, all seven of the case-study student teachers reported that they were able to teach at least one lesson using technology. While the number of participants in the study is small, the improvements in integrating technology in the student teaching experience are notable. It appears the majority of the cooperating teachers in this study were expanding beyond the notion of teaching the way they were taught and modeling teaching methods that integrated new technologies. Thus, the student teachers were introduced to teaching methods that included the use of technology.

Additional on-site support. Another supporting factor in the technology context that surfaced in the interviews was support from the on-site educational computer strategist (ECS). Prior research has indicated that on-site support is an important factor in supporting technology use (e.g., Ronkvist, Dexter, & Anderson, 2000; Sheingold & Hadley, 1990).

Fourteen of the cooperating teachers noted that they referred their student teacher to the ECS in some capacity for support with the integration of technology in their lessons. Cooperating teachers indicated that ECSs gave support to student teachers in many capacities. They noted support such as offering advice and materials for lesson planning with technology, coming to the classroom to help with technology lessons, introducing software one-on-one, and arranging for the student teachers to take home software or laptop computers. This is consistent with findings in recent literature that on-site technology coordinators who provide support in both technical and instructional domains
are an important factor in supporting teacher use of technology (e.g., Ronnkvist et al., 2000).

Administrative support. In the school context, administrative support was also a factor cited in supporting technology use. During the case-study interviews, while not asked directly about administrative support, two of the cooperating teachers volunteered information on how valuable they found support from their school administrators. Both Mr. Somers and Ms. South specifically mentioned that support from their administrators was an important factor in their use of technology in teaching. They explained that the vision of their principals for getting technology into the hands of the students led to increased numbers of computers in their classrooms. While at two different middle schools, both Mr. Somers and Ms. South had seven computers in their classrooms, and both of their student teachers reported using technology for presentations and for student learning activities using computers in the classroom. This is consistent with previous research indicating administrative leadership and support is an important factor impacting teacher use of technology (e.g., Anderson & Dexter, 2000; Sandholtz et al., 1997).

Based on research from this study, it appears that access to technology and on-site support are important factors for supporting use of technology (e.g., Ronnkvist et al., 2000; Sheingold & Hadley, 1990). Research from this study extends these findings to the field experience component of teacher education and suggests that adequate access to technology and available on-site technology coordinators are important factors for supporting student teachers’ use of technology.
Conceptual Perspectives About Mentoring

Recent research has called for information on how mentors conceptualize mentoring and their experiences in conducting relevant mentoring practices (Wang, 2001). In this study, analysis indicated that the all of the cooperating teacher mentors had initial beliefs that mentoring involved providing emotional support to the student teachers, and that their job was to demonstrate teaching practices. This is consistent with early findings on mentoring that viewed mentoring as a form of assistance for novice teachers (Odell, 1986, Wang & Odell, 2001).

However, as the process of mentoring in the teaching profession has evolved, more recent literature views mentoring as an opportunity to “push teaching toward practice that is based upon different assumptions of knowledge, learning, and teaching” (Wang & Odell, 2001, p. 5). This call for an educative mentoring approach posits that mentors need perspectives that are based on explicit visions of good teaching that “enable novices to learn in and from their practice” (Feiman-Nemser, 2001, p. 18).

In this study, the multi-case analysis of practices supporting technology use revealed conceptual perspectives of the case-study cooperating teachers that moved beyond emotional support and technical advice and helped student teachers learn a conceptual approach to teaching. The responses of the case study cooperating teachers appear to reflect a growth in conceptual perspectives that promotes elements of educative mentoring (Feiman-Nemser, 2001). They indicated beliefs in approaches that help student teachers find their own way of doing things, learn in and from their practice, and focus on student learning. For example, according to Mr. Somers, “helping them learn how to think on their feet...how to improvise and pick things up and go with it” was part of his
conception of his role as a mentor. In an interview, he reported on a lesson in which his student teacher had to “think on her feet.” After a technical difficulty arose during a lesson using a computer, the student teacher had to devise an alternative strategy to continue the lesson. With support from Mr. Somers, she decided to transfer quickly the student data to another computer so the students could continue the cooperative learning project. Thus, according to results from this study, it appears that the cooperating teacher’s conceptual perspectives impact how student teachers integrate technology into their practice.

Question Two

This section addresses the second research question: What are the mentoring practices of cooperating teachers in preparing student teachers to teach with technology?

There is growing support in research about the need to hear more from cooperating teachers concerning their work as field mentors (Kahn, 2001; Koerner, 1992; Tannehill, 1989; Tjeerdema, 1998; Veal & Rikard, 1998). Recent studies have begun to provide opportunities for mentors to articulate their experiences with student teachers (Kahn, 2001). In this study, cooperating teachers were asked specifically about their practice with student teachers as they mentored them toward technology use.

As the reported teacher practices were first identified and grouped into meaningful categories, an early attempt to use the National Educational Technology Standards for Teachers (International Society for Technology in Education, 2000a) to frame the practices proved unworkable. The standards provide general descriptions of what teacher practice with technology should be. For example. “Teachers use technology to support learner-centered strategies that address the diverse needs of students” (International
Society for Technology in Education, 2000a, p. 20). While identifying "what" outcomes student teachers should do can be easily correlated with standards, "how" those outcomes are achieved requires a different frame for analysis. To illustrate this point, if a standard is turned into a question, the dilemma becomes clear. How do you prepare "teachers [to] use technology to support learner-centered strategies that address the diverse needs of the students?" (International Society for Technology in Education, 2000a, p. 20). In addressing this question, the mentoring literature provided a better fit for framing the cooperating teacher practices in mentoring student teachers to achieve those standards. Thus Odell's (1986) early work in identifying mentor support practices provided a suitable frame for identifying technology support practices.

One-on-one tutoring. In the multi-case analysis, several trends appeared to emerge in identifying these practices. The first trend involved one-on-one tutoring with specific software applications. Rather than merely telling student teachers how to use technology in general, cooperating teachers took time and individually showed them software programs. Six of the case-study teachers noted that they used this practice with their student teachers. Additionally, several teachers from the general group of cooperating teachers reported this practice. They articulated two approaches.

One approach was to set aside time to explore a variety of software available for use. For example, Ms. Soto noted that she and her student teacher took time after school to go to the computer lab. They went through the software programs and this provided an opportunity for the student teacher to ask questions. Ms. Soto was also able to refer her to the support manuals that accompanied the software as a means for providing ideas on ways to integrate the programs. She indicated that her student teacher integrated one of
the programs from the one-on-one tutoring session during a lesson in the computer lab and connected the student activity to a science topic.

