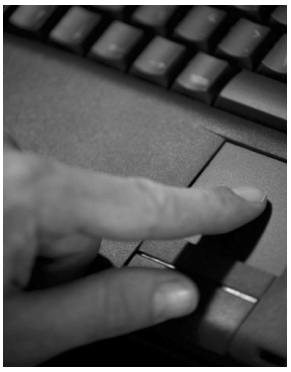

Mentoring Overcomes Barriers to Technology Integration

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Abstract

This article describes a mentoring relationship among elementary teachers in a rural school district and graduate students in instructional technology in the College of Education at a university in the Midwestern United States. Teachers identified common barriers to technology use: vision, access, time, assessment, *and* professional development. *The mentoring relationship provided the professional development support needed to promote opportunities for modeling the curriculum integration of technology, redesigning lessons around technology-rich resources, and overcoming barriers to technology use.*

As educational institutions acquire more sophisticated hard ware and software, the need arises for teachers to obtain the necessary skills to implement these tools into the classroom curriculum. To make effective use of these tools, teachers must (a) redesign lessons around technology resources, (b) solve logistical problems of how to teach a class of students with a small number of computers, and (c) adjust the role of the teacher for the classroom transformed by technology (Maddux, 1997).

Although teachers indicate they see value in students using computers, some are not able to make the connection to how the computer fits into the daily classroom. Common barriers to the use of technology by teachers in this study included the following:

- *Vision.* Most teachers do not have a clear understanding of curricular uses of technology within the curriculum. "An important step in achieving meaningful technology use is to develop a vision of how to use technology to achieve important educational goals" (Ertmer, 1999, p. 54). "Teachers lack models showing the value of technology for their own professional use" (U.S. Congress, Office of Technology Assessment [OTA], 1995, p. 28).
- *Access.* Despite tremendous investments in technology, many schools lack the infrastructure to support the most promising applications of technology. In addition, costs continue to be high for purchasing, connecting, and training teachers to use technologies (Ertmer, 1999; Fabry & Higgs, 1997; OTA, 1995).
- *Time.* Teachers need time to experiment with computers, share experiences with other teachers, plan and debug lessons using methods that incorporate computers, and attend training and workshop sessions (Ertmer, 1999; Fabry & Higgs, 1997; OTA, 1995).
- *Assessment.* Teachers need opportunities to learn strategies for evaluating the results of the implementation of technology in the classroom. Rubrics, electronic portfolios, process-oriented feedback, and performance tasks can be used to examine student learning with new technologies (Ertmer, 1999). "Existing standardized measurements of student achievement may not reflect what has been learned with technology. Teachers are held accountable for change that takes time to show results" (OTA, 1995, p. 41).
- *Professional development.* Districts spend 6%–15% of their technology budget on professional development. Technology training often focuses on basic operation rather than curriculum integration. Teachers need ongoing opportunities to use technology in ways that model the type of learning experiences we are asking them to create (Ertmer, 1999; Fabry & Higgs, 1997; OTA, 1995). Professional development for teachers must confront the traditional methods of instruction and examine the new teaching methods that make use of the computer to determine how best to support the curriculum. Teachers must be provided with pedagogical support through observation of technology-enriched lessons, curriculums, and classrooms as well as consultation opportunities with experienced mentors in the integration of technology (Brunner, 1992). The use of computers and other classroom technologies as part of the daily curriculum is crucial if technology is to be an effective educational resource for students in meeting educational goals. Training opportunities allow teachers to build skill and confidence in the use of technology (Haugland, 1999). Research has shown that teachers need both inservice training in the use of technology applications and ongoing curriculum support in order to be able to incorporate technology into the curriculum in meaningful ways (Ertmer, 1999).

Janas (1996) and Stewart (1999) have addressed mentoring as a means of supporting the professional development needs of higher education faculty. However, little can be found in the research to support the use of mentoring to aid in the professional development needs of elementary school teachers in the use of technology.

