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WHY IMPROVING PRESERVICE TEACHER EDUCATIONAL TECHNOLOGY PREPARATION MUST GO BEYOND THE COLLEGE'S WALLS

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To prepare new teachers to use technology within their programs of preparation, schools, colleges, and departments of education (SCDEs) can develop and require coursework in which students learn how to operate and teach with technology and set expectations that students demonstrate their integration abilities during student teaching. This survey of student teachers found that setting these expectations for designing and delivering instruction using technology was effective in getting student teachers to use technology during clinical experiences. However, additional factors beyond the control of SCDEs were equally important, such as the level of access to technology and the support of and feedback from cooperating teachers at the student teaching site. The authors discuss the implications these factors hold for SCDE's extending efforts "beyond their walls" to prepare new teachers to use technology.

Keywords: *field experiences; technology; preservice teacher*

Field experiences are identified as an important component in the preparation of new teachers (Griffin, 1986; McIntyre, Byrd, & Foxx, 1996). Much attention has been paid to aspects of the context of the field experiences and how they might influence student teachers as they practice teach. Teacher educators have attended to contextual influences such as cooperating teachers' beliefs, instruction, and feedback (Borko & Mayfield, 1995; Bunting, 1988; Osunde, 1996); university supervisors' levels of feedback (Richardson-Koehler, 1988); whether the site provides an environment that supports students' using what they have learned in university courses (Zeichner & Gore, 1990) or provides students with experiences with key populations—such as multicultural, urban, or special education students (McIntyre et al., 1996); and if field experiences overall reflect key theoretical and conceptual components of the teacher preparation program (Guyton & McIntyre, 1990).

The aspects of the field experience context that relate to educational technology use are a focus as teacher education institutions examine how their programs of preparation provide opportunities for students to work toward the technology competencies inherent in the Interstate New Teacher Assessment and Support Consortium Standards (1992), used by many states as licensing requirements, and in the National Educational Technology Standards for Teachers (International Society for Technology in Education, 2000), which were adopted by the National Council for Accreditation of Teacher Education as a part of their accreditation requirements. During the past few years, many institutions' work to embed these standards in their programs and address the profession's

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concern to help new teachers learn to use technology as an effective instructional tool (American Association of Colleges of Teacher Education, 1999; American Council on Education, 1999; National Commission on Teaching and America's Future, 1996; National Council for Accreditation of Teacher Education, 1997) has occurred as a part of a Preparing Tomorrow's Teachers to Use Technology (PT3) grant from the U.S. Department of Education.

Although there is consensus in the educational technology field that preservice teachers should use technology during practicum and student teaching experiences and that this does not happen often enough (CEO Forum on Education and Technology, 1999, 2000; Moursand & Bielefeldt, 1999; Office of Technology Assessment, 1995), researchers have identified the many difficulties inherent in providing such field-based practice opportunities. Various schools, colleges, and departments of education (SCDEs) have reported efforts to provide equipment to sites to ensure adequate technology access (Stetson & Bagwell, 1999), determine the technology attitudes of the cooperating teacher (Bosch & Cardinale, 1993), or organize technology equipment and services (Picciano, 1992). Other research emphasized the impact of quality technical and instructional support on whether technology is used by teachers for their own professional work or by students in their classrooms (Ronnkvist, Dexter, & Anderson, 2000).

To determine where we might best focus our efforts to improve the opportunity of our preservice teachers to use technology during student teaching through our Ed-U-Tech project, a PT3 implementation grant that began in 1999 at the University of Minnesota, we conducted a survey of our program's student teachers in the spring of 2001 and 2002. We researched the contextual factors mentioned in the literature to determine which were most important in predicting the preservice teachers' own professional uses of technology and their having K-12 students use technology in the classroom. We analyzed these factors in terms of how the things over which SCDEs have direct control (e.g., coursework and expectations to use technology) compare with those over which they have far less control (e.g., field site technology access and support).

THE CONTEXT OF THE STUDY

The scope and components of the Ed-U-Tech project were informed by the conceptual framework of a constructivist model of learning applied to teacher education—acknowledging that for preservice teachers to develop their ability to teach, they must be provided opportunities to actively construct their understandings of pedagogical content knowledge and integrate new understandings with prior knowledge (Grossman, 1992; Grossman & Stodolsky, 1995; Hollingsworth, 1989; Shulman, 1986). We were also informed by the recommendations that SCDEs create a standards-based college-wide technology program, prepare instructors to model technology use for students, and integrate technology use into methods courses as well as provide technology-rich field experiences (Handler, 1993; Mergendoller, Johnston, Rockman, & Willis, 1994; Office of Technology Assessment, 1995; Persichitte, Caffarella, & Tharp, 1999; Strudler & Wetzel, 1999). We saw preservice teachers' opportunities to practice designing and delivering technology-integrated instruction as key for helping them construct their understanding of technology as a support to pedagogy.