Another approach was to use "just in time" instruction for a single piece of software, followed by an opportunity to put it into practice. For example, Mr. Jurek mentioned that Ms. South took "probably just 10 to 15 minutes" to show him the grading program one morning. He noted that she immediately asked him to start entering data and grades so that he could practice and develop his new skills.

One-on-one instruction was also identified as a requested support practice by all of the case-study student teachers. In the words of one student teacher, "Step by step, walk me through." In a workshop session, one cooperating teacher shared that instead of just handing a boxed software program to his student teacher to explore on her own, he "actually opened the box and showed her how to access the software on the school network" and walked her through steps in starting the program. This is consistent with previous research findings that one-on-one help was an important type of support for teachers in learning how to use technology (e.g., Ronkvist et al., 2000). In this study, the one-on-one sessions led to student teachers' use of the software in their practice. Thus, based on analysis of data from both cooperating teachers and student teachers, it appears that one-on-one support for learning software is a promising practice in mentoring student teachers toward technology use.

**Modeling.** A second trend in practice that surfaced in the multi-case studies was actively modeling technology use for the student teachers. The literature has indicated that modeling offers learners a framework for imitating practice (e.g., Bandura, 1977). In this study, the cooperating teachers modeled technology use in several ways.
The first approach involved using technology for student-centered learning activities. Four of the case study cooperating teachers noted that they modeled computer-projected presentations requiring student participation. For example, Mr. Sotelo described how he modeled use of graphic organizers with students. He said, "So I showed her how ... we use them. I modeled them for her to the class, and then I showed her how to make her own by using the computer to make them fit her lesson." His student teacher reported using them for lessons.

Another form of modeling involved demonstrating computer presentations in classes. For example, Ms. Jenks articulated that Mr. Somers modeled a PowerPoint (1983-2000) presentation he used as an introductory pre-test for content area topics. She noted, "I followed that model" and noted that he gave her a copy of the presentation to modify for her own presentation.

Ms. Sorens talked about how she modeled a presentation to show the technical steps in presenting a lesson. She described how she modeled a presentation "just so that he could get familiar with ...how I set the computer to the projector, and how I go through it." She also reported that her student teacher then created and delivered presentation.

A third form of modeling addressed using productivity tools in teacher practice. For example, Ms. Soto explained that she modeled how to use technology to increase her professional productivity. She modeled writing lesson plans on the computer for her student teacher. "After a few weeks of watching me do this we decided that that she needed to be printing hers on the computer as well." Ms. Soto also modeled preparing report cards on the computer. Her student teacher noted the modeling and the time saved by using technology for this professional productivity practice. She said, "I was with her
while she was doing it. It's awesome. It takes two hours to do 30 students’ report cards, and that's very good."

A final form of modeling involved using email as a means of professional communication. For example, Mr. Sotelo mentioned that as the department chair, he modeled email use to share department information and teaching resources, and noted that he included the student teachers in the mailing lists and treated them as part of the department. He explained that the student teachers actively participated in department communications and learned how to use it for acquiring information as well as seeking advice on lessons. So student teachers not only had a chance to see email use modeled, they also adopted the practice of using it as a means of professional communication.

All of the modeling practices mentioned led to student teacher imitation of the practice in their work. According to analysis of results from both the cooperating teachers and student teachers in this study, it appears that active modeling of varied uses of technology is a promising practice in mentoring student teachers toward technology use.

Curriculum connections. In the multi-case analysis a third apparent trend was teacher reports on discussions with their student teachers about how technology connected with the curriculum. The literature has posited that in order for teachers to understand how to use technology effectively in the classroom, they must be introduced to curriculum-related uses they can put into practice with their students (Willis, 1993), and that these uses should focus on using technology use to acquire content area knowledge (Jonassen et al., 1994).

In discussing connections between content area and use of technology, the cooperating teachers noted two strategies for making the connection. Ms. Soto explained
that in one situation, they started with the software first then made the connection to the curriculum. For example, her student teacher wanted to use a particular software program. So they discussed the topics they were addressing in class and made a connection with a science topic. The activity involved having students using graphics software to demonstrate their understanding of the water cycle.

Ms. South talked about a second approach where the content area was considered first and technology was integrated as a presentation to demonstrate a concept. They were getting ready to start discussing themes in geography, and made the connection to use a webbing software program to illustrate those five themes.

Encourage and challenge. A fourth trend identified in the multi-case analysis was that cooperating teachers encouraged technology use by offering a vision, establishing expectations, and posing challenges to their student teachers. Mentoring literature indicates that mentors should support and challenge novices to improve their teaching practice (Odell & Huling, 2000). During the workshop sessions and interviews, the cooperating teachers willingly shared the strategies they used to encourage and challenge their student teachers. One teacher noted that she had posed a challenge to her student teacher to “do one use of technology a week somewhere in his lessons.” At the next session, other teachers reported that they, too, were trying that strategy. This collaborative sharing of practice supports research from Perry et al., (1999), which found that teachers valued an opportunity to learn from one another, and use that learning to experiment with new strategies in their own practice.

Those who know more do more. One final observation from the results on technology mentoring practices was the fact that the cooperating teacher with the lowest reported
technology score (2.0) on the Staff Technology Self-Evaluation Rubric also reported using the fewest number of practices identified on the Taxonomy of Mentoring Practices of Cooperating Teachers (see Figure 2). In the first workshop, Mr. Sowell shared that he was just beginning to use technology and had recently signed up for an email account on his home computer. During the first interview, he commented, “I kind of enjoy technology….But, I think people must be careful not to let technology take us over.” He added that while he believed that technology did have a place in education, he was concerned that it shouldn’t comprise the whole lesson “because I think that helps make the student lazy.”

These early skeptical beliefs about technology use in the classroom are supported in the research and reflect beliefs of teachers identified at the entry level of use where they express “serious reservations about students’ access to computers and about whether the new technology [will] ever ‘fit in’” (Sandholtz et al., 1997, p. 37). However, that research also indicated that as teachers persisted with the innovation and gained more experience, their beliefs slowly started to change and they became more comfortable with technology. In the present study, Mr. Sowell was a willing, engaged participant in the workshop sessions. By the last workshop, he was enthusiastically guiding the collaborative production of a short digital video in which he recorded the voice of the narrator.