The term *mentor* has its roots in Homer's *Odyssey:* "In its original meaning, a mentor is a teacher" (Lucas, 1999, p. 2). Mentors help novices learn by doing and inspire the novice to persevere. The mentor helps the novice make a connection between theory and practice ("Mentoring," 1999). In a school, the classroom teacher mentors the student teacher in classroom practice. Many organizations are instituting mentoring programs as a means of enhancing recruitment into the field, upgrading skills, increasing job satisfaction, and retaining employees in a mobile job market (Kerka, 1998).

As a professional development model, mentoring has the advantage of addressing individual needs while providing guidance in planning, implementation, and support for teachers in the classroom. The mentor provides role modeling, acceptance, confirmation, counseling, and friendship (McArthur et al., 1995). The teacher benefits from the experience as he or she learns how technology can transform traditional instruction, and the mentor has an opportunity to reflect on his or her own practice of teaching with technology.

This article describes a mentoring relationship among elementary teachers in a rural school district and graduate students in instructional technology in the College of Education at a university in the Midwestern United States. The mentoring relationship provided the professional development support needed to promote opportunities for modeling the curriculum integration of technology, redesigning lessons around technology-rich resources, and overcoming common barriers to technology use.

Method

This study investigated one-on-one mentoring as a strategy for helping inservice teachers learn to use technology in teaching and learning. Mentoring has been shown to help teachers gain confidence in technology use when presenting technology-enriched content, and the collegiality of the mentoring relationship helped teachers work through a variety of technology problems that may arise in the classroom (May, 2000). An elementary school in southeastern Ohio was selected as the study site. The school includes Grades K–6, with two classes at each grade level. Approximately 13% of its students are the children of international students attending the local university. The school provides services for students who speak English as a second language (ESL), have hearing impairments, have multiple handicaps, and have learning disabilities.

For several years, there has been administrative support for teachers' computer use. To teach large groups of students in a technology-rich environment, the school established a microcomputer laboratory two years ago. This lab has nine Windows-based computers with Internet access and the following software: WordPerfect Office (1995–2001), Communicator (1994–2001), and HyperStudio (1989–2001). The number of computers in individual classrooms varies from one to five. Classroom computers have similar software to that available in the computer lab.

Sample

The study was conducted over 21 weeks during the 1998–1999 school year and included eight K–6 teachers and eight instructional technology doctoral students. Each instructional technology graduate student mentored one teacher. At the beginning of the school year, the participating teachers took a survey that assessed their technology professional development needs. This survey specifically evaluated teachers' areas of expertise and level of technology skills. The teachers were asked to:

1. identify areas of their curriculum in which they would like to use technology to improve teaching and learning;
2. identify the software, technology skills, and uses of technology in content areas in which they personally wanted or felt they needed help;
3. rate themselves as "novice," "intermediate," or "experienced" in specific skills; and
4. identify what barriers prevented them from using technology in their classroom.

The needs assessment survey provided the researchers with an opportunity to match the skills and knowledge of the graduate student with the teachers that had indicated an interest in an area or a desire to learn specific information. A set of technology skill criteria was used as the background for determining the "novice," "intermediate," and "experienced" levels of the teachers. This skill set had been developed and implemented throughout the Ohio public school system by the Ohio Department of Education's Ohio SchoolNet Commission. (Find more information at www.ohioschoolnet/k12/oh/us/resources/document/frameset.asp.) The teachers' technology experiences were diverse. Two teachers considered themselves to be "novice" in technology use, while the other six considered themselves to be "experienced." None of the teachers considered their abilities to match the "intermediate" criteria. However, as the study progressed the teachers changed their labels for their technology skill levels. By the end of the study, only one teacher labeled himself "experienced," with the other five deciding that their technology skills ranked "intermediate." Based on the survey results, each teacher was paired with a graduate student mentor to help him or her develop needed skills and to learn about and teach with technology.

