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Robert W. Smith

Dennis S. Kubaska Jr

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Technology Use Among Interns and Their Partnership Teachers

Robert W. Smith and Dennis S. Kubasko, Jr.

Traditional understandings of learning to teach typically involve the placement of a novice teacher with a more experienced mentor whose role is to supervise and guide the mentee. However, many mentees are more knowledgeable and skilled in the use of such technologies than their mentors (Dexter & Reidel, 2003). The purpose of the study was to investigate interns' and partnership teachers' (mentors) use of technology, beliefs about technology, and obstacles to technology integration. Interns' use of technology during their internship was examined both in relation to the mentoring they received as well as to the broader implications for instructional practice. Interns on average rated their skills with using technology higher than that of their partnership teachers. Interns viewed the barriers to technology as being less substantial than their partnership teachers; however there were few differences between partnership teachers and interns in their beliefs about the value of technology integration. The findings of the study raise some important issues about interns' use of technology in teaching and learning and the problems of providing appropriate mentors.

Overview and Perspectives

Traditional age college seniors who were student teachers this spring have never known a time when there were not personal computers. Born in 1981, they grew up manipulating a mouse, typing term papers with a PC, burning music to compact discs, and surfing the internet. Often these students are more familiar with and

knowledgeable about emerging technologies than their parents, teachers, and professors. Classroom teachers often find ways to use the knowledge and skills of their more technologically savvy students to help them keep pace with their own use of technology. This reality raises interesting questions in relation to preservice teachers' use of new technologies. Specifically, how are preservice teachers guided to use technology in instruction, and does such use offer the potential to change teaching practices?

Traditional understandings of learning to teach typically involve the placement of a novice teacher with a more experienced mentor whose role is to supervise and guide the mentee. However, many mentees are more knowledgeable and skilled in the use of such technologies than their mentors (Dexter & Reidel, 2003).[1] Preservice teachers' level of comfort and skill in using technology has been seen as leading to an increased use of computers in instruction (U.S. Department of Education, 2000) and, thus, as a possible catalyst for changing instruction (Pedretti, Smith-Mayer, & Woodrow, 1999). However, others have argued that future teachers need to have more experience with technology and receive more guidance in the use of technology (Lemke & Coughlin, 1999).

The incorporation of new technologies in P-12 teaching has received widespread interest and support at the state and federal level. Some states require that preservice teachers meet state technology standards for teacher licensure and several states also have technology standards for teachers. The Department of Education has funded 400 PT3 grants to develop teachers' confidence and comfort level in using technology in the classroom. The National Educational Technology Standards for Teachers (NETS-T) proposed by the International Society for Technology in Education (ISTE) provides six standards for inclusion of technology in all teacher education programs. The overall goal, as described in Standard 3, is that teachers use methods and strategies for applying technology to maximize student learning.

Student and Teacher Use of Technology

While there is little specific data available on mentors' use of technology, there is general data on teacher and student use of technology. Evidence of the widespread and increasing use of

technology in K-12 learning is provided by the 2001 NAEP assessment. Seventy-seven percent of grade 12 U.S. history students reported using a CD or the internet to research projects about topics in history or geography (U.S. Department of Education, 2001). Eighty-six percent of the same sample of students reported using computers to write their reports. When Grade 12 science students were assessed by NAEP, the percentage of students who used computers more than once a week increased from 32% in 1996 to 53% in 2000, while 69% of the students surveyed use the internet at home (U.S. Department of Education, 2000).

In relation to teacher use of technology, a 2001 study of 4,400 teachers in 22 school districts in Massachusetts found that teachers used technology regularly for preparation (several times a month) and e-mail (several times a year) but less frequently for instructional purposes in the classroom (Russell, Bebell, Dwyer, & O'Connor, 2003). The authors examined teacher use of technology in six different areas. Although the study revealed a positive correlation between the six categories of use, suggesting that teachers who used technology for one purpose were likely to also use the other types of technology, the relationships were generally weak. Teachers who had entered the profession during the past five years were found to use technology significantly more for *preparation* than teachers who had taught for six or more years. However, in relation to teacher use of technology to *deliver instruction*, there were no significant differences related to the number of years of teaching. In comparing student use of technology during instruction, the authors stated, "New teachers require students to use technology during class time significantly less than do teachers who have taught for six or more years" (Russell et al., 2003, p. 306). They explained the new teachers' lower use of technology during class time as reflecting their belief that "use of technology harms specific aspects of student learning" (p. 305).

In examining the factors that appear to influence teachers' use of technology, the authors concluded, "Teacher beliefs about the importance of technology for teaching were the strongest predictor of the frequency with which technology is used" (Russell et al., 2003, p. 302). In addition, teacher confidence with technology was only a predictor for two—delivery and preparation—out of four categories.[2] While the study found that new teachers are more confident in working

with technology than teachers with 6-15 and 15-plus years of teaching experience, there were no differences between the groups in their beliefs about the positive impact of technology on student learning.