One could speculate that the reason for his small number of reported practices was a resistance to technology use. Another more plausible explanation might be that he was just at the early stages of technology use himself (Sandholtz, et al., 1997) and was simply not aware of what he could do to support his student teacher in technology use. He had
little conceptual understanding of how technology could be used in the classroom and therefore was not able advise his student teacher on practices to support technology use in teaching. Based on results from this study, it appears that teachers who use technology less in their practice use fewer mentoring practices that can support student teachers in use of technology.

Student teacher requests for practice. Findings from this study suggest that student teachers want knowledgeable cooperating teachers who can give them one-on-one instruction with software and suggest ways it can be integrated into classroom learning activities. For example, in responding to a question about what she would like cooperating teachers to do to support student teacher use of technology, Ms. Johan articulated, “My world is very limited to what I’ve...experienced.... [Use] your experience to help me gain some understanding [of] what I’m supposed to be doing with this technology.” Student teachers need thoughtful mentors who can not only provide technical expertise, but also help them gain a conceptual understanding of how to use technology in the classroom. This finding closely parallels educative mentoring research advocating that mentors attend to the questions and concerns of novices and give “living examples of one person’s way of teaching” (Feiman-Nemser, 2001, p. 24).

Articulating and defining teacher practice is a necessary first step in determining promising, effective, or exemplary practice. The mentoring practices defined in this study are not intended as a final answer, rather they are offered as a starting point to begin building the knowledge base on promising practices in mentoring student teachers toward technology use. This study adds to the bodies of literature on mentoring and technology
integration and suggests a merging of those bodies to explore more fully approaches to preparing student teachers for 21st century classrooms.

**Question Three**

This section addresses the third research question. In what ways might cooperating teachers refine their own mentoring practice with student teachers to reflect learning from professional development activities for cooperating teachers introducing new technologies and constructivist practice?

*Learning From Professional Development*

Prior research has used communities of inquiry as a professional development approach for groups of teachers to study their practice together (Falinscar et al., 1998). In this approach, the professional development activities are designed to focus on a specific area of teacher practice. For this study, the workshop sessions and online course environment provided a means for cooperating teachers to make explicit the implicit nature of their practice in mentoring student teachers to teach with technology. The workshops and online space were based on a cooperative inquiry approach (Reason, 1998) that focused on the question, what do cooperating teachers do to prepare student teachers to teach with technology?

According to Putnam and Borko (2000), “The learning of teachers is intertwined with their ongoing practice” (p. 6); and bringing together a diverse range of teachers with different types of knowledge and expertise provides a rich setting for members to draw upon each other’s knowledge and create new insights into their own practice. During each workshop session in this study, cooperating teachers were given 15 minutes in small groups to talk about their work as field mentors (Kahn, 2001) and discuss their practice in
supporting student teachers. In these collaborative sessions, the teachers examined different facets of their practice as they shared successes, counseled each other, and problem-solved individual situations with technology difficulties. They offered support and challenge not only to their student teachers but also to their fellow mentors.

Perry et al. (1999) used a similar method to help teachers examine their practice in literacy assessment and found that teachers valued the opportunities to learn from one another. The current study supports that finding as several teachers referred to the benefits in those small group activities. For example, Ms. Sorens said that she was learning things in the classes, especially "hearing other teachers talk about their student teachers." Mr. Sowell, the early stage technology user, remarked, "I loved the presentations and the other teacher's concepts for sharing [were] very helpful." It can be speculated that these sessions were part of helping him start refining his view of technology use from being "careful not to let technology take us over." to active collaborator and guide on a digital video project. These findings parallel the literature indicating that teachers found it helpful to learn from one another.

Teachers also shared that the workshop activities helped refine their practice. For example, Ms. Sorens told how a mentoring activity focused on recalling the qualities of someone who had been a mentor for her, helped her gain a new conceptual understanding of her role as a mentor. She stated, "At first, I guess I thought it was like being a supervisor." She later described her role as "cooperating together, that's what a cooperating teacher is." She explained the refinement as a shift from telling him what to do, to talking about what they needed to do.
Mr. Somers reported that the workshops provided new ideas to take back and try with his student teacher. He remarked, "Not one single workshop did I come back and not say, 'Oh, we’ve got to do this.'"

Odell and Huling (2000) noted that, "The preparation of experienced teachers to assume the mentor role is the key to quality mentoring programs" (p. 67). They suggested that mentors should be actively involved in professional development during their work as mentors, and should have opportunities to work together with other mentors to improve their practice and move toward high expectations for both mentors and novices.

In analysis of results from this study, it appears that professional development in mentoring practices supported professional growth in cooperating teachers to refine, challenge, and improve their practice in mentoring student teachers toward technology use.

*Online communication of refinements.* While teachers willingly talked about the refinements in their practice during interviews, the clearest articulations of refinements of beliefs in mentoring practice were messages posted in the online forum. Online communication was explored as a vehicle for communication in a professional development project focused on inquiry into mathematics instruction (Lehman et al., 2001). Findings from that study indicated that regular patterns of online participation among the teachers did not develop as anticipated.

During the present study, teachers were shown how to use the online forum in the first workshop. In the second workshop, they were given an assignment and time in class to post a message about a practice they were using to mentor student teachers to teach with technology. This was to ensure that they knew how to access and use the online
forum. Even though they knew how to use it, few teachers posted additional messages. Just as in the Lehman et al. (2001) study, regular patterns of participation did not develop. Only the six teachers who had to participate in the online forum in order to earn a university credit posted messages regularly.

However, these six teachers did post thoughtful messages about their mentoring practice with their student teacher. Several of the messages noted refinements in their practice. For example, during the first interview, Ms. Solmon clearly asserted her beliefs about her role as a mentor. She said, "My role with him, first of all, is to teach him how to maintain discipline." Toward the end of the semester, Ms. Solmon eloquently shared in an online posting how her beliefs had been refined. She wrote, "If I tell him how to do something exactly as I do it, he may not rise to his full potential, only to mine." Thus, even though the online postings were few in quantity, there were several that reflected a high quality of reflective thought. This supports research from Kindred (2000) and McComb (1994) that use of online media encouraged clear articulation of ideas.