The mentors were international instructional technology students studying in the second or third year of their doctoral degree program. (All students in the instructional technology program at the time of this study were international students.) They were very interested in the opportunity to learn more about U.S. schools

and to practice their own use of technology with the teachers in the classroom. The elementary school used was also the school where many of the international students on campus sent their own students. All of the international graduate students were proficient in English and had teaching experience within their own countries. A discussion was held with the participating teachers over concerns of language, culture, and U.S. school experience. The participating teachers did not view the involvement of international graduate students as mentors as a problem; rather, they saw this as a positive addition to help promote multicultural diversity in a school that is predominately White. The teachers also noted that having the international graduate students in the school building might provide the teachers with an opportunity to improve the relationships with the young international students in their own classrooms.

Data Collection and Analysis

Data was gathered from multiple sources using multiple measures, including the journals kept by teachers and mentors. Each mentor was required to meet with his or her teacher for at least 45 minutes per week for 21 weeks. The 45 minutes represented typical teacher planning period. However—as indicated in the mentor reports, teacher reports, and a review of the journals, e-mail messages, and researcher observations—the mentors and teachers often met for a least one and one-half hours each time. The teachers wanted to meet with the graduate students mentors during a planning period, during a recess/music period, or after school. The mentor was often asked to work with the teacher on a project during a planning period and then to stay as the class worked on that project.

Separate focus group interviews were conducted with teachers and mentors by university faculty. These interviews provided opportunities for the teachers and mentors to discuss the effectiveness of the program. Additional data was gathered through a review of print and digital documents and field notes taken by the mentors and the university faculty members responsible for supervising the graduate students. Field notes were taped for each discussion, classroom observation, and meeting. A university faculty member in instructional technology acted as the liaison between the mentors and teachers. The faculty member also assisted in the data collection by maintaining a journal of the process and conducting focus group interviews with the teachers and mentors at the end of the study. (Two faculty members acted as participant observers and wrote this article with two graduate students, both of whom are now also faculty.) During the focus group interviews, the teachers and mentors were asked to describe the process of mentoring, using technology in the classroom, and what is was like to be a teacher, as well as questions that were derived from the coded themes in the journals, field notes, and observations.

Data was analyzed throughout the study in a cycle beginning with data collection, continuing through reflection and analysis, and then looping back through more data collection. The number of data sources helped triangulate the data during the research process.

Results

With respect to the barriers to technology use, the mentoring process provided a model for overcoming the barriers found in this setting. The barriers are provided below with examples of how mentoring transformed them.

Vision

Mentors modeled integration of the technology in the teacher's classroom, providing opportunities for the teacher to observe how technology can be used and managed in their own setting. Often it is not that teachers do not want to use technology but that they lack the ability to "see" and "manage" how technology can be used in their classroom. One teacher captured many of the sentiments of the focus group members with the comment, "I may not be completely comfortable with technology yet; but I now see that it is really manageable and my partner had several good ideas for my class. I hope to use these in the future."

The teachers indicated that the process of modeling technology use in real settings allowed them to "see how it works" and that it is indeed manageable. A teacher stated,

> I think I have more confidence about managing it all now. I had ideas about using the technology but this has given me an opportunity to see the graduate student at work with the students, so I know it can be done … even with my class.

Access

Teachers needed help with technical support. Mentors provided the teachers with this support by showing them how to repair machines, load software, navigate printing problems, and locate necessary hardware. This provided teachers with more access to the technology in their classrooms. Journal entries from the mentors indicate that hardware and software maintenance continues to be a problem for teachers wishing to use technology. Comments similar to the following were common in the mentors' journals.

> She [the teacher] told me [the mentor] that the computers were not working and the printer could not print. … I started to look at the printer. I realized there was no cable to connect the printer to the computer.