The work of the Ed-U-Tech project was implemented through a content area–specific approach to technology (Dexter, Doering, & Riedel, 2003) and sought to create a continuous strand of preparation focused on integration and instructional decision making that led from the required technology course to the methods courses and then to clinical experiences. Project staff members planned project activities to overcome the typical barriers the literature identified: that is, we provided faculty development, developed assignments and sample products and teaching software that were relevant for K-12 curriculum, and increased access to technology in college classrooms. Now all students take a one-and-a-half credit course on technology in a section specifically designed for their initial licensure program; the amount of technology integrated into the methods courses varies according to instructors but includes at least some modeling and discussion of technology and opportunities to design technology-integrated instruction.

Students affected by these efforts and participating in this study were predominantly postbaccalaureates enrolled in a 5th-year program and seeking initial licensure in either elementary education or in one of 11 different content areas at the secondary level. In the majority of these licensure programs, the student teaching experience is in the spring after a summer and fall semester of coursework. Students enroll in one or more classes in the summer term following student teaching to complete the program requirements.

DATA SOURCES AND METHODS

The survey was administered to two sets of preservice teachers at the University of Minnesota who finished their student teaching assignments within 6 months prior to taking the survey. The eight-page, 89-item survey was designed to assess student teacher use of different forms of educational technology as well as the conditions encouraging or otherwise affecting that use. The questionnaire contained questions about the characteristics of the student teaching site, availability of different forms of technology at the site, the frequency of technology use during student teaching, barriers to that use, and the level of technical and instructional support from others at the site. The questionnaire also asked preservice teachers about any feedback they received about their use of educational technology.

The first set of surveys (2000-2001 academic year) was administered initially as a Web-based survey in the spring of 2001 with respondents contacted through electronic mail. After this initial administration yielded a low and biased return (13.9%), a mail-in survey was sent to nonrespondents in the fall of 2001. This increased the overall return rate to 48% (111 of 231) for the first set. To avoid these problems with the second set, the surveys were administered in teaching methods courses immediately following student teaching experiences. This resulted in a return rate of 57.6% (91 of 158). The overall return rate for all surveys was 51.7% (201 of 389) for both sets of surveys.

Respondents were asked in a forced-choice format what the grade level was of the school where they did their student teaching (early childhood education, elementary or K-8, junior high or middle school, and high school). They were nearly evenly divided by grade level of their student teaching site: 35.3% taught at an elementary site, 22.4% taught at junior high or middle school sites, and 41.8% taught at a high school site. Only one student teacher worked in early childhood education. For purposes of data analysis, this respondent was recoded as having taught at an elementary site. Respondents were also asked about the content area taught during student teaching in a forced-choice format that allowed respondents to write in areas not listed. Respondents reported teaching in 12 of the 13 content areas addressed by Ed-U-Tech ranging from 50 respondents in elementary education to 4 respondents in agricultural education.

Data Analysis Procedures

The following analysis describes the factors contributing to technology use during student teaching. These factors are divided between university-determined factors (preparation and expectation to use technology) and clinical site-determined factors (quality and availability of technology and technical and instructional support). The actual use of technology by teachers for instructional preparation and by their K-12 students is also described. Multiple regression models are then used to compare the impact of university and clinical-site determined factors on both teacher and K-12 student use of technology. The number of different content areas taught and the low number of respondents for some content areas precluded analysis comparing technology use by content area. At each stage of the analysis, however, results were analyzed to see if they differed by grade level of student teaching site (elementary, middle school or junior high, and high school).