**Learning From Student Teachers**

A trend that emerged from the multi-case analysis in this study was that cooperating teachers reported ideas for refining their practice as they learned from and were mentored by their student teachers. Dawson and Nonis (2000) found reciprocal benefits in their study as preservice teachers shared knowledge about teaching and technology at their varied levels of expertise. In the present study, analysis revealed that cooperating teachers noted learning from their student teachers. This learning was characterized in two forms: as reciprocal learning and reciprocal mentoring.
In reciprocal learning, both parties have opportunities to share their knowledge with the other party. In multi-case analysis, several instances of reciprocal learning were evident. For example, Ms. Solmon explained, “I think I learn more through him because when he says he doesn’t understand something, we both kind of learn. I’m learning from him.” Mr. Somers discussed how a change in plans helped the student teacher learn how to adapt and think on her feet and he learned a new approach for using technology in which he saw how students’ thinking changed as they were exposed to new information. Mr. Sotelo remarked about how he and Ms. Johans learned together just by “talking and actually sitting down together and doing it on the computer.”

In reciprocal mentoring, Wink and Putney (2002) explained “the notion of the more experienced or capable other can alternate depending on the situations and setting” (p.161). The multi-case analysis revealed several examples of reciprocal mentoring that occurred with technology use. Ms. Solmon described Mr. James use of a stepping in mentoring strategy as he stepped into her lesson to show her how to use the ELMO. Ms. South mentioned how she received just-in-time support from Mr. Jurek as she learned new features on the software program. Finally, Mr. Jensen talked about the modeling strategy he used to help Mr. Sowell see how use of the Internet could support student learning. The consistent feature in these cases that identifies the strategy as reciprocal mentoring rather than reciprocal learning is that the student teacher was the “more capable other” who used their expertise in a professional practice approach to develop the skill of the novice. The novices in these cases were the cooperating teachers. For example, Ms. South noted, “It’s not demeaning to him that you don’t know it. He’ll go ahead and teach you.”
Findings from this study support Dawson and Nonis' (2000) research that identified reciprocal benefits in the mentoring as teachers and preservice students shared knowledge about teaching and technology at their varied levels of expertise. In addition, it appears from the multi-case analysis in this study that the concept of reciprocal benefits during field experience situations was extended to the concept of reciprocal mentoring. This suggests a reframing of mentoring approaches introduced to cooperating teachers to include a discussion of reciprocal mentoring and the development of practices that would encourage this reciprocity.

Implications of The Findings

Field Experience Placements

Research indicates that teachers tend to teach the way they were taught (Cuban, 1986; Lortie, 1977) and that student teaching is a critical component in establishing practices for future settings (Guyton & McIntyre, 1990). If schools are to adequately prepare students for the increased use of technology that characterize the job needs of the 21st century (Darling-Hammond, 2000), then they must be guided by knowledgeable teachers to meet this challenge (Moursund & Bielefeldt, 1999). For those concerned with the field experience placements of student teachers in settings that will prepare them work in for 21st century classrooms, findings from this study suggest several considerations for selection of those placements.

First, the import of promising practices of one-on-one tutoring and modeling active use of technology for supporting student teacher use suggests that cooperating teachers should have technology skills adequate to model both of these practices. Student teachers...
working in classrooms where these practices are not modeled may face a greater challenge in learning to integrate technology into their practice and may be handicapped in the task of preparing future students for their place in tomorrow's technological world.

Second, access to adequate levels of technology appear to be important factors in supporting student teacher use of technology. If the focus during student teaching is to have the student teacher use technology, then working in a classroom with a single computer may be adequate. In this research, student teachers who only had access to a single computer in the classroom were able to learn productivity practices such as keeping electronic grade books, using lesson plan templates, and in presenting computer aided classroom presentations. But, they had no opportunity to explore, develop, and learn how to facilitate lessons that supported student use of technology with content area topics. Therefore, if the focus during student teaching is to encourage the student teacher to develop teaching practices that integrate technology in active, student-centered lessons, this study suggests that placements limited to a single computer in the classroom without access to additional technology may not be adequate. In order for student teachers to learn how to support student-centered lessons with technology, they need knowledgeable mentor teachers and adequate access to technology.

School District/University Mentoring Partnerships

In this study, the school district/university partnership was developed based on the convergence of four themes in research. First, recent research has begun exploring school district/university partnerships as a means of developing technology-using placements for student teachers (Dawson & Nonis, 2000; Wetzel et al., 2001). Second, mentoring has been explored as a professional development approach to help practicing teachers learn to
use computers effectively (MacArthur et al., 1995). Third, recent mentoring research has called for the integration of new models of reform-minded instruction during mentoring to support the development of skills that novices and their students will need to flourish in tomorrow’s classrooms (Wang & Odell, 2001). Finally, according to research from Sandholtz, Ringstaff and Dwyer (1997), “Technology is a catalyst for change in classroom processes because it provides a distinct departure, a change in context that suggests alternative ways of operating” (p. 47).

At the convergence of these four themes is an intersection where technology use and mentoring programs come into focus. In mentoring programs for student teachers, the addition of technology use in teaching opens an opportunity for cooperating teachers to become learners again and be introduced to new models for teaching that can impact their mentoring practice. Rather than merely suggesting that they change their practice to include technology, they can be introduced to new practices integrating technology in curriculum-based, student-centered activities that expose them to new models for teaching and learning. Research from Sandholtz, Ringstaff and Dwyer (1997) articulates “Instructional evolution is not simply a matter of abandoning beliefs but one of gradually replacing them with more relevant ones shaped by experiences in an altered context” (p. 48). Findings from the present study suggest that introduction of technology use in student teacher mentoring programs provides the altered context that sets the stage for consideration of new practices. Odell and Huling (2000) noted that “Formal and ongoing professional development can provide the necessary foundation and structure for mentor growth” (p.67). Based on results of the present study, school district/university
partnerships that support the student teaching experience should consider a dual focus on reform-minded mentoring strategies and student-oriented use of technology.

The mentoring strategies should include both technical practices for supporting technology use and conceptual development of mentoring perspectives. In the current study, reciprocal mentoring appears to be a natural occurrence in mentoring for technology use as some student teachers may bring prior knowledge of technology skills that are more developed than those of the cooperating teacher. Therefore, cooperating teachers need to be introduced to mentoring concepts that promote and support learning in the act of teaching.

The technology strategies should combine development of basic skills in curriculum-focused activities rather than merely teaching different software programs. Research has indicated that learners need both technical advice and conceptual development when learning new tasks (Bransford et al., 2000), and technology integration is a new task in teaching. In the present study, cooperating teachers cited activities focusing on technology use in content area topics as leading to refinements in their practice. Therefore, teachers need to be introduced to technology uses that promote student and teacher learning.

Limitations of the Study

One of the major limitations of questionnaire and interview research is that it reflects self-reported data. Workshop topics and activities may have influenced practices cooperating teachers discussed during interviews. In addition, the cooperating teachers may have reported practices that they believed the researcher wanted to hear. While
interview data from the student teachers provided some corroboration for identification of mentoring practices, a notable limitation is that the bulk of the data was self-reported.

