

Cooperating Teacher Practice in Mentoring Student Teachers Toward Technology Use

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Abstract

This paper investigates the mentoring practices of 16 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. Data were gathered from multiple sources during a semester of student teaching. A complex variety of contextual and conceptual factors influencing the integration of technology into student teaching experiences are presented, including access to technology, on-site support, and beliefs about mentoring. Findings describe the practices of cooperating teachers in mentoring student teachers toward technology use in six areas: system information, resources and materials, instruction, productivity, modeling, and support and challenge. Recommendations for other school district/university partnerships attempting to integrate technology in field experiences suggest implementation of supplemental programs for cooperating teachers addressing a dual focus on reform-minded mentoring strategies and student-oriented use of technology.

Introduction

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 (Feiman-Nemser, 1983; Guyton & McIntyre, 1990; 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, noted that we have few explicit accounts of what cooperating teachers do and how they do it in their work with student teachers (Cochran-Smith, 1991). This paper addresses that gap in knowledge and provides insight into the practices of cooperating teachers in supporting student teacher use of technology.

Review of the Literature

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 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). However, 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).

Teacher preparation and ongoing professional development have been identified as essential ingredients for powerful use of digital content in the classroom (Trotter, 1999), and 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). 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.

Thomas, Larson, Clift , and Levin (1996) 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” (p. 6). However, a national survey 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 (Moursund & Bielefeldt, 1999). 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. Adding complexity to the issue of integrating technology in field experiences is the problem of locating technology-using teachers for these placements (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 & Grove, 2002; U.S. Congress, 1995). Studies have begun 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). However, little research is available specifically addressing the cooperating teachers’ experiences in facilitating technology use by their student teachers.

Theoretical Framework

The framework for the study addressed 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 technology contextual dimensions, the next layer addressed mentoring dimensions, and the final layer addressed a technology effectiveness dimension to identify a cross section of cases for further study.

In the sociocultural perspective of learning, knowledge is situated in and developed in the context of its use (Brown et al., 1989). Knowledge about teaching is situated in the activity of teaching and it grows out of practice in authentic situations (Perry, Walton, & Calder, 1999). In a mentor-novice relationship, the sociocultural perspective emphasizes that interactions with more capable or experienced others are critical in order for novices 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).

For the mentoring dimensions, this 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 a case study approach to capture the words and terms introduced by one exemplary mentor to characterize conceptual approaches to mentoring practices.

In addressing the technology contextual dimensions, this research drew from studies that addressed the technology practice of teachers (Becker, Ravitz, & Wong, 1999; Ertmer, Gopalakrishnan, & Ross, 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. They also noted that an important factor in use of technology with students was the level of access teachers had to computers. 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 cooperating teacher and student levels of technology use.

The technology effectiveness dimension drew from the framework of Jones, Valdez, Nowakowski, and Rasmussen (1995), who posited that the intersection of two continua - learning and technology performance - can be useful in defining technology practices that support student learning. In this study, questions from 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 and their student teachers for further case studies.

The Study

This study employed qualitative methods and descriptive statistics. The purpose was to describe the mentoring practices of cooperating teachers as they prepared student teachers to integrate technology into teaching and learning activities. A cooperative inquiry methodology (Reason, 1998) was used to focus cooperating teacher participation on the collaborative construction of a knowledge base of practices they used to prepare their student teachers to teach with technology. Two research questions guided the study:

1. What are the general technology contexts in which 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?

Participants

Participants included 16 cooperating teachers and seven student teachers. The cooperating teachers from elementary (n=8), middle (n=4), and high schools (n=4) were enrolled in a series of four monthly mentoring workshops during the semester they worked with student teachers. The full-day workshops were delivered via a K-12 school district/university partnership. The morning sessions focused on mentoring activities and the afternoon sessions focused on technology-rich learning activities to support their student teachers. In addition, an on-line discussion forum was used to elicit information on how teachers described, defined and refined their practice with student teachers.

Midway through the study, seven of the cooperating teachers were identified for further case studies, and their student teachers were invited to become participants. At this point, three of the cooperating teachers who were working as “track break alternate teachers” at a school with a year round schedule were eliminated from the selection process. This was due to their more limited involvement with the student teachers and the lessened opportunity for them to engage in mentoring practices. This left a pool of 13 cooperating teachers for selection.