Although the ordinary least squares regression technique employed as follows is con-

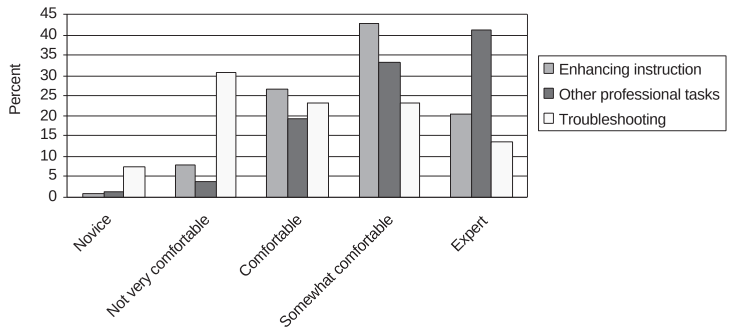

FIGURE 1: Preservice Teacher's Skill and Comfort Using Education Technology

sidered robust when model assumptions are violated (Lewis-Beck, 1980; Weisberg, 1985), several checks on the model assumptions were made. These included plotting residuals versus fitted values to test regression assumptions of constant variance and linearity (Weisberg, 1985) and examination of correlations among predictors to look for problems with multicollinearity. No significant problems were detected with either regression model. Skewed distributions normally present with frequency-of-use measures were superseded by combining technology use indicators into indices that approximated a normal distribution.

The number of nonresponses did not exceed 3.5% for any given question and were omitted from each of the following analyses with one exception. When asked about the availability and quality of technical and instructional support at student teaching sites, students were allowed to choose the response "support not needed" rather than rate the availability and quality of support. In constructing indices based on these questions for use as predictors in regression analyses, these responses were replaced with the sample mean. All other nonresponses were omitted listwise in the multiple regression analyses.

RESULTS

Program Preparation for Use of Technology

Student teachers were required to take a 1.5 credit course on instructional technology, "Technology for Teaching and Learning." As part of the Ed-U-Tech project, the instructor of that course worked to create content-specific sections of the course and coordinate the course curriculum with each of the 13 licensure areas addressed by Ed-U-Tech. Respondents were asked in a forced-choice format whether they took a course section specific to their licensure area. A total of 75.4% reported taking a section tailored to their particular licensure area, whereas the remaining students took a section for multiple content areas that may have included their particular area.

Using a 5-point scale ranging from *novice: not at all comfortable* to *expert: very comfortable*, students were asked to rate their skillfulness and comfort using educational technology for three separate functions: enhancing your instruction, completing other professional tasks, and troubleshooting problems with hardware and software. Figure 1 shows the distribution of responses to these questions. A clear pattern is evident, with students rating their skill and comfort with completing professional tasks the highest (most common response = *expert: very comfortable*), followed by instructional enhancement (most common response = *somewhat comfortable*), and then troubleshooting (most common response = *not very comfortable*).

Program Expectations to Use Technology

Student teachers were asked in a forced-choice format about expectations for using educational technology during student teaching

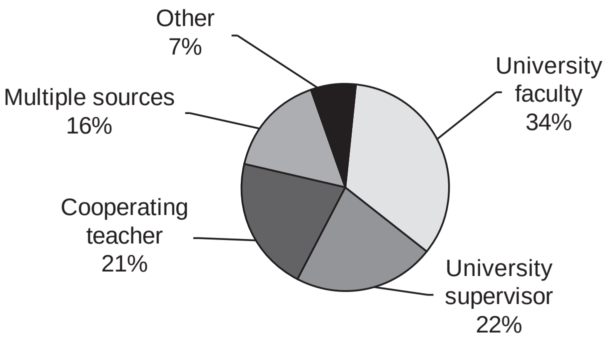

FIGURE 2: Source of Expectations for Preservice Teacher to Use Technology During Student Teaching

(required, encouraged, or neither required nor encouraged). A total of 30% said they were neither required nor expected to use technology, 39.5% said they were encouraged to use technology, and 28.5% said they were required to use technology. This did not differ by the grade levels of the student teaching sites.[1]

Students who indicated they were encouraged or required to use educational technology during student teaching were asked in an open-ended question who encouraged or required them to do so. The majority said it was either at the request of their student teaching supervisor or a university instructor (see Figure 2). Students were also asked to indicate (yes or no) whether they received feedback on their use of technology during student teaching from their supervising teacher, university supervisor, or methods faculty member. Students most frequently indicated they received feedback from their cooperating teacher (50.5%) followed by supervisor (36.5%) and methods faculty member (17.5%). None of these forms of feedback differed significantly by the grade levels of the student teaching sites.[2]

Students who received feedback from at least one of these sources were asked whether they received feedback once, twice, three to four times, or four or more times. Of those reporting feedback from some source on their use of educational technology during student teaching, most received feedback four times or less (88.8%). This frequency did not vary depending on the source of the feedback or the grade level of the student teaching site.

Conditions at Clinical Experiences Site

In addition to conditions largely determined by the university—teachers' preparation to integrate technology and program expectations for them to do so during student teaching—we asked respondents about technology integration conditions at their clinical experiences site.