A second limitation in this study was the small number of participants. 16 cooperating teachers and seven student teachers. All participants were volunteers, and the findings were drawn from data specific to this study. The degree to which findings can be generalized is limited. However, readers can analyze results from the present study and decide which findings may be applicable to their particular context.

The researcher’s role as a participant-observer was both a limitation and an asset. As an instructor, she was able determine the workshop content that was presented to the teachers. This proved valuable during the interviews as cooperating teachers referred to workshop content that influenced their practices with student teachers; she was able to use this knowledge to probe for more explicit connections between the workshop activities and their practice. Her role was a limitation in that the analysis and reporting were reliant on the interpretations of the researcher. Measures taken to address this bias included using multiple data sources, triangulating those sources, and having participants read drafts of the interviews to check for accuracy.

This study is descriptive in nature and raises key issues that can be explored in future studies. It does not, however, report on exemplary practice for cooperating teachers based on observed outcomes. Recommendations for practice are preliminary in nature.

Recommendations for Further Study

The results of this study suggest several directions for future research:
1. This study used self-report data to define the practices of cooperating teachers in mentoring student teachers to teach with technology. It is recommended that studies be conducted using observation methods during the field experience to further explore and define the practices of cooperating teachers in mentoring student teachers toward technology use.

2. Conducting longitudinal studies with cooperating teachers can provide more information on the conceptual perspectives of mentors and how those perspectives are impacted through professional development on mentoring, and how that impact effects the development of student teachers.

3. This study examined contextual, conceptual, and practical factors that impact the use of technology in the student-teaching experience. Future studies should take a more systematic look at these factors and other factors that can lead to more effective placements for student teachers. Such research could help identify parameters for a range of levels from minimal to optimal that support student teacher use of technology.

4. While the present study yielded information on the use of technology by student teachers during their field experience, longitudinal research is needed to follow these student teachers into their first years of practice to determine the effects of this program on their use of technology in classroom practice. Interview data coupled with observation data would provide much needed information in designing future school district/university partnerships for the field experience.
APPENDIX A
National Educational Standards for Teachers
Student Teaching/Internship Performance Profile

1. Apply troubleshooting strategies for solving routine hardware and software problems that occur in the classroom.
2. Identify, evaluate, and select specific technology resources available at the school site and district level to support a coherent lesson sequence.
3. Design, manage, and facilitate learning experiences using technology that affirm diversity and provide equitable access to resources.
4. Create and implement a well-organized plan to manage available technology resources, provide equitable access for all students, and enhance learning outcomes.
5. Design and facilitate learning experiences that use assistive technologies to meet the special physical needs of students.
6. Design and teach a coherent sequence of learning activities that integrates appropriate use of technology resources to enhance student academic achievement and technology proficiency by connecting district, state, and national curriculum standards with student technology standards (as defined in the ISTE National Educational Technology Standards for Students.)
7. Design, implement, and assess learner-centered lessons that are based on the current best practices on teaching and learning with technology and that engage, motivate, and encourage self-directed student learning.
8. Guide collaborative learning activities in which students use technology resources to solve authentic problems in the subject area(s).
9. Develop and use criteria for ongoing assessment of technology-based student products and the processes used to create those products.
10. Design an evaluation plan that applies multiple measures and flexible assessment strategies to determine students' technology proficiency and content area learning.
11. Use multiple measures to analyze instructional practices that employ technology to improve planning, instruction, and management.
12. Apply technology productivity tools and resources to collect, analyze, and interpret data and to report results to parents and students.
13. Select and apply suitable productivity tools to complete educational and professional tasks.
14. Model safe and responsible use of technology and develop classroom procedures to implement school and district technology acceptable use policies and date security plans.
15. Participate in online professional collaboration with peers and experts as part of a personally designed plan, based on self-assessment, for professional growth in technology.

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APPENDIX B

Staff Use of Technology - 2001 Self-Evaluation Rubric

Name: ___________________________ Date: ______________

Please judge your level of achievement in each of the following competencies. Check the number that best reflects your current level of skill attainment. (Be honest, but be kind.) This tool is designed to help understand your current level of skills with computer technologies and to plan for professional development.

1. Basic Computer Use
   ___Level 1 - I do not use a computer.
   ___Level 2 - I use the computer to run a few specific, pre-loaded programs.
   ___Level 3 - I run two programs simultaneously, and have several windows open at the same time.
   ___Level 4 - I trouble-shoot successfully when basic problems with my computer or printer occur. I learn new programs on my own. I teach basic operations to my students.

2. File Management
   ___Level 1 - I do not save any documents I create using the computer.
   ___Level 2 - I select, open and save documents on different drives.
   ___Level 3 - I create my own folders to keep files organized and understand the importance of a back-up system.
   ___Level 4 - I move files between folders and drives, and I maintain my network storage size within acceptable limits. I teach students how to save and organize their files.

3. Word Processing
   ___Level 1 - I do not use a word processing program.
   ___Level 2 - I occasionally use a word processing program for simple documents. I generally find it easier to hand write most written work I do.
   ___Level 3 - I use a word processing program for nearly all my written professional work: memos, tests, worksheets, and home communication. I edit, spell-check, and change the format of a document.
   ___Level 4 - I teach students to use word processing programs for their written communication.

4. Spreadsheet
   ___Level 1 - I do not use a spreadsheet.
   ___Level 2 - I understand the use of a spreadsheet and can navigate within one. I create simple spreadsheets and charts.
   ___Level 3 - I use spreadsheets for a variety of record-keeping tasks. I use labels, formulas, cell references and formatting tools in my spreadsheets. I choose charts that best represent my data.
   ___Level 4 - I teach students to use spreadsheets to improve their own data keeping and analysis skills.
5. Database
__Level 1 - I do not use a database.
__Level 2 - I understand the use of a database and locate information from a pre-made database such as Library Search.
__Level 3 - I create my own databases. I define the fields and choose a layout to organize information I have gathered. I use my database to answer questions about my information.
__Level 4 - I teach students to create and use databases to organize and analyze data.

6. Graphics
__Level 1 - I do not use graphics with my word processing or presentations.
__Level 2 - I open, create, and place simple pictures into documents using drawing programs or clipart.
__Level 3 - I edit and create graphics, placing them in documents in order to help clarify or amplify my message.
__Level 4 - I promote student interpretation and display of visual data using a variety of tools and programs.