Preservice Teacher Use of Technology

Studies of preservice teachers also identify increased confidence as one of the characteristics of growing up in a technology-rich environment. Seventy-three percent of preservice teachers responded that they were partially or very comfortable with computers (Whetstone & Carr-Chellman, 2001). In another study, 84% of K-12 preservice teachers reported using technology during their internship to word process almost daily or frequently, 74% used the internet almost daily or frequently, and 11% used presentation programs almost daily or frequently (Dexter & Riedel, 2003). In ratings of skill and comfort in using education technology in the three areas of "enhancing instruction," "other professional tasks," and "troubleshooting," 42% of preservice teachers rated themselves as "expert" in "other professional tasks" (Dexter & Riedel, 2003). Overall, the research indicates that preservice teachers are generally comfortable with using computers for word processing, and a small percentage uses them for presentation programs. Twenty percent of preservice teachers described themselves as an "expert" in using technology in "enhancing instruction" (Dexter & Riedel, 2003).

Mentoring and Technology Use

In examining new teachers' use of technology, Russell et al. (2003) challenge the assumption that "technology use in classrooms will increase simply because a teacher grew up in a technology-rich world" (p. 308). They argue that even though new teachers may be more comfortable with technology, "They need to develop positive beliefs about technology and skills to use technology in a wide variety of ways" (p. 309). While recommending the pairing of a preservice teacher with an experienced and sophisticated technology-using teacher, they note that this may not be possible. Instead, they suggest that the practices employed by these teachers be incorporated into the teacher education program.

The provision of an experienced and knowledgeable mentor/ partnership teacher serving to model, guide, and continuously evaluate a mentee's teaching would appear to be as important in learning to use technology as it is in other aspects of learning to teach. The NETS-T standards call for all interns to be "supervised by a mentor or master teacher on a consistent basis" to enable them to become proficient and technologically literate (ISTE, 2003). Further, the standards state that a mentor or supervising teacher should be able to assist students/interns to "identify, evaluate, and select specific technology resources available at the school site and district level to support a coherent lesson sequence" and "guide collaborative learning activities in which students use technology resources to solve authentic problems in the subject area(s)" (ISTE, 2003). In a study in which student teachers were asked to rank the use of eight different sources of support for technology integration, the cooperating teacher received the highest support (71%) while the school technology coordinator (57%) and fellow students (43%) lagged behind (Dexter & Reidel, 2003). However, in the same study, 30% of student teachers indicated that instructional support for technology at their student teaching site was "fair" to "poor," and when asked whether their cooperating teacher used and modeled technology integration in their teaching, most responded "strongly disagree."

The following study was designed to examine the mentoring relationship and its implications for technology use in teaching and learning. Of specific interest was the interns' use of technology during their internship both in relation to the mentoring they received as well as to the broader implications for instructional practice. The research sought to answer the following questions:

1. How and in what ways do interns and mentors use technology in teaching and learning?
2. What mentoring do interns receive in the use of technology from their partnership teacher?
3. How do interns and their partnership teachers perceive the obstacles to integrating technology in the classroom?

Participants

The participants in this study were enrolled in a 2002-2003 secondary teacher education program at a regional university in the Southeast. The university is part of a Professional Development System (PDS) involving a twelve-year partnership with ten surrounding school districts. As the recipient of a three-year Department of Education, Preparing Tomorrow's Teachers to use Technology (PT3) grant, incorporation of technology became a high priority for teacher preparation. All undergraduate preservice teachers in the secondary program were required to take a three-credit course on Instructional Technology. The course included an overview of the internet, desktop publishing, creation of web pages, spreadsheets, databases, and electronic presentations. Technology is also integrated throughout their coursework and particularly emphasized in the content methods courses. Additional technology workshops were held on hand-held computers, e-portfolios, and using technology in Senior Project, funded by the PT3 grant. Local school partnership teachers were invited to many of these workshops. Given the goal of Professional Development Schools (PDS) to promote best practices in teaching and learning for preservice and inservice teachers, examination of interns' and partnership teachers' use of technology in our PDS was particularly appropriate.[3] Furthermore, the study sought to respond to the request that those working in PDSs be able to document the impact of partnerships on the learning of prospective and experienced teachers (Teitel, 2001).

The study was divided into two main phases. Phase one involved surveying 60 secondary interns and their partnership teachers in their use of technology. Phase two consisted of in-depth interviews and analysis of twelve social studies and eight science interns and the mentoring provided by their twenty partnership teachers in their use of technology.