The “Technology Effectiveness Framework” (Jones et al., 1995) was used to identify a cross section of those 13 cooperating teachers for the case studies. In this framework, “learning” is represented on the horizontal axis and progresses from passive at the low end to engaged at the high end. On the vertical axis, technology performance is represented from low to high. Selected questions from Becker et al.’s (1999) teaching philosophy criteria were combined to create a score for each cooperating teacher on the axis of learning engagement. Mean scores from all

questions on The Staff Self-Evaluation Rubric (Bellingham Public Schools, 2001) were used to define their scores on the axis of technology performance. The intersection of those two scores identified a point in one of four quadrants on the grid. Table 1 shows the four quadrants and indicates the seven cooperating teachers selected for case studies. Each case was composed of the identified cooperating teacher and the student teacher. Additional data for the case studies were generated through a second interview with the cooperating teacher, and an interview with their student teacher.

Table 1

Cooperating Teachers Selected for Case Studies

<u>Technology Effectiveness Quadrant</u>	<u>Total number of teachers</u>	<u>Selected for case study</u>
Engaged learning and high technology performance	5	3
Engaged learning and low technology performance	2	1
Passive learning and high technology performance	3	2
Passive learning and low technology performance	3	1
Totals	13	7

Data Collection and Analysis

Data were collected via multiple venues throughout the semester. Sources included electronic transcripts from online discussion forums, transcripts of small group discussions among the cooperating teachers during the workshops, 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. Selected sources were gathered from both cooperating teachers and their student teachers for triangulation.

Data for the study were gathered in two phases. The first phase was conducted with all 16 cooperating teachers. Then, in order to provide a more holistic picture of the various contexts that can occur during student teaching experiences, the second phase of case studies were used to illustrate specific portraits.

Descriptive statistics from questionnaires and content analysis from interviews, small group discussions, in-class activities, and field notes generated data for analysis of the first question. For the second question, content analysis was used to identify all cooperating teachers' phrases from interviews, small group discussions, and online postings that addressed specific instances of practices with their student teachers. Spradley's (1980) model for domain analysis was then used to code these clusters or patterns of practices into cover terms. Once these cover terms were identified, content analysis of student teachers' interviews were used to verify those practices. All together, 30 cover terms were constructed from the data. The cover terms were then organized into a taxonomy to show the relationship among the terms.

Findings

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 dimensions that affect cooperating teachers' practice. Each teacher practices in a unique context. Technology practice is affected by general contextual factors that influence use (Ertmer, et al., 2001). In addition, mentoring practice is affected by mentors' conceptualization of their role in working with novices (Feiman-Nemser, 2001; Wang, 2001). The first research question explores the technology context and mentoring perspectives of the cooperating teachers. The second

research question focuses specifically on their mentoring practices. Data for both dimensions noted in the first question are addressed followed by findings for the second question describing the mentoring practices found in this study.

Technology Dimension

This dimension addresses the access to technology and other factors that influenced the technology context of the cooperating teachers. Data are presented in four areas: general access, use in student teaching, additional on-site support, and administrative support factors.

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

In multi-case analysis involving seven cases studies, 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.

Another facet of general access that emerged from this study was the availability of laptop computers. Literature has indicated that laptops provide teachers with convenient access to technology allowing opportunities to bridge barriers of time and access to accelerate their development of technology skills (Falba, Grove, Anderson, & Putney, 2001; Ronnkvist, Dexter, & Anderson, 2000). In the present study, 10 of the 16 cooperating teachers had school district

laptops. Three of those ten teachers were involved in the case study analyses. All three of their student teachers reported checking out laptop computers for home use that enabled them to explore software for teaching presentations and prepare lessons for student use of technology.

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). In this study, seven of the 16 cooperating teachers indicated that there were computers in the classroom during their own student teaching. However, only one reported that his cooperating teacher modeled a lesson using with technology and two of the cooperating teachers noted that they had taught a lesson using the 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 school-level technology coordinators, termed educational computer strategists (ECS) in this particular district. 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. One teacher commented: “[The ECS] plays a

huge role for all of us. So, we use her all the time... I had her come in for a couple of lessons in the beginning so [the student teacher] could see the role of the ECS and what you could ask for.”

Cooperating teachers indicated that ECSs gave support to student teachers in many capacities 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 (Ronkvist, et., 2000), and extends those findings to field experience settings.