7. E-mail
__Level 1 - I have an e-mail account but rarely use it.
__Level 2 - I send messages using e-mail – mostly to district colleagues, friends, and family. I check my e-mail account on a regular basis and maintain my mail folders in an organized manner.
__Level 3 - I incorporate e-mail use into classroom activities. I use e-mail to access information from outside sources.
__Level 4 - I use e-mail to request and send information for research.

8. Research/Information-Searching
__Level 1 - I am unlikely to seek information when it is in electronic formats.
__Level 2 - I conduct simple searches with the electronic encyclopedia and library software for major topics.
__Level 3 - I have learned how to use a variety of search strategies on several information programs, including the use of Boolean (and, or, not) searches to help target the search.
__Level 4 - I have incorporated logical search strategies into my work with students, showing them the power of such searches with various electronic sources to locate information which relates to their questions.

9. Desktop Publishing
__Level 1 - I do not use a publishing program.
__Level 2 - I use templates or wizards to create a published document.
__Level 3 - I create original publications from a blank page combining design elements such as columns, clip art, tables, word art, and captions.
__Level 4 - I design original publications that communicate to others what I’ve learned.

10. Video Production
__Level 1 - I do not use a video camera.
__Level 2 - I create original videos for home or school projects.
__Level 3 - I create original videos using editing equipment.
__Level 4 - I use computer programs to edit video presentations and I teach my students to create and edit videos.
11. Technology Presentation
___ Level 1 - I do not use computer presentation programs.
___ Level 2 - I present my information to classes or groups in a single application program such as a word processor, a spreadsheet, or a publishing program.
___ Level 3 - I present my information and teach my class using presentation programs such as Powerpoint or SuperLink, incorporating various multimedia elements such as sound, video clips, and graphics.
___ Level 4 - I teach my students how to use presentation software. I facilitate my students’ use of a variety of applications to persuasively present their research concerning a problem or area of focus in their learning.

12. Internet
___ Level 1 - I do not use the Internet.
___ Level 2 - I access school and district websites to find information. I follow links from these sites to various Internet resources.
___ Level 3 - I use lists of Internet resources and make profitable use of Web search engines to explore educational resources.
___ Level 4 - I contribute to my school or district websites. I teach students how to effectively use the resources available on the Internet.

13. Responsible Use/Ethics
___ Level 1 - I am not aware of any ethical issues surrounding computer use.
___ Level 2 - I know that some copyright restrictions apply to computer software.
___ Level 3 - I understand district rules concerning student and adult use of e-mail and Internet. I know the programs for which the district or my building holds a site license. I understand the school board policy on the use of copyrighted materials.
___ Level 4 - I model ethical use of all software and let my students know my personal stand on this issue.

14. Technology Integration
___ Level 1 - I do not blend the use of computer-based technologies into my classroom learning activities.
___ Level 2 - I understand the district technology plan supports integration of technology into classroom activities, but I am still learning about what strategies will work and how to do it. I accept student work produced electronically, but do not require it.
___ Level 3 - From time to time, I encourage my students to employ computer-based technologies to support the communicating, data analysis and problem solving outlined in the district technology plan.
___ Level 4 - I frequently model and teach my students to employ computer-based technologies for communication, data analysis, and problem-solving as outlined in the district technology plan.

*This scale was borrowed and modified with permission from the original Mankato (MN) Schools scale.

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Revised 8/01/01
APPENDIX C

PART J. YOUR TEACHING PHILOSOPHY

J1. The following paragraphs describe observations of two teachers' classes, Ms. Hill's and Mr. Jones'. Answer each question below by checking the box under the column that best answers that question for you.

Ms. Hill was leading her class in an animated way, asking questions that the students could answer quickly, based on the reading they had done the day before. After this review, Ms. Hill taught the class new material, again using simple questions to keep students attentive and listening to what she said.

Mr. Jones' class was also having a discussion, but many of the questions came from the students themselves. Though Mr. Jones could clarify students' questions and suggest where the students could find relevant information, he couldn't really answer most of the questions himself.

<table>
<thead>
<tr>
<th>Ms. Hill's</th>
<th>Tend towards</th>
<th>Can't decide</th>
<th>Tend towards</th>
<th>Definitely</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ms. Hill's</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mr. Jones'</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a. Which type of class discussion are you more comfortable having in class? ........

b. Which type of discussion do you think most students prefer to have? ........

c. From which type of class discussion do you think students gain more knowledge? ........

d. From which type of class discussion do you think students gain more useful skills? ........

J3. Different teachers have described very different teaching philosophies to researchers. For each of the following pairs of statements, check the box that best shows how closely your own beliefs are to each of the statements in a given pair. The closer your beliefs to a particular statement, the closer the box you check. Please ✓ only one for each set.

a. "I mainly see my role as a facilitator. I try to provide opportunities and resources for my students to discover or construct concepts for themselves."

Mr. Jones: "That's all nice, but students really won't learn the subject unless you go over the material in a structured way. It's my job to explain to students how to do the work and assign specific practice."

b. "The most important part of instruction is the content of the curriculum. That content is the community's judgment about what children need to be able to know and do."

Ms. Hill: "The most important part of instruction is that it encourages 'sense-making' or thinking among students. Content is secondary."

c. "It is useful for students to become familiar with many different ideas and skills even if their understanding for now is limited. Later in college, perhaps they will learn these things in more detail."

Mr. Jones: "It is better for students to master a few complex ideas and skills well and to learn what deep understanding is all about, even if the breadth of their knowledge is limited until they are older."

d. "It is critical for students to become interested in doing academic work—interest and effort are more important than the particular subject-matter they are working on."

Mr. Jones: "While student motivation is certainly useful, it should not drive what students study. It is more important that students learn the history, science, math and language skills in their textbooks."

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"It is a good idea to have all sorts of activities going on in the classroom. Some students might produce a scene from a play they read. Others might create a miniature version of the set. It's hard to get the logistics right, but the successes are so much more important than the failures."

"It's more practical to give the whole class the same assignment, one that has clear directions and one that can be done in short intervals that match students' attention spans and the daily class schedule."
Notice of Approval to Conduct Research Involving Human Subjects

DATE: October 4, 2001

TO: Karen J. Grove

FROM: Dr. Fred Preston, Chair
UNLV Social Behavioral Sciences
Institution Review Board

RE: Status on Research Project Entitled: Cooperating Teacher Practices in Preparing Student Teachers to Teach with Technology

OPRS Number: 311S0901-089
Approval Date: October 1, 2001

This memorandum is official notification that the protocol for the project referenced above has been reviewed. The protocol has been determined as having met the criteria for exemption from full IRB review. In compliance with this determination of exemption from full board review, the protocol is approved via the expedited review process for a period of one year. The approval is effective October 1, 2001 and will continue for a period of one year.