In phase one, sixty secondary interns were enrolled in a semester long internship and each student participated in the study. The interns represented the following six content areas: English (17), mathematics (13), social studies (12), physical education (9), science (8), and music (1), and taught two block classes for approximately fourteen weeks. The interns were placed with a partnership teacher in schools that varied from rural, suburban, to urban and with varying

degrees of socioeconomic and ethnic diversity represented in their student populations. All partnership teachers are required to have at least three years of teaching experience and must have undergone extensive training by the university PDS.

Phase two consisted of individual interviews with the twelve secondary social studies and eight secondary science interns and direct classroom observations of the interns' teaching. The decision to focus on the science and social studies interns was one of convenience: The secondary science coordinator supervised all the science interns, and the social studies coordinator supervised nine out of the twelve social studies interns.

Methodology

Upon completion of the internship in the spring of 2003, 60 secondary interns were asked to complete the "Secondary Intern Technology Survey." Items on the survey were organized to address the three main research questions: interns' and mentors' use of technology, the mentoring relationship, and barriers to using technology. Other topics that were explored included intern beliefs about the effects of technology on high school students' motivation and achievement and responsibility for teaching high school students to use technology. All surveys and questionnaires were first reviewed and critiqued for accuracy by a university instructional technology coordinator. Based on the critique and recommendations, revisions were made to each instrument. Secondly, the surveys and questionnaires were reviewed by a curricular specialist, and revisions were made to each instrument based upon the constructive feedback. The instruments employed a variety of Likert scale responses, free-response questions, and open-ended items.

All sixty partnership teachers were surveyed about their use of technology using the "Partnership Teacher Technology Survey." Surveys were sent to each partnership teacher upon the completion of their interns' student teaching experience. The surveys collected both quantitative and qualitative data. Many of the questions asked of partnership teachers were the same ones asked of interns. These included (1) their level of comfort and skill in using technology, (2) the types of technologies they used, and (3) their beliefs about the effects of

technology on student achievement. In addition, twenty science and social studies partnership teachers were surveyed using the "Partnership Teacher Mentoring Survey." The teachers were queried about the mentoring they provided to their intern pertaining to the use of technology. Nineteen of the twenty secondary teachers responded to the survey.

As a result of an initial review of the data, it was determined that further probing of some specific questions would be needed. Purposeful selection of interview participants was targeted. Two weeks following the completion of surveys, students in social studies and science were contacted, and all interns agreed to be interviewed. Individual interviews, each of which lasted approximately an hour, were conducted using the "Intern Interview Questionnaire." The interviews allowed a more in-depth exploration of interns' responses to the survey questions. The interviews were transcribed and the data read through to identify categories (Bogdan & Biklen, 1992). Examples of categories included different uses of technology, teacher and student use of technology, and benefits from using technology. Finally, the survey and interview data were triangulated with our observations of the interns' teaching and their use of technology.

Findings

Intern and Mentor Use of Technology

The findings are organized around the three research questions. In relation to research question one, how and in what ways interns and mentors use technology, the data has been organized around three themes: (1) skill with technology, (2) types of technology, and (3) beliefs about technology.

Skill with Technology. Using a Likert scale (1=novice, 2=intermediate, 3=advanced, 4=expert), secondary interns rated themselves and their partnership teachers' overall skills with using technology in support of teaching and learning. The results show that while 34% of interns rated themselves as novice or intermediate users, they rated 58% of their partnership teachers as novice or intermediate (see Table 1). At the opposite end of the continuum, 65% of the interns rated themselves as advanced or expert users compared to only 42% of

their partnership teachers. The partnership teachers also rated themselves. Sixty-eight percent indicated that their technology skills were only intermediate.

Table 1. *Intern and Mentor Rating of Overall Skill with Using Technology*

Survey Responses	Novice	Intermediate	Advanced	Expert
Intern self assessment (n=52)	8% (4)	26% (14)	54% (28)	11% (6)
Intern assessment of mentor (n=60)	25% (15)	33% (20)	27% (16)	15% (9)
Mentor self assessment (n=38)	10% (4)	68% (26)	13% (5)	8% (3)

Note. n equals the number of responses to the items. First number represents the percentage of participant responses to each survey item. Second number represents the frequency of participant responses.

An independent-samples t test was conducted to determine if the student interns' self-assessment and their assessment of their partnership teachers responded differently to the survey item. The test was significant [$t(96) = 2.75, p = .007$]. Student interns ($M = 3.63; SD = 0.82$) on average rated their skills with using technology higher than they rated their partnership teachers' ($M = 3.18; SD = 0.73$).