Student teachers were asked about the availability of educational technology at their sites as well as their satisfaction with the kinds and quality of technology available (at the University of Minnesota, each licensure program selects their own placement sites for students). A common pattern that emerged over several measures was that student teachers reported greater availability of technology for their own use and satisfaction with that technology than when asked about technology for their students' use. Using a 5-point scale ranging from *always or almost always available* to *never available*, students were asked to rate the availability of computers for their use during class and computers for their students' use in class. Figure 3 shows responses when student teachers were asked to rate the availability of computers at the school where they taught. Nearly twice as many preservice teachers (34.7%) said computers were available for their own use during instruction in class compared with being available for their students' use (14.4%).[3]

Student teachers were given a checklist of eight different types of support for using educational technology and asked to indicate both whether it was available during student teaching and whether they used it. Figure 4 compares the availability of different sources of support along with whether the student teacher reported actually drawing on that source. Staff members at each student teaching site were the most frequently cited source. Nearly three quarters (74.3%) of student teachers reported their supervising teacher was available to assist with technology use, and 71.8% reported using that support. Other school staff members, including the school technology coordinator and other teachers at the student teaching site, were also named as sources of support for technology use. Fellow students were cited as frequently as

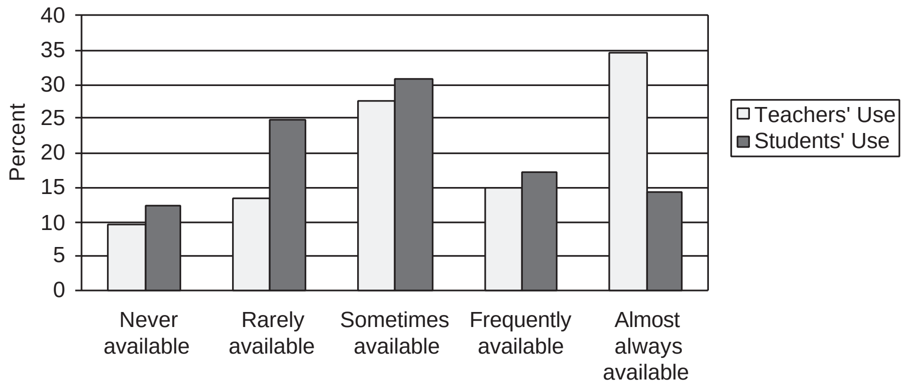

FIGURE 3: Rating of Availability of Computers at Student Teaching Sites

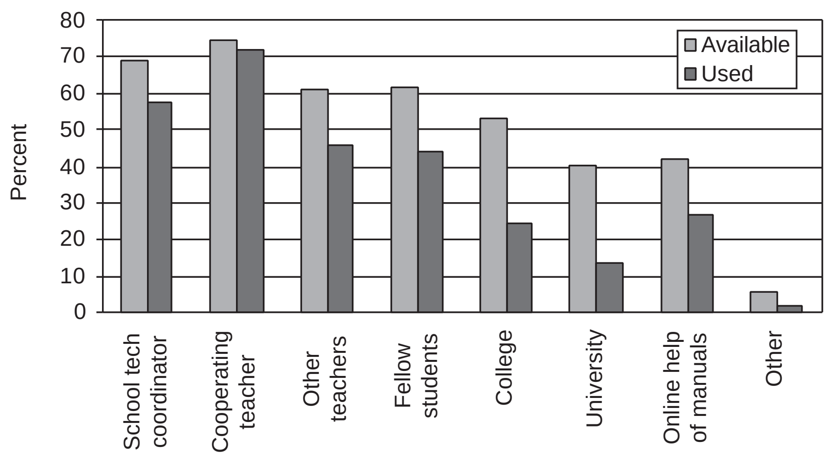

FIGURE 4: Availability and Use of Sources of Support for Technology Integration During Student Teaching

were other teaching staff members. College and university staff members were, by contrast, not viewed as being frequently available sources of support and were even less frequently used as support. Just more than half (53.0 %) of student teachers reported college staff members as available to support technology use during student teaching, and 24.3% reported using college staff members. There were no statistically significant differences by availability or use by grade with the exception that student teachers at junior high or middle schools reported using their school technology coordinator more than did elementary or high school teachers.[4]