Should the use of human subjects described in the referenced protocol continue beyond a year from the approval date, it will be necessary to request an extension. Any changes to the original approved protocol must be submitted for additional approval.

If you have questions or require any assistance, please contact the Office for the Protection of Research Subjects at 895 – 2794.

cc: OPRS File
APPENDIX E

Final Questionnaire

Date: __________

1. Name ________________________________

2. School ______________________________

3. Current grade level or area ________________________________

4. Number of years you have been teaching at this school including this year _______

Please answer the following questions about your classroom.

5. Number of computers in your classroom _____

6. Internet access in your classroom (y/n) _____

7. Number of computers in your classroom with Internet access_____ 

Please answer the following questions about your use of technology.

8. How often do you use a computer for school related work? (Please check a box.)

<table>
<thead>
<tr>
<th>Daily</th>
<th>Weekly</th>
<th>Several times a month</th>
<th>Monthly</th>
<th>Once or twice a semester</th>
<th>Never</th>
</tr>
</thead>
</table>

9. How often do you use a computer for instructional purposes? (Please check a box.)

<table>
<thead>
<tr>
<th>Daily</th>
<th>Weekly</th>
<th>Several times a month</th>
<th>Monthly</th>
<th>Once or twice a semester</th>
<th>Never</th>
<th>No computer in my room</th>
</tr>
</thead>
</table>

10. Do you have a school district provided laptop? (y/n) _____

11. Do you use the laptop for teaching activities? (y/n) _____

12. Do you use the laptop away from school for lesson research and planning? (y/n) _____

13. Do your students use the laptop? (y/n) _____

Please answer the following questions about use of technology in the classroom.

14. How frequently do students use the computer in your classroom? (Please check a box.)

<table>
<thead>
<tr>
<th>Daily</th>
<th>Weekly</th>
<th>Several times a month</th>
<th>Monthly</th>
<th>Once or twice a semester</th>
<th>Never</th>
<th>No computers in my room</th>
</tr>
</thead>
</table>

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15. How frequently do your students use computers in a lab classroom? (Please check a box.)

<table>
<thead>
<tr>
<th></th>
<th>Daily</th>
<th>Weekly</th>
<th>Several times a month</th>
<th>Monthly</th>
<th>Once or twice a semester</th>
<th>Never</th>
<th>No lab at my school</th>
</tr>
</thead>
</table>

16. How frequently do your students use a mobile lab brought to your classroom? (Please check a box)

<table>
<thead>
<tr>
<th></th>
<th>Daily</th>
<th>Weekly</th>
<th>Several times a month</th>
<th>Monthly</th>
<th>Once or twice a semester</th>
<th>Never</th>
<th>No mobile lab available</th>
</tr>
</thead>
</table>

17. Briefly describe any technology-aided presentations you have used with your students in the past year. (e.g. PowerPoint to introduce the parts of speech, Inspiration to brainstorm ideas on endangered species, spreadsheet to record student generated data)

18. Briefly describe any technology activities your students have done in the past year. (e.g. Inspiration to map parts of an ecosystem, AppleWorks slide show on Dr. Seuss, database on the solar system, Internet search on medieval topics, Math Forum website for tangram lesson, Accelerated Reader practice activities, World Book CD-Rom to research snails)

Please answer the following questions concerning professional development.

19. Year you completed your initial teaching degree _______

20. Highest degree obtained (B.A., M.A. etc) _______

21. Year highest degree obtained _______

22. Number of additional hours beyond highest degree _______

23. Total number of years teaching, including this year _______

24. Number of student teachers you have had, including your current student teacher ___
25. During your student teaching, was there a computer in the classroom? (y/n) ____
26. During your student teaching, did your master teacher teach a lesson using the computer? (y/n)____
27. During your student teaching, did you teach any lessons using a computer? (y/n) ____
28. Do you have a computer at home? (y/n) ____
29. If you have a home computer, do you use it for school work? (y/n or not applicable) _

Please answer the following questions concerning the online course work.

30. What did you like most about the use of online communication in this course?

31. What did you like least about the use of online communication in this course?

32. Describe any instances in the online coursework that you believe helped create a sense of community for this course.

Additional comments
APPENDIX F

Initial Semi-structured Interview with Cooperating Teachers

This interview is for me to collect information relevant to my study on the practices of cooperating teachers in preparing student teachers to teach with technology. It is not an evaluation of you, but a means of soliciting your views and perceptions.

The first few questions will give me some background on you as a professional.

1. What is your name?
2. How long have you been teaching?
3. What grades or subject areas have you taught?
4. How do you think your students learn?
5. How many times have you had a student teacher? (Grove)

The next few questions will focus on your participation with Project THREAD.

6. How did you come to participate as a cooperating teacher in this project? (Wang)
7. How long have your been working with Project THREAD?

Now I would like to talk about your role as a cooperating teacher.

8. What do you believe is your role in working with student teachers? (Wang)
9. How do you think student teachers learn how to teach? (Wang, Gold)
10. What do you believe student teachers need from cooperating teachers? (Gold)
11. Do you find any personal or professional rewards or advantages in working with student teachers? (Gold)

In this part of the interview, I would like to focus on technology.

12. How do you use technology in your teaching? (Grove)
13. What are some of the most important things your student teacher needs to learn about teaching with technology? (Wang, Grove)
APPENDIX G

Second Semi-structured Interview with Cooperating Teachers

This interview is for me to gather additional information relevant to my study on the practices of cooperating teachers in preparing student teachers to teach with technology. It is not an evaluation of you, but a means of soliciting your views and perceptions.

1. What do you believe is your role concerning your student teacher's use of technology during student teaching?

2. What do you believe you can do to support your student teacher’s use of technology?

3. What do you believe you need to do to help your student teacher learn how to teach with technology?

4. What resources beyond yourself did you guide your student teacher to use during the semester?
   a. Did you recommend any web resources? Please identify.
   b. Did you encourage them to consult with the ECS? In what way?
   c. Did you suggest any other teachers on staff as resources? For what specific purposes?
   d. Did you identify any software resources? Which ones and why?

5. What strategies or practices did you use with your student teacher to help them integrate technology in their lessons?
   a. Probe for constructivist, student-centered practices in learning activities.