When isolating for two different disciplines, partnership teachers' views of their interns' overall skill with using technology in support of teaching and learning were very similar for both science and social studies content areas. The social studies partnership teachers' ratings of his or her intern indicated 2 (18%) intermediate, 7 (64%) advanced, and 2 (18%) expert. This compares with the science partnership teachers' ratings of his or her intern: 3 (38%) intermediate, 4 (50%) advanced, and 1 (12%) expert. None of the interns were rated as a "non-user" or "novice."

Types of Technology. Secondary interns and partnership teachers rated their use of different technologies in teaching and learning. Responses showed that interns' (n=60) use of different types of technology varied. Seventy-eight percent of the interns indicated that they often used an electronic/computer grade book to record and manage student assessment, 17% often used computer technology to individualize instruction for students who needed remediation, and only 12% used e-mail often to provide immediate feedback to students.

Partnership teachers (n=38) responded to the same questions. While 94% often used an electronic/computer grade book, only 5% often used technology to individualize instruction, and only 5% used e-mail often to provide feedback. In response to the item on access to different technologies in their classroom, interns' answers varied from a high of 77% for access to a desktop or laptop computer, 25% had access to an LCD projector, but only 4% had access to a scanner.

The social studies and science interns used a wide range of technologies including word processing, PowerPoint, WebQuests, handhelds, probeware, and electronic lesson design for portfolio development using a web-based toolset. In terms of overall technology skill level, seven of the 19 science and social studies partnership teachers indicated their skill level was comparable to that of their intern, while twelve indicated their intern was more highly skilled.

Beliefs About Technology. There were few differences between how partnership teachers and interns responded to the questions concerning beliefs about technology use (1=strongly disagree, 2=disagree, 3=agree, 4=strongly agree). Generally both groups rather strongly agreed with regard to the following statements: (1) I support the use of technology in the classroom, (2) Incorporating technology into instruction helps students learn, and (3) Student motivation increases when technology is integrated into the curriculum (see Table 2). Interestingly, in response to the item "teaching students how to use technology is my job," partner teachers (Mean=2.7) and student interns (Mean=2.6) on average only moderately agreed.

Mentoring Relationship

The types of mentoring interns are receiving in the use of technology from their partnership teacher have been categorized into the following three areas: (1) the role of the partnership teacher, (2) feedback provided to the intern, and (3) technology and teaching effectiveness. Both the interns' and the partnership teachers' perspectives are presented.

Role of the Partnership Teacher. Nearly all content area interns (97%) indicated that their partnership teacher supported their use of technology. Their responses were first analyzed and classified in terms of support for the use of traditional technology (VCR, TV, overhead

projector) and support for emerged (PowerPoint, Electronic grade book, computer lab) and emerging (streaming video, handheld computers, and probeware) uses of technologies. In fact, 90% of intern responses referred only to their use of emerged or emerging technologies, with 10% of their responses referring to the use of traditional technologies.

Table 2. *Mentor and Intern Beliefs about Technology*

Survey Items	Partnership Teacher	Student Intern		
	M (SD)	*M (SD)*	*t (df)*	*p*
I support the use of technology in the classroom	3.5 (.50)	3.6 (.62)	0.44 (95)	.662
Incorporating technology into instruction helps students learn	3.4 (.50)	3.5 (.62)	0.45 (94)	.652
Student motivation increases when technology is integrated into the curriculum	3.3 (.62)	3.2 (.53)	-0.57 (90)	.571
Teaching students how to use technology is my job	2.7 (.80)	2.6 (.76)	-0.18 (92)	.857

Interns described a variety of ways that their partnership teachers were involved in their use of technology. The partnership teachers' role was dissected into two categories. The first category referred to partnership teacher support in which he or she both encouraged and assisted the intern and/or he or she modeled for the intern the use of technology. Providing encouragement and assistance was the main role identified by 32 (53%) interns. Examples ranged from, "He encouraged the use of technology to 'razzle dazzle' students" to, "She offered full support and even helped me gain more time in the computer lab." Eleven interns (18%) also gave specific examples of technology they had learned from their partnership teacher. One intern stated, "I learned how to use fitness assessment software" and another stated, "She instructed me in different techniques and shared all resources." In contrast, the second category, cited by 10 (17%) interns,

described examples in which the partnership teacher used the technology resources developed by his or her intern. One intern stated, "She [her partnership teacher] taught one of my PowerPoint lessons and was evaluated by the principal." In another case in which the partnership teacher's use of technology was limited to the TV/VCR, the intern described his teacher as being "willing to try whatever I was using."