In separate sets of questions and using a 5-point scale, students were asked to rate the availability of general technical and instructional support at their student teaching sites (see Figure 5). They were then asked to rate, using a 5-point scale, the quality of that general technical and instructional support (see Figure 6). For each question, respondents were allowed to indicate "support not needed" instead of rating the availability or quality of support. Approximately one fifth of respondents (22.8%) indicated that instructional support was not needed, whereas slightly fewer (19.8%) indicated that technical support was not needed. The availability and quality ratings for each were highly related.[5] Technical support was viewed as more available and of better quality than was instructional support by student teachers at a statistically significant level.[6] Whereas the median rating for availability of technical support was "always or almost always available," the median rating for instructional support was "frequently available." Where the median rating for the quality

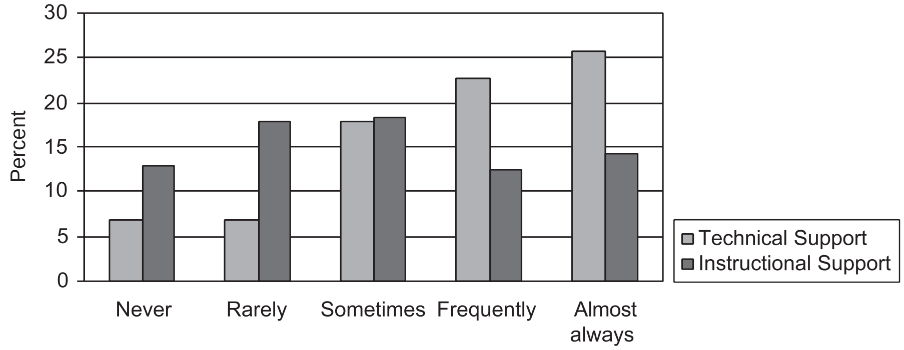

FIGURE 5: Availability of Support at Student Teaching Sites

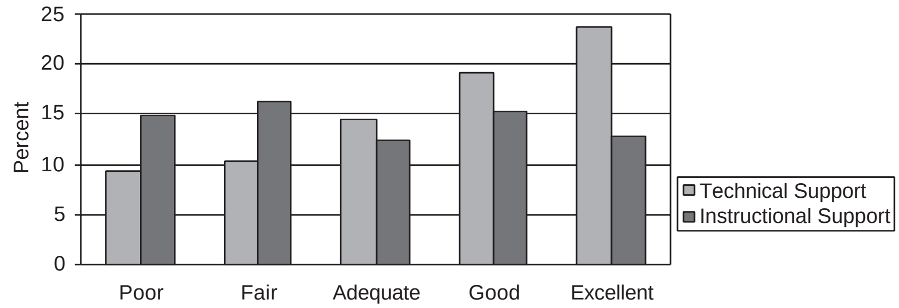

FIGURE 6: Ratings of Quality of Support at Student Teaching Sites

of technical support was "good," the median rating for the quality of instructional support was "adequate."

This tepid review of instructional support for technology was congruent with the students' ratings on a 5-point (*strongly disagree* to *strongly agree*) scale of this statement regarding modeling of and support for using technology from supervising teachers: "During student teaching, my cooperating teacher used and modeled technology integration in her or his teaching and thus encouraged and supported my use of educational technology in my teaching." The most common response was to strongly disagree with the statement, whereas the median was between *strongly disagree* and *neither agree nor disagree*. Student teachers in elementary or high schools (versus junior high or middle schools) were especially likely to disagree with this statement.[7]

Use of Technology During Student Teaching

The final part of the survey asked the preservice teachers to rate the frequency, using a 5-point scale (*almost daily*, *frequently*, *sometimes*, *rarely*, and *never*), of their use of 12 different types of software for course planning and instruction as well as how often they required or encouraged their students to use such software for their own learning. Table 1 presents the frequencies for five of the most commonly used types of technology.

The frequency with which preservice teachers reported requiring or encouraging their own students to use technology was far less than how often they used technology themselves. Similar to patterns observed for preservice teachers' own use, word-processing programs and Internet browsers were reported as being the most frequent types of software required or encouraged of students. The actual frequency of use by preservice teachers was quite different compared with their students. For example, 84.6% of preservice teachers indicated they used word processors almost daily or frequently, although they reported 32.7% of their students did the same. Nearly three-quarters (74.2%) of preservice teachers indicated they used the Internet either almost daily or frequently compared with 33.6% of their students.