6. What strategies or practices did you use with your student teacher to help them integrate technology in their professional practice?

7. Did you have any instances where you learned something about technology from your student teacher? Please describe.
APPENDIX H

Semi-structured Interview with Student Teachers

This interview is for me to collect information relevant to my study on the practices of cooperating teachers in preparing student teachers to teach with technology. It is not an evaluation of you, but a means of soliciting your views and perceptions.

1. What are your views of technology use in the classroom?
   a. How important do you think technology is in education? (and why)
   b. Do you see any advantages in using technology? Please explain.
   c. Do you see any disadvantages? Please explain.

2. Were you able to teach any lessons using technology? Please describe.

3. How do you believe students learn and acquire new information?

4. Were you able to use technology to support other student learning activities? Please describe.

5. Do you believe your university courses prepared you for technology use in teaching and learning activities? Please explain.

6. What practices of your cooperating teacher helped support you in your use of technology in teaching situations?

7. What practices of your cooperating teacher helped support you in your use of technology for professional practice situations, such as keeping track of student data such as grades, using online communications, gathering research or information from the internet, or recording professional practice information such as teaching notes or lesson plans?

8. Were there any things your cooperating teacher did that you found particularly helpful in supporting or encouraging your use of technology?

9. Were there any factors that inhibited your use of technology?

10. Was there anything you would have liked your cooperating teacher to do to support your use of technology?

11. What are your plans for the future regarding technology use in education? (i.e. will you spend time reviewing software, improving your personal skills, taking advantage of professional development, etc.)
APPENDIX I

Permission to Quote Copyrighted Material

University of Nevada, Las Vegas

I, Henry J. Becker holder of copyrighted material in the Teaching, Learning and Computing Survey entitled “Teacher’s Survey: Combined Versions 1-4” hereby give permission to graduate student Karen J. Grove to quote in her doctoral dissertation that portion of the above described work.

I also permit that quoted material to be included in copies of the completed dissertation submitted to University Microfilms, Inc. for microform reproduction. I understand that proper scholarly citation will be adhered to.

Message
From: hjbecker@uci.edu
Subject: Re: Doc student request for permission to use material
To: grove@nevada.edu

Sure. You’re welcome to use or adapt any of the survey questions from the Teaching, Learning, and Computing survey. No need for a document; please I’d rather that you just use this email for documentation.

Hank Becker

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APPENDIX J

Informed Consent (Cooperating Teachers)

University of Nevada, Las Vegas
Department of Curriculum and Instruction

Title Of Study: Cooperating Teacher Practices in Preparing Student Teachers to Teach with Technology

I am Karen J. Grove, a doctoral student in the Department of Curriculum and Instruction at UNLV. I am conducting research on teacher practice under the direction of Dr. Neal Strudler.

Purpose: You are being asked to participate in a research study that investigates the practices of cooperating teachers in preparing student teachers to integrate technology in their teaching.

Procedures: As a volunteer, you will be asked to complete a self-evaluation rubric on your technology use, a follow-up questionnaire, and participate in an online communication forum. In addition, the researcher may ask you to participate in follow-up interviews. The interviews may be single episodes, or you may be asked to participate in a series of bi-monthly interviews. The interviews are completely voluntary and you have the right not to respond to any questions, or to terminate the interviews at any point. All interviews will be tape-recorded. Audiotapes will be kept until they are transcribed whereupon they will be erased. The rubric and questionnaires will be completed in class. The online communication forum will take approximately 30 minutes per week. If you participate in the interviews, an additional 30 minutes will be required for each interview.

Risks: Because of the assurance of anonymity, you should not experience any risk associated with this study. However, you are encouraged to alert the researcher if any questions arise.

Benefits: As a participant, you may gain a deeper understanding of how to integrate technology into your teaching practices. This research will also add to the professional knowledge base on effective practices for preparation of student teachers.

Confidentiality: All information collected will be strictly confidential and your anonymity will be protected through the use of pseudonyms. All information gathered (i.e. data and consent forms) will be stored in locked filing cabinet in my study for three years.

Right to refuse or withdraw: Your participation is completely voluntary and you may withdraw from participation at any time. Non-participation will not result in any penalty or loss of benefits to which you are otherwise entitled. You will be informed if the study design or use of the data is to be changed.

Questions: If you have any questions regarding this research, please contact Karen Grove at 895-1465 or Dr. Neal Strudler at the UNVL Department of Curriculum and Instruction at 895-1306. For questions involving the rights of human subjects, please contact the UNLV Office for the Protection of Research Subjects at 895-2794.

I have read the above information and agree to participate in this research study.

___________________________________  ______________________________
Signature of Participant  Date

___________________________________  ______________________________
Signature of Researcher  Date
APPENDIX K

Inform ed C onsent (Student Teachers)

University of Nevada, Las Vegas
Department of Curriculum and Instruction

Title Of Study: Cooperating Teacher Practices in Preparing Student Teachers to Teach with Technology

I am Karen J. Grove, a doctoral student in the Department of Curriculum and Instruction at UNLV. I am conducting research on teacher practice under the direction of Dr. Neal Strudler.

Purpose: You are being asked to participate in a research study that investigates the practices of cooperating teachers in preparing student teachers to integrate technology in their teaching.

Procedures: As a volunteer, you will be asked to complete the “Staff Use of Technology Self-Evaluation Rubric” form to assess your technology skills, and participate in an interview to discuss practices you found helpful in preparing to teach with technology. The rubric will take about 15 minutes to complete. The interview will take approximately 30 minutes to complete. The interview will be tape-recorded. Audiotapes will be kept until they are transcribed whereupon they will be erased.

Risks Because of the assurance of anonymity, you should not experience any risk associated with this study. However, you are encouraged to alert the researcher if any questions arise.

Benefits: As a participant, you may gain a deeper understanding of how to integrate technology into your teaching practices. This research will also add to the professional knowledge base on effective practices for preparation of student teachers.

Confidentiality: All information collected will be strictly confidential and your anonymity will be protected through the use of pseudonyms. All information gathered (i.e. data and consent forms) will be stored in locked filing cabinet in my study for three years.

Right to refuse or withdraw: Your participation is strictly voluntary and you may withdraw from participation at any time. Your participation in this study is completely voluntary, and non-participation will not result in any penalty or loss of benefits to which you are otherwise entitled. You will be informed if the study design or use of the data is to be changed.

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I have read the above information and agree to participate in this research study.

______________________________  __________________________
Signature of Participant        Date

______________________________  __________________________
Signature of Researcher         Date

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