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 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 teachers had seven computers in their classrooms, and both of their student teachers reported using technology for presentations and for student learning activities in the classroom. This is consistent with previous research indicating administrative leadership and support is an important factor impacting teacher use of technology (Anderson & Dexter, 2000; Sandholtz et al., 1997), and extends those findings to field experience settings.

Mentoring Dimension

This dimension addresses the conceptual perspectives of the cooperating teachers in addressing their role as mentors. Data for this dimension are reported in two areas: conceptions

about how student teachers learn to teach, and conceptions of the types of support they need from cooperating teachers.

Conceptual beliefs about learning to teach. In order to identify their conceptual perspectives concerning their role as cooperating teachers, the participants were asked in the first interview how they believed student teachers learned to teach. 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, one middle school teacher 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.

A majority of the cooperating teachers stated that they believed student teachers learned to teach by observing. Fourteen (88%) specifically stated that they observed their cooperating teacher, ten (63%) specifically mentioned observing other teachers. The value in taking time for reflection and questioning after lessons was recognized by 11 (69%) of the teachers. A middle school teacher noted, "Sometimes, it's hard to talk 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?"

Five of the cooperating teachers (31%) mentioned that students learned to teach by applying their university course work. Only three of the cooperating teachers (19%) mentioned that student teachers' prior experiences and observations as students affected how they learned to teach. One teacher referred to this prior knowledge during his interview: "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.”

Conceptual beliefs about support. The 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.

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. One teacher characterized the support as reassurance: “I think they need reassurance that they’re capable of doing this.” Another framed the support as a comfortable relationship that supported communication: “He came to me whenever he had a questions, and I think that’s important, too, that the cooperating teacher and the [student] teacher have 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. One teacher stated it most succinctly when she said, “That’s the key, model for them.”

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

Mentoring Practices

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, 1991). 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). 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; Tjeerdsma, 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, 2000) 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, 2000, 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?” 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 more suitable frame for identifying technology support 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 strong 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 1 reveals a taxonomic analysis of mentoring practices reported by all cooperating teachers in supporting student teacher use of technology in teaching and graphically displays the findings.

Discussion

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

General Technology Context

Several trends were apparent in the data gathered on the general technology context. First, student teaching placements in classrooms with more than one computer in the classroom supported increased opportunities for student teachers to develop lessons for student use of technology. In addition, student teacher access to laptops for home use supported their skill development and use of technology in teaching activities. Second, support from an on-site ECS was noted as a strong resource in the context supporting student teachers' use of technology.