TABLE 1 Frequency of Teacher and Student Technology Use at Student Teaching Site

	Almost Daily	*Frequently (4)*	*Sometimes (3)*	*Rarely (2)*	*Never (1)*	*Did Not Answer*	*Mean Frequency*
Word processors							
Teacher use (%)	65.8	18.8	11.4	2.0	1.5	0.5	4.46
Student use (%)	8.4	24.3	31.7	16.3	19.3	0.0	2.86
Spreadsheets							
Teacher use (%)	9.4	17.3	24.8	19.3	28.7	0.5	2.59
Student use (%)	2.5	3.0	12.4	13.4	68.8	0.0	1.57
Databases							
Teacher use (%)	6.9	6.9	16.8	20.8	47.0	2.0	2.05
Student use (%)	1.5	0.5	5.0	13.4	78.7	1.0	1.31
Presentation programs							
Teacher use (%)	1.0	9.9	20.3	20.3	44.6	2.0	2.08
Student use (%)	1.5	4.5	12.9	14.9	66.3	0.0	1.60
Internet browser							
Teacher use (%)	36.1	38.1	17.8	3.0	4.5	0.5	3.99
Student use (%)	5.4	28.2	31.7	8.9	25.7	0.0	2.79

Two scales were constructed to represent general educational technology use by preservice teachers and students based on the previous indicators. Each added the frequency of use for word processors, spreadsheets, databases, presentation programs, and the Internet. The range for each scale was 5 to 25, and both scales achieved acceptable reliability.[8] As expected, the scale mean for teacher use (15.16) was significantly higher than that for student use (10.17).[9]

Figure 7 displays a scatter graph of teacher technology use by their students' technology use. The two scales are positively and significantly related.[10] At the low ends of teacher use of technology there is very little variation in student use of technology. However, this is not true at the high end of teacher use of technology. In other words, little use of technology by preservice teachers is generally associated with little use by their students, but a high level of technology use by preservice teachers is not necessarily indicative of a high level of technology use by their students. Although there were no statistically significant differences in teacher use by grade level of students, there was for student use of technology.[11] Preservice teachers at high schools required or encouraged their students to use technology more often than did teachers at junior high and middle schools or elementary schools.

Predictors of Preservice Teachers' and Students' Technology Use

To determine the relative contributions of university-determined factors (preparation of and expectation to use technology) and clinical site-determined factors (quality and availability of technology and technical and instructional support), we developed explanatory models of what factors contributed to the frequency of preservice teacher and student use of educational technology through the use of multiple linear regression. Using the two scales described previously as dependent variables in two parallel regression models, technology use was thought to be mainly a function of the resources available to the teacher (school technology, instructional support, technical support, and teacher's own skill) and whether technology use was required or encouraged by the cooperating teacher and/or university supervisor. Given that the grade level of the student teaching site may introduce a set of factors affecting technology use (e.g., reading level of students), dummy variables for high school and elementary grades were also included. Students also reported if they taught at a junior high or middle school; this group served as the reference category for the regression models.

The availability of school technology was operationalized by a 5-point rating of the avail-

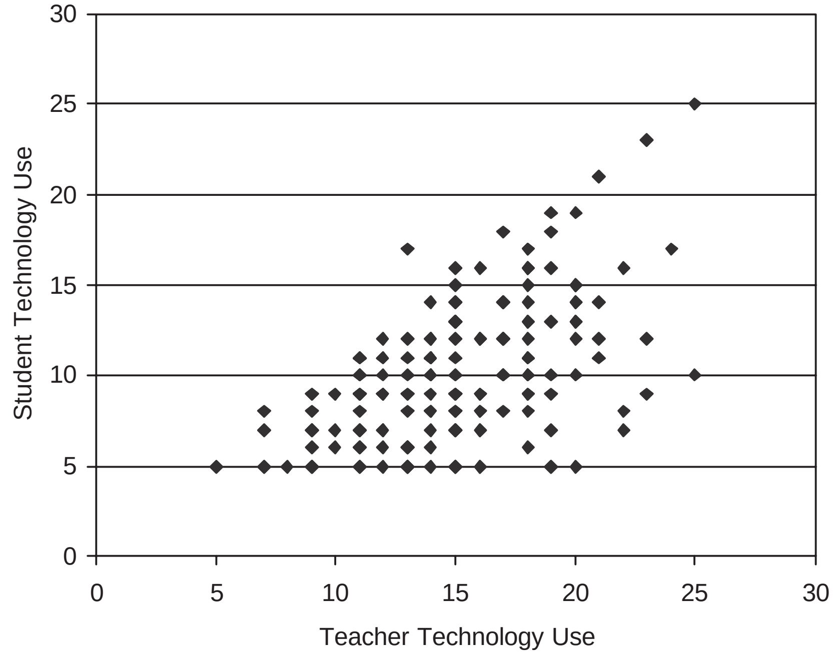

FIGURE 7: **Scatter Graph of Preservice Teachers' Use of Technology by Their Students' Use of Technology in Class**