The mentors were surprised by the lack of support for the maintenance and repair of hardware in the building. They were very eager to make each machine work and install the necessary software so that the technology would be available for use in each classroom. This mentoring provided the instructional technology students with opportunities to improve their hardware and software skills as well as their instructional skills.

Time

Teacher schedules are very difficult to manage. Teachers were not as willing to participate in professional development at the end of the day when they were tired. The mentoring allowed the mentors and teachers to learn "just in time." Teachers met the mentors in their own classroom and used their own equipment when they needed the mentors' help. In a focus group discussion, teachers echoed these sentiments, one stating, "I want to learn how to use the technology myself, but having the mentor gave me the opportunity to learn it in my time frame and with the students."

Assessment

Teachers had an opportunity to use the experiences of the mentor to determine ways of designing and evaluating projects. Mentors provided lesson design opportunities to teachers in instances in which the evaluation of technology skills were desired by teachers.

> The teacher and I [the mentor] discussed the next lesson at the end of the session and we agreed they [the students] were now ready to start on a project. He [the teacher] requested that I write for him a list of skills they had learned so far. What I did instead was to prepare an assignment sheet, which I suggested he could give the students before our next meeting. The sheet asked the students to prepare a [HyperStudio] stack [based on a project the teacher would discuss with them] that would show the different skills.

Professional Development

Mentoring allowed the teacher to examine ways of using computers within the curriculum and learning new skills. Mentoring helped the teacher develop strategies for overcoming the barriers of vision, time, access, and assessment.

The mentors often presented the teachers with models for integration. Teachers then used these models to redesign their lessons to incorporate technology. Thus, teachers did not create artificial lessons; instead, they followed their own lessons, incorporating technology to enhance the learning process. For example, a fifth-grade teacher was already working on a unit on Native Americans at the beginning of this study. After he and his class learned to use HyperStudio, the students created HyperStudio stacks to support and assess what they had learned during the unit. Each of the participants designed and implemented a lesson in which computers were used extensively as part of the instruction. The following are examples of completed classroom projects:

- *Native Americans*—Using a lesson plan on Native Americans, the teacher helped students create a HyperStudio stack about Native Americans. The students then created a quiz using the testing feature in HyperStudio to assess knowledge gained from the Native American Unit.
- *Solar Systems and U.S. Constitution*—Working with students to create two HyperStudio stacks (one on the solar system and the other on the U.S. Constitution) the teacher determined that she needed to learn more about HyperStudio. This teacher felt she was an experienced user when first interviewed. As she worked with her mentor, she decided she was really at the intermediate level.
- *Class Home Page*—With the help of her mentor, one teacher worked with her students to create a class home page using Communicator.
- *Halloween Stories*—Using word processing software and clip art and with help from the mentor, one teacher collaborated with students and a parent volunteer to create Halloween stories on the computer.
- *John Glenn Project*—This teacher worked collaboratively with another fifth-grade teacher in the building. The participating teacher worked with students to create a HyperStudio stack to complement the Solar System stack created in the other fifth-grade classroom. The stack looked at the life of John Glenn, a state hero.
- *Student Album*—Each student created a card in HyperStudio to share his or her story in an electronic class album.

Solving the logistics of computer use in individual classrooms was often problematic. The classrooms had limited numbers of computers, machines were not working and had to be repaired, software was not loaded and ready for use, and printers were not always available. Technical support was at the district level, and the district technologist was only in the building every other week for one day. One of the ways the mentors and teachers solved this problem was to schedule the lab for use when possible, thereby allowing all students access to computers.

Mentors provided technical support during the mentoring partnership and taught teachers how to troubleshoot their own machines. At times, the mentor and teacher discovered how to repair the machine. The mentors were often seen as "knowing everything." This notion was quickly dismissed. Teachers found that "no one knows everything" and "everyone continues to learn how to use technology." A second-grade teacher gave the following comment in the focus group, with a nodding of agreement by a fifth-grade teacher:

> I did not expect the mentors to need to go and "find out" things. It was reassuring that no one knows it all. I thought the mentors would have all the answers right at hand. It was neat that they had to go find the answers sometimes, too.