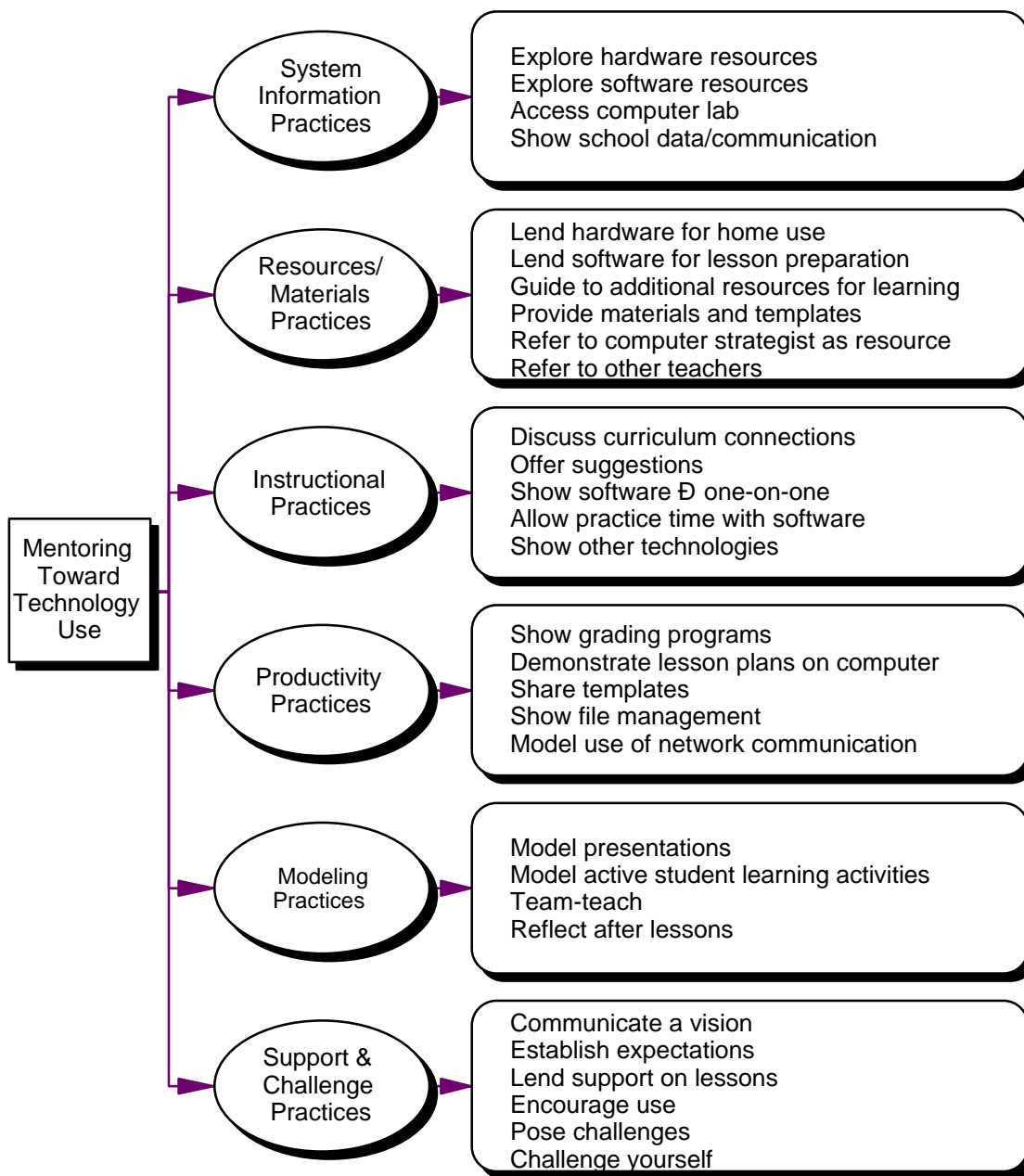


Figure 1. A Taxonomy of Mentoring Practices of Cooperating Teachers

Examples cited included planning support and resources outside the classroom, instructional support in the form of modeling a lesson with students in a lab, and technical problem solving with equipment. Finally, regular or ready access to a computer lab supported student teacher instructional uses of technology for active student learning lessons.

Mentoring Practices That Support Technology Use

Multi-case analysis along with triangulated data from student teachers suggests five trends in practices that supported student teacher use of technology. First was the trend of one-on-one tutoring in software applications and professional productivity practices. The case study teachers reported using one-on-one practices such as previewing software, showing school data collection practices, demonstrating grading programs and lesson plan templates, and introducing student teachers to district and departmental email communication systems. The student teacher data verified these step-by-step approaches. As one commented “the one-on-one is good because then I can feel free to just ask any questions that will come up.”

A second trend in practice was modeling of technology use in professional practice. The cooperating teachers modeled presentations, student-centered learning activities, professional productivity practices such as attendance and grading programs, and use of email for professional communication. One student teacher noted, “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 pictures....and I followed that model.”

A third trend involved discussion and reflection on technology use with content area topics. The discussions included curriculum connections to specific pieces of software, suggestions for ways to experiment with integrating “new” software into learning activities, and reflections after those lessons. The cooperating teachers indicated that these connections could

start either with the curricular content and then make a connection to technology, or the student teacher would suggest a piece of software they were familiar with and the cooperating teacher would help make a connection to an appropriate use with a content area activity. The cooperating teachers also noted that reflections after the lessons offered opportunities for the student teachers to examine their practice and discuss strategies for future practice.

A fourth trend was helping student teachers learn to tap other avenues of support for technology use. This included guiding them to the on-site computer strategist for ideas and technical advice, as well as contacting other teachers on the staff to use as resources in planning and presentations.

A final 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. 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, Walton, and Calder (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.

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.

Implications for Field Experience

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, cooperating teachers should have adequate technology skills for modeling student learning activities and professional productivity 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 appears to be an important factor 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; Strudler & Grove, 2002; 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 designed to support cooperating teachers in their work with 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 with student teachers. Rather than merely suggesting that they change their practice to include technology, they can be introduced to opportunities to experience 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 supplemental programs for cooperating teachers addressing a dual focus on reform-minded mentoring strategies and student-oriented use of technology.

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