The responses from the science and social studies intern interviews were similar. When asked about what they learned from their partnership teacher, the interns' responses included (1) not learning anything new, (2) using a school's media retrieval system, (3) learning an electronic grading program used by many local school systems, (4) continuing their understanding of presentation-specific types of technology (advanced PowerPoint options and web pages), (5) knowing how to make effective use of the internet, and (6) applying content specific technology tools (i.e., probeware). One intern, Keith (all names are pseudonyms), described what he learned from his partnership teacher. He stated,

> She showed me how to do the media retrieval, getting the videos. But that's basically it. She relied on the overhead, which is not a bad thing, but I used the computer. I was fluent in all that, so I really didn't get that much from her.

Mandy, another intern, stated that her partnership teacher "would help me with the content of my PowerPoints, but not how to improve the design." Finally, Wendy's experience, in which she received detailed guidance from her partnership teacher on using technology, was the exception to the norm. She stated,

> That's probably one of the things we talked about the most, the best ways to use technology. We talked about the computer lab and what worked for her and what worked for me.

Feedback Provided to the Intern. All content area interns' responses to the item on "the content and nature of feedback" they received from their partnership teacher on their use of technology were analyzed into four categories: no feedback, praise, general feedback

on overall effectiveness of lesson, and specific guidance. Twenty-three percent of interns indicated that they received no feedback from their partnership teacher on their use of technology. Eight percent of interns stated that the feedback they received from their partnership teacher on their use of technology involved general praise. Forty-seven percent of interns reported receiving feedback in the form of an overall assessment of the lesson's effectiveness. In this case, either the partnership teacher told the intern what worked or what needed improvement with the lesson or else the partnership teacher helped the intern reflect on the lesson. The final category, indicated by 22% of interns, involved the partnership teacher providing specific feedback on an intern's use of technology. For example, some student interns stated that their partnership teachers gave them feedback on the time, quality, and format of their electronic presentations.

Analysis of the survey responses from the social studies and science partnership teachers revealed considerable overlap in the qualitative responses to the items on their role and feedback in guiding interns' use of technology. The following five categories were identified from the partnership teachers' responses: (1) general encouragement, (2) technical assistance (i.e., connecting the computer to the monitor), (3) specific guidance in using technology (i.e., "I reviewed the lessons only to see if they matched the state's standard curriculum"), (4) having no role in their intern's use of technology, and (5) discouraging the use of technology in the class. An example of the latter category included a science partnership teacher who "asked him not to rely completely on technology to carry his lesson." Examples of specific guidance provided to interns included: help in finding resources, feedback on the length of PowerPoint presentations, and the recommendation that the intern use a minimalist approach with PowerPoint slides.

Technology and Teaching Effectiveness. All except for one of the nineteen social studies and science partnership teachers indicated that their interns' use of technology contributed to the interns' teaching effectiveness. Some of the teachers responded with words such as "Definitely!" and "Absolutely!" The explanation cited most frequently by the social studies teachers was that technology contributed to providing a variety of strategies to engage students for a ninety-minute block class. Specific examples included: use of additional resources and teaching strategies from the internet; incorporation of pictures and

video clips in lessons; visual stimulation/reinforcement from using PowerPoint notes; and student engagement with WebQuests. Karen, a biology teacher, stated that the integration of technology taught her intern "to be more disciplined" in her planning and implementation of daily lessons. Jim, another partnership teacher, commented that the intern was able to "get away from lecture and notes, and that helped her connect with her class." Partnership teachers were asked to include any evidence to support their view on whether technology improved interns' teaching effectiveness. Partnership teachers referred to increased student achievement, students' positive attitudes toward each discipline, and students' increased involvement in class. Evidence for the changes could be found in the informal comments from students in class, their end of course grades, and observed attitudes toward each discipline. Of the nine social studies teachers who included comments on student grades, seven stated that students' grades increased, either for all or for some students. Of the two remaining teachers, one stated he was unable to comment as he wanted to see students' performance on the state end-of-course test, and the other stated, "It didn't have a negative effect." Some specific comments relating to improved student grades included, "His technology review games assisted in grades," "In some cases grades improved because notes were visual for them," and "All assignments were submitted when technology was involved, thereby increasing student grades."

Obstacles to Integrating Technology

Like new and experienced teachers, many obstacles exist for interns to overcome when integrating technology in their classrooms. The kinds of barriers to integration, the difficulties acquiring access, and the mentoring received from partnership teachers have been articulated as common themes to technology incorporation.

Barriers. All content area interns and partnership teachers were asked to respond to a number of items that have been identified as barriers to integrating technology. A Likert scale was used to determine differences in responses (1=not a barrier, 2=minor barrier, and 3=major barrier).

An independent-samples *t* test was conducted for each item to determine if group differences were significant from each other (see Table 3). Significant differences were found for the following five items:

Lack of, or limited access to, computers; availability of software; too much material to cover; lack of mentoring; and technology integrated lessons require too much preparation. No significant differences were found for the following items: lack of knowledge about technology; lack of technology integration knowledge; and lack of time in class to implement technology-based lessons. In general, interns viewed the barriers to technology as being less substantial than their partnership teachers.