Transformation of the teacher's role using computers in the classroom in such a short period was limited. Each teacher progressed at his or her own pace. During the first eight weeks of the study, teachers preferred that the mentor take the lead role when students were using technology. These roles reversed as the study progressed, with the teacher taking the lead role by the end of the study. Mentors noted in the focus group, "I really felt like I was not needed toward the end. The teacher

was ready to take charge of using the technology with the students. I felt left out."

All teachers initially indicated they were not sure how to work with students in a classroom setting when technology was used. In the final four weeks of the project, teachers indicated they were more comfortable and able to answer their students' "tech" questions. The mentors observed that the teachers' comfort level influences whether they acquire more technology knowledge. The more a teacher knows about the technology, the more willing he or she is to use computers in the classroom with students.

In the final analysis, the teachers and students were highly motivated and enthusiastic about using technology in the classroom. The mentors recorded several incidences of teachers' excitement as they learned to perform different tasks. Teachers stressed that they needed technical support first, then opportunities to see technology integrated into an actual classroom setting. Teachers were most interested in learning exactly what skills and knowledge were needed at that point in time to support their lessons. Teachers indicated that they often attend technology workshops that do not readily apply to their classroom. Data collected from mentors and teachers supported the use of just-in-time learning. The just-in-time learning provided by the mentors was highly motivating to these elementary teachers.

Mentors indicated that the teachers took longer than expected to gain new computer knowledge and skills. Students acquired the same knowledge and skills very quickly. The teachers were surprised at how quickly their students learned technology skills. Mentors and teachers indicated that time constraints continue to be the leading barrier in their integration of technology into the classroom.

Conclusion

The one-on-one mentoring involving the instructional technology graduate students and elementary teachers overcame many of the time and access barriers to technology integration in elementary classrooms. The mentoring provided vision to the teacher for designing lessons around technology-rich resources, solving technical support problems, and using technology in the teaching and learning process. Comments from the teachers at the end of the study support the continuation of such projects in this elementary school and with others in the area.

Recommendations

Mentoring is a promising way to provide teachers with professional development in technology integration. Where an alliance with a university can be made, it provides opportunities for both the mentor and teacher. Mentorship provides models of computer use to the classroom teacher and help in lesson plan design. This university/K–6 mentoring partnership supports not only the professional development of the classroom teacher but the professional development of the graduate student mentor as well. School districts often have a difficult time obtaining substitute teachers; mentoring provides a cost-effective means for obtaining technical support and professional development without the burden of finding substitute teachers.

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Theme: Technology and Field Experience

Please consider submitting an article for the winter 2002 theme issue of the *Journal of Computing in Teacher Education.*

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In many teacher education programs, a single course in educational technology has been all that was required for preservice teachers to graduate and receive certification. More recently, teacher educators have recognized the importance of providing experiences for teaching with technology in context. This has resulted in the infusion of technology components into university methods courses and, ultimately, into students' field-based practica. The field experience has a powerful effect on students' perceptions of what it means to be a teacher and shapes their future practices. Providing preservice teachers with access to technology and mentor-modeling of appropriate uses of technology in field experiences is a crucial step toward preparing technology-using teachers for the future.

The value of infusing technology-related experiences throughout the teacher preparation curriculum has been widely recognized. Many of the successful Preparing Tomorrow's Teachers to Use Technology (PT^3) grant recipients included a model for infusing technology into field-based experiences for preservice teachers. However, this has proven to be a particularly challenging endeavor. Difficulties include lack of adequate technology facilities—lab and classroom—as well as network and Internet capabilities, limited numbers of technology-using mentor teachers, and the absence of a shared vision for how technology can best be used to support student learning.

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