ability of computers for preservice teachers' use during instruction or for their K-12 students' use in class (see Figure 3). An instructional support index was constructed by adding ratings of the availability of such support and the quality of instructional support (see Figures 5 and 6). Students who indicated such support was not needed had their scores replaced by the mean of each indicator. A technical support index was constructed in a similar manner by adding together ratings of the availability and quality of technical support at the student teaching site (see Figures 5 and 6). An index of students' skill was constructed by adding together items asking preservice teachers to rate their skill at using technology to enhance their instruction, complete professional tasks, and troubleshoot hardware and software problems, forming a reliable scale[12] (see Figure 1). A dummy variable was coded to represent whether preservice teachers were required or encouraged to use technology by their cooperating teacher or university supervisor. The reference category was respondents who indicated they were not required or encouraged to use educational technology. The results of the two regression models are displayed in Table 2. Each explains a moderate amount of variation on the scale scores for teacher and student use of educational technology. The regression models offered somewhat different explanations of technology use by student teachers and students. Given that the predictors are in different units, standardized regression coefficients are used to facilitate comparison among the predictors.[13]

The frequency of student teachers' use of technology was predicted nearly equally by the availability of computers for their use during class ($\beta = .165$) and the requirements or encouragement by the cooperating teacher and university supervisor to use educational technology ($\beta = .170$). None of the other variables were statistically significant predictors of teacher technology use. The frequency with which student teachers had their students use technology was predicted foremost by the availability of computers for student use during class ($\beta = .269$) followed by whether the student teaching took place at a high school ($\beta = .205$). Expectations by cooperating teachers or university supervisors to use technology ($\beta = .166$) were also a significant predictor, as was the level of instructional support ($\beta = .174$). Variations in the dependent variable for each model tended to shift the role

TABLE 2 Regression Models Predicting Teachers' and Students' Use of Educational Technology

	Teachers' Use of Technology		*Students' Use of Technology*	
Predictors	*Unstandardized Coefficient (standard error)*	*Standardized Coefficient*	*Unstandardized Coefficient (standard error)*	*Standardized Coefficient*
Constant	10.712 (1.617)**		5.950 (1.502)**	
Technical Support Index	–.056 (.167)	–.032	–.232 (.158)	–.130
Student Teacher Skill and Comfort Index	.150 (.111)	.099	.019 (.103)	.012
Elementary school site (1 = K-8, 0 = not)	–1.074 (.767)	–.132	–1.127 (.725)	–.138
High school site (1 = high school, 0 = not)	.188 (.735)	.024	1.62 (.695)*	.205*
Required or expected to use technology (1 = yes, 0 = no)	1.416 (.598)*	.170*	1.401 (.560)*	.166*
Availability of computers for teachers' use (students' use)	.481 (.229)*	.165*	.865 (.233)**	.269**
Instructional Support Index	.146 (.389)	.085	.308 (.157)*	.174*
Adjusted *R*-squared	.077			.197
Number of respondents	188		190	

*$p \le .05$. **$p < .01$.

of instructional support. In general, when the index of student use of technology was constructed to include more sophisticated and less common uses of technology (e.g., multimedia authoring and concept mapping), the importance of instructional support increased.

DISCUSSION

The findings of this study empirically bear out the assertions made over the years that the technology context at a field site would affect whether preservice teachers would use technology during student teaching. But this study contributes beyond confirming this conventional wisdom and previous small-scale case studies by systematically analyzing a wider array of factors (i.e., field-based factors of school level, technical support, access to technology, and instructional support and preservice teachers' skill and comfort using technology and expectations to use it) and determining which of these factors predict whether student teachers at field sites use technology and have K-12 students do so.

Such information is helpful in that like the Ed-U-Tech project discussed in this article, more than two thirds of the grantees of the more than 440 SCDEs receiving PT3 implementation grants during the past 3 years indicated a project focus point was concerned with preservice teachers' technology use in their K-12 field experience (PT3, 2002). It is likely that many programs without PT3 grants are also addressing this component of their program. The findings reported here could help direct SCDEs' efforts toward the most key contextual factors.