Table 3. *Barriers to Integrating Technology*

Survey Items	Partnership Teacher	Student Intern		
	M (SD)	*M (SD)*	*t (df)*	*p*
Lack of, or limited access to, computers	2.4 (.77)	2.0 (.71)	-2.69 (94)	.008**
Availability of software	2.3 (.78)	1.9 (.70)	-2.41 (92)	.018*
Lack of knowledge about technology	2.0 (.62)	1.8 (.68)	-1.89 (92)	.061
Lack of technology integration knowledge	2.0 (.58)	1.8 (.68)	-1.46 (94)	.147
Too much material to cover	2.5 (.73)	1.9 (.70)	-3.78 (94)	.000***
Lack of mentoring	1.9 (.70)	1.6 (.62)	-2.56 (94)	.012*
Technology integrated lessons require too much preparation	2.0 (.70)	1.7 (.60)	-2.38 (94)	.019*
Lack of time in class to implement technology-based lessons	2.0 (.78)	1.8 (.70)	-1.80 (94)	.075

Significant at the: *.05, **.01, ***.001 level.

Access to Technology. Interviews with the social studies and science interns allowed more in-depth exploration of their experiences in gaining access to technology. Four of the twelve social studies interns described entering classrooms set up to project text and graphics, two using LCD projectors and two using the TV monitor. Six interns

described classrooms in which the teacher did not use the computer for instruction and relied on an overhead projector. These six interns described many examples of initiatives they had taken to access particular equipment and changes they had made to the classroom to incorporate the new technology. Five of the interns had to borrow LCD projectors either from their department, from the school library, or from other departments and connect them to a computer in the classroom. The sixth intern, John, brought his own LCD projector. He described his experience.

> I didn't want to use the TV screen for the projection so I brought my own LCD projector and, of course, I had to hook that up every day. It couldn't reach her [partnership teacher's] computer so I had to bring my own laptop.

Because there was no safe storage space in the classroom for his laptop and LCD projector, John had to carry them home every night and set them up again each morning. Another intern, Mandy, described her experience.

> There was no room in the classroom to put the LCD projector so I had to completely split all the desks. Then the students were sitting so close they could hardly move. I had to check out the LCD. The school had four, two of which were broken.

Mentoring. While both partnership teachers and interns identified mentoring as a minor obstacle to their use of technology, one area of particular interest was in examining whether partnership teachers learned from their interns. In response to the question whether they had learned new ways from their intern to integrate technology into their teaching, almost 80% of the partnership teachers said they had. This included four teachers who said they had learned to use PowerPoint and another who stated that she had learned to insert pictures into PowerPoint slides. Other examples included: web sites with audio and video, internet resources to provide alternative perspectives, online lesson plans, linking web sites and handouts to electronic lesson plans, and use of real time information and satellite imagery. However, when asked whether they would incorporate these new learnings into their

teaching, some of the teachers responded with uncertainty. For example, one teacher stated, "I learned to do PowerPoint, but I haven't used it yet. I probably will do in the future." One teacher, who described her intern as an expert in technology, indicated that she had not learned new ways from her intern. She wrote, "Unfortunately, I did not learn the "how to" from Mandy." The partnership teacher described wanting to have a whole day with her intern to set up lessons with links to web sites and stated, "Hopefully, Mandy will have a staff development day for us in August."

If the partnership teachers were learning from the interns, we were interested in whether this might have influenced the overall relationship between intern and partnership teacher. Twenty-eight (47%) of all content area interns indicated that their relationship with their partnership teacher was "one of equals in which we both learned and shared ideas." Auburn, an intern who described herself and her partnership teacher as "fairly skilled with computers," provided an example of this relationship. She stated,

> She [her partnership teacher] knew PowerPoint, but I would help her with slides, slide transitions, and animation. She would ask me how to do this and that and I would help her with web searches.

In summary, mentoring was only identified as a minor obstacle to the use of technology. Some of the partnership teachers appeared to have learned new ideas from their interns, and some interns' knowledge of technology appeared to have contributed to the establishment of a more equitable relationship with their partnership teacher. The limitations of these arrangements, and particularly the lack of specific guidance for interns in their use of technology, are discussed in the next section.