First, SCDEs should attend to the significant contextual factor over which they have direct control—setting expectations for student teachers' use of technology. However, it is not clear the degree to which all students should be held to the same set of expectations, as the appropriate degree (as well as nature) of technology integration is likely to vary by content area. Because students' abilities to demonstrate technology use in a classroom are predicated on their ability to do so, SCDEs must first ensure students have an adequate opportunity to learn to integrate technology through coursework. The audience for the students' demonstrations is more often the cooperating teachers and, at minimum, the supervisor from the university. Both groups may need some preparation to know what to watch for and comment on while observing student teachers' technology integration. Or, they can perhaps work best as a team; Borko and Mayfield (1995) suggested that cooperating teachers that take on the role of teacher educators interact with preservice teachers in more effective ways. They recommended the university supervisors focus their efforts on helping the cooperating teacher approach their interactions with preservice teachers in that way.

A factor that proved influential over which SCDEs do not have direct control was the level of access to technology at the field site. One way SCDEs can influence this contextual factor is to seek out field sites with better levels of technology. However, such sites may not exist, be convenient as placement sites, or have qualified and willing-to-cooperate teachers at them. Creative models to address improving technology access at field sites are now emerging from PT3 grantees. These include equipping classrooms as model sites (Wetzel, Zambo, & Padgett, 2001), allowing students to request placements in technology-rich sites (Strudler & Grove, 2002), using video conferencing to extend the access to such classrooms (Beyerbach, Walsh, & Vanatta, 2001), or providing equipment that can be checked out and taken to the field site as needed.

Finally, instructional support was a significant predictor of student teachers having their K-12 students use technology. Probably because they were closest at hand, cooperating teachers were rated as the most available and used sources of support, with other school-based staff members such as the technology coordinator and even fellow student teachers at the site coming in ahead of college support sources and faculty members. Although this contextual factor may appear to be beyond the control of an SCDE in that it is off-site, there are two approaches that SCDEs could take in this matter. First, they could work to further educate the cooperating teachers so they might serve as better sources of support. Suggested approaches include developing their expertise through workshops (Brush et al., 2002; Dickey, 2002) or co-planned projects with preservice teachers (Arhar, Koontz, & Hill, 2002; Bolick, 2002; Dawson & Norris, 2000) and field-based faculty modeling (Norton & Sprague, 2002). Second, they could work to make sources of instructional support as conveniently available as are the school-based staff members. For example through computer-mediated communication such as chats or e-mail (Casey, 1992; Coleman, 1990; Lowe, 1993).

Several points were outside the scope of this study and suggest areas of further research. These include relating how SCDEs develop their students' skill and comfort with technology, such as by designing integrated instruction as a part of methods courses, to their extent and nature of technology uses during student teaching. This study was limited in that it did not research the purpose or quality of the student teachers' uses of technology. We also did not explore the relationship of the cooperating teachers' integration activities to those of their student teachers.

CONCLUSION

Because of the value of field experiences for preservice teachers, efforts to prepare new teachers have always extended beyond the college's walls. The recent emphasis on preservice teachers' technology preparation underscores this point and further complicates it with a need for contextualized expectations, access to technology, and technology integration instructional support. McIntyre et al. (1996) emphasized that the teacher education field should make changes to field experiences as different approaches and contextual factors are shown by evidence to make a difference. This study identifies three such factors and points to promising models and further research needs that can aid the identification of other important factors.

NOTES

1. $\chi^2(4) = 1.627$, $p = .804$.
2. University supervisor feedback by grade: $\chi^2(2) = 4.306$, $p = .116$; methods faculty feedback by grade: $\chi^2(2) = 3.441$, $p = .179$; cooperating teacher feedback by grade: $\chi^2(2) = 2.834$, $p = .242$.
3. The difference between the two items is statistically significant based on a paired *t* test ($t = 6.543$, $p < .01$).
4. $\chi^2(2) = 16.450$, $p < .01$.
5. Pearson's *r* correlation coefficient between availability and quality was .76 for technical support and .78 for instructional support.
6. Paired *t* test of the availability of technical versus instructional support: $t = 6.545$, $p < .01$. Paired *t* test of the quality of technical versus instructional support: $t = 5.203$, $p < .01$.
7. ANOVA of grade by statement was statistically significant, $F(2, 193) = 4.032$, $p < .05$.
8. Teacher technology use scale: alpha = .71; student technology use scale: alpha = .80.
9. The difference between teacher and student use is statistically significant based on a paired *t* test ($t = 19.213$, $p < .01$).
10. Pearson's *r* correlation coefficient between teacher and student use scales was equal to .56.
11. ANOVA of grade by student use of technology scale: $F(2, 196) = 8.606$, $p < .01$.
12. Alpha reliability coefficient = .79.
13. With standardized regression coefficients, an increase in one standard deviation of the predictor variables is associated with an increase in the dependent variable equal to the coefficient.

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