Discussion

The findings from this study indicate that the interns were on average more confident and knowledgeable in their use of technology than their mentors. While a small number of skilled and knowledgeable partnership teachers use emerging and emerged technology, the majority

(78%) of mentors in this study have average to low skill. These findings are consistent with other research on teachers entering the profession, indicating that they are more confident in their use of technology (Russell et al., 2003). However, the interns in this study used technology equally (i.e., for planning and for instruction). This finding differs from Russell et al.'s study in which teachers entering the profession used technology more for planning than instruction. This difference may result from the difference in the groups studied. This study examined teacher interns and Russell et al.'s study involved
beginning teachers. Furthermore, some of the conceptual differences identified between novice and expert users of technology, for example, "novice teachers use computers as a means of reward and punishment" (Meskill, Mossop, DiAngelo, & Pasquale, 2002, p. 52), were not found.

In this study, technology use overwhelmingly involved teacher use: The social studies and science interns used technology, for example, in planning and to enhance instructional presentation. There were few examples of interns having students use technology. While this finding is supported by Russell et al.'s (2003) observation that new teachers require students to use technology significantly less than do teachers who have taught for six or more years, it did not appear to be based on a belief that technology harms specific aspects of student learning.

Notwithstanding the above limitations in the interns' use of technology in teaching and learning, of those teachers who reported that the intern's use of technology added to his/her teaching effectiveness, 48% stated that it increased students' involvement in the class and 28% indicated that it increased students' achievement. A review of the research on the effects of technology on student learning indicates generally positive findings (Schacter, 1999). Whether the incorporation of new technologies will significantly change teaching and learning is still open to discussion (Meskill, 1999). Some educators argue that technology is unlikely to bring about significant changes in teaching and learning and only a fraction of school faculty are technology leaders (Cuban, Kirkpatrick, & Peck, 2001). The authors argue that both the resistance of high schools to change as well as technological flaws will "trump the slow revolution in teaching practices" (Cuban et al., 2001, p. 830). While this study does not address

the potential of technology to significantly change teaching and learning, the paper highlights the importance of providing interns with appropriate mentoring in the use of technology.

With few technology mentors available, the social studies interns who introduced emerged or emerging technology into their partnership teachers' classrooms and used it on a regular basis could be seen as "trailblazers" or "pioneers" (Schlechty, 1997). While the change was not systemic and other social studies teachers use such technologies, some of the interns ventured "where no person has gone before, without maps and without the benefit of empirically based models and with little to guide them except belief in themselves" (Schlechty, 1997, p. 210). In addition to the interns introducing technology into their mentors' classrooms, many of the partnership teachers indicated they learned new ways from their interns.

The leadership in the use of technology demonstrated by many interns has implications for the mentoring relationship. While traditionally mentees are seen to benefit from the mentoring relationship, research has identified a variety of benefits that mentors receive from mentoring. These include: a positive belief about helping others, improving themselves, receiving respect, developing collegiality, and profiting from novice teachers' fresh ideas and energy (Hegstad, 1999; Scott, 1999). The results of this study suggest that interns' use of emerged and emerging technology may change the traditional mentoring relationship. Forty-seven percent of interns described their relationship with their partnership teacher as "one of equals in which we both learned and shared ideas." One example of the role reversal with regard to technology is provided by a partnership teacher. He stated, "My intern did most of the work. He made the PowerPoint presentations at night and I would get to use them first period the next morning. It worked great." While the extent of the mentor's dependence upon the intern in this case was exceptional, this type of more equal relationship has been described as one of reciprocity in which both mentor and mentee take turns in the role of teacher and student (Sergiovanni, 1993). Such relationships of colleagueship have typically been identified as occurring toward the end of student teaching (Fairbanks, Freedman, & Kahn, 2000).

The positive aspect of intern leadership in technology and a more open relationship between intern and mentor has to be considered against the lack of mentoring for interns in their use of technology. Only 22% of interns indicated that they received specific feedback from their partnership teacher on their use of technology. Twenty-three percent of interns indicated they received no feedback at all from their partnership teacher on their use of technology. The importance of having mentors who are experienced and sophisticated users of technology has been identified by other educators (Russell et al., 2003), as well as the need to educate the cooperating teachers so they might serve as better sources of support (Dexter & Reidel, 2003). In addition, the problem is not just a lack of knowledgeable mentors, but many school leaders do not have a good sense of the ways in which teachers are using technology and how to evaluate these uses of technology (Russell et al., 2003).

Although interns received little guidance from their partnership teacher in their use of technology, many partnership teachers learned new ways to integrate technology. An important distinction emerged between those partnership teachers who made changes to their practice and those who indicated they had still to implement what they had learned. Some examples of changes teachers had made to their practice included: inserting pictures into PowerPoint slides, using web sites with audio and video, using internet resources to provide alternative perspectives,and using online lesson plans. Those teachers who had not made changes to their practice were generally those using traditional, even antiquated, technology. Various explanations including lack of teaching experience with new technology, lack of on-site support, lack of help supervising children, lack of specialist technology teachers, lack of computer availability, lack of time, and lack of financial support have been provided for why teachers do not use computers (Mumtaz, 2000). The three obstacles the partnership teachers in this study rated as the biggest barriers to change were access to computers, availability of software, and too much material. Other factors, such as lack of mentoring, lack of knowledge, and a lack of time both to prepare technology integrated lessons and to implement such lessons, were seen as minor barriers. The partnership teachers appeared to locate the obstacles to using technology with factors outside of their control: access to computers, availability of software, and too much content to

cover. However, interns rated these same items as minor obstacles. Interns provided many examples of how they were able to obtain equipment from other departments or their school's media center in order to be able to use emerged or emerging technology in their classroom. Consequently, there may be other explanations to account for the mentors' lower use of technology.

Partnership teachers' beliefs indicated strong support for technology and the role of technology in enhancing student learning and motivation. While Russell et al. (2003) found that belief about the importance of technology for teaching is the strongest predictor of delivery in the classroom and teacher-directed student use, in this study teacher beliefs did not appear to be consistent with practice. It is possible that for some partnership teachers the adjustment required to incorporate emerged and emerging technologies was too great. This might explain the responses of those partnership teachers who reported having learned new technology, but who had not yet used it. For example, when John was asked whether he thought that his partnership teacher would implement the PowerPoint he had taught her, he replied, "No, I don't think she'll change and use the PowerPoint or, if she does, it will be strictly for pictures." Even while supporting the value of technology, some teachers may remain unconvinced that their use of traditional technology is any less effective in supporting student learning than approaches using emerged and emerging technologies. Furthermore, teachers may be put off from making what they see as significant changes in their teaching because of the time required and the uncertainty involved with change. More research on the effects of technology on teaching and learning may be needed to identify both the strengths and limitations. Additionally, it is important for teachers and administrators to have access to such findings so that such research can inform instructional decisions.

Conclusions

The findings of the study raise some important issues about interns' use of technology in teaching and learning, the problems of providing mentors to guide interns' use of technology, and the challenges in developing mentors' use of technology. Compared to Russell et al.'s (2003) study of beginning and experienced teachers

and the frequency of technology use, the interns are making much more frequent use of technology. In the former study, teachers reported using technology for delivery of instruction and for recording grades "once or twice a year." In this study, 78% of interns reported that they "often" use an electronic grade book, and in individual interviews, the six social studies interns described using PowerPoint either daily or every other day.

There are a number of limitations of this study which need to be considered in assessing the findings:

- The participants were drawn from a specific geographical location which may have influenced the use or availability of technology. For example, in relation to the use of technology in teaching, this state has had a high stakes testing program in place for the last eight years.
- The study only involved one group of interns.
- The study is a self-report of our program's graduates and, therefore, may incorporate bias.
- The incorporation of technology into teaching and learning was a priority for our teacher education program and more generally a state requirement for those seeking teacher licensure.
- The study only reports on the interns' use of technology during the internship. Following the interns into their first year of teaching would provide more insight into their use of technology.

One of the strengths identified of interns who graduate from a professional development school model is that they are more likely to assume leadership roles in the schools (Maloy, Pine, & Seidman, 2002). It is difficult to know the effect of the Professional Development System on the interns' use of technology in this study.

In the short term, it is unlikely that there will be enough mentor teachers who are knowledgeable and skilled in using technology. Offering more workshops through the Professional Development System and possibly targeted by discipline may help with developing mentors' knowledge and skill with emerging and emerged technologies. Even though many of the interns provided on-site support for

approximately four months guiding and modeling the use of new technology for their partnership teacher, it is possible that over several years of a mentor working with interns mentors might make significant changes in their use of technology.

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Robert W. Smith is an associate professor with the Watson School of Education at the University of North Carolina at Wilmington. He teaches social foundations, has primary responsibility for secondary social studies, and coordinates the secondary teacher education program. His research interests include the use of technology to enhance teaching and learning and high school reform.

Dennis S. Kubasko, Jr. is an assistant professor of secondary science education at the University of North Carolina at Wilmington. His teaching responsibilities include undergraduate courses in science methods and educational technology as well as graduate courses in science methods and environmental studies. His research interests include the integration of emerged and emerging forms of technology for the purposes of teaching and learning, nano-education knowledge acquisition through real-time laboratory investigations, and using informal science settings to teach science.

Endnotes

1   In this paper emerged and emerging technologies refer to the following types of technology: PowerPoint, electronic grade book, computer lab, WebQuests, probeware, and streaming video.

2   The other two categories were student use and use for e-mail.

3   Professional Development Schools' National Standard 1: Learning
     Community, states that "the PDS is a learning-centered community that
     supports the integrated learning and development of P-12 students,
     candidates, and PDS partners" (NCATE, 2001).