Technology in Teacher Education

A Closer Look

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ABSTRACT

The 1998 ISTE (International Society for Technology in Education) Information Technology in Teacher Education survey identified factors important for helping new teachers use information technology (IT) in education. In 1999, I resurveyed high-scoring institutions from the previous survey to find out how they achieved their superior levels of capacity. Important attributes of successful institutions included professional development, funding, and suitability of the physical plant for technology. The value of personal commitment to the technology program was particularly emphasized. These high-capacity institutions also relied heavily on their introductory technology courses. Technology courses are not highly correlated with other measures of capacity at most institutions, but it appears that as technology permeates a program, IT-specific coursework becomes more applicable to the various aspects of teacher preparation.

In the late 1990s, a number of national surveys and reports highlighted the role of teacher education in preparing new teachers to use technology in the classroom (National Council for Accreditation of Teacher Education [NCATE], 1997; Persichitte, Tharp, & Caffarella, 1997; President's Committee of Advisors on Science and Technology, 1997). The general finding was that although technology use is increasing in teacher training programs, preservice education could do more to help student teachers learn to integrate new tools into their jobs after graduation. One important factor was that technology was not well integrated into the college classroom. Students had access to computers and basic technology skills courses, but they did not have many examples of actual application of technology in teaching and learning.

1998 Survey on Information Technology in Teacher Education

In 1998, I and others collected information on 416 schools, colleges, and departments of education (SCDEs) in the United States (Moursund & Bielefeldt, 1999). Respondents (mostly college deans and education faculty) were asked to rate their own institutions in terms of a variety of indicators of capacity, including coursework, technology facilities and support, skills of graduates, and field experience opportunities.

Overall, there were few significant differences in the ratings from SCDEs of different demographic profiles. Geographic location, size of school, public versus private administration, Carnegie classification, and job description of the respondent did not seem to be related to the level of ratings.

A factor analysis of the 32-item survey indicated four groups of items in which the questions were closely related to one another:

- Integration of technology into the program (7 items)
- Facilities (11 items)
- Field experience (4 items)
- Application skills (4 items)

Of these, *integration* (the actual of use of technology in the program) was the best predictor of other aspects of capacity. When questions were clustered into factors, we observed scattered significant differences on demographic characteristics (e.g., institutions affiliated with NCATE tended to report more integration of technology), but we still could not identify any particular type of institution that would be more likely to report high technology capacity.

Six items, having to do with hours of coursework, faculty technology skills,

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technology planning, and distance education, were not statistically related to any of the factors. The number of hours of technology training integrated into other coursework had a moderate correlation with other ratings of capacity; however, technology-specific coursework had little correlation even with the reported technology skills of graduates.

Our tentative recommendation was that teacher training institutions should concentrate on increasing integration of technology throughout their programs through faculty staff development and field experiences rather than on developing additional technology courses.

High-Capacity Programs

One limitation of large survey studies is that they often do not include information on how the respondents achieved the levels of capacity they report. In an effort to better ground our findings and to provide guidelines for other institutions, we conducted a follow-up survey of those institutions that had above-average ratings on all four factors in the 1998 survey. In identifying these high-capacity institutions, we first limited our search to those institutions that responded to at least 30 of the 32 survey items, the mean level of response. Then we calculated a total score for each institution on the survey items in each of the four factors. Those scores were compared with the average scores for each factor.

We selected SCDEs that rated themselves highly on all four factors because we believe that aspects of technology capacity are necessarily related. Observers of college classrooms have reported that effective use of technology depends on a combination of facilities, technical support, professional development, and leadership (Barron & Goldman, 1994; Strudler, McKinney, & Jones, 1995). High capacity in one area, such as equipment, may have a limited effect on teaching and learning if it is not complemented with the training and other support needed to make use of the facilities. This relationship was observed in our 1998 survey, in which there were moderate correlations ($r = .34$ to .62) among the four factors we identified.

Using the procedure described above, we identified 62 institutions that reported above-average levels of capacity on all four factors. In spring of 1999, we sent these SCDEs a follow-up survey that asked respondents how they achieved their reported levels of capacity in technology preparation of new teachers. Specifically, we asked each institution to describe what helped or hindered them in providing technology facilities, integration of technology into their programs, field experiences, and graduates with basic technology skills.

In addition, we asked follow-up questions about two findings from the 1998 survey. Noting that the survey did not find a relationship between high numbers of technology course hours and other measures of capacity, we asked each respondent to describe the role of required technology courses in teacher preparation. We also asked respondents to rate (on a scale of 1–4) the importance of several alternative methods of providing technology training, including formal coursework in and outside of the education program, training integrated into other education and non-education coursework, prior training in high school or community college, and informal learning.

Another question we felt required elaboration had to do with technology planning. In 1998, we asked only whether an institution had a written, funded, regularly updated technology plan. Sixty-five percent did not (or the respondents were uncertain if one existed). Those that did have a plan had somewhat higher scores on the different factors, but the presence of a technology plan explained, at most, approximately 5% of variance. We felt we needed more information on the role of technology planning. We asked the high-capacity institutions (half of whom had plans) to rate, on a scale of 1–4, how important a formal technology plan is to implementing information technology in teacher education, and to describe the characteristics of an effective technology plan. The survey form appears as Appendix A (p. 13–15).

The answers to the specific questions above were supplemented by two open-ended response items. On the 1998 survey, we invited respondents to describe any noteworthy or exemplary features of their program's technology use. The 1999 survey included a comment area. In addition, some institutions attached supplementary documents to their survey responses.

Twenty-two of the 62 high-capacity institutions (35%) responded to the 1999 survey. As a group, these SCDEs had mean scores on each of the factors that were .8 to .9 standard deviations above the means for the full sample of 416 institutions (Table 1). As might be expected, standard deviations at this upper end of the sample distribution were considerably compressed.

Note that the questions under each of the factors should be treated as independent scales. There are different numbers of questions and different numbers of possible points under each of the factors. We do not consider the total score on the 1998 survey to be a reliable measure of capacity, because the meaning of high or low scores on some items depends on interpretation. For instance, some institutions felt that a low score on required technology courses was a strength, because it meant technology was integrated throughout the programs.

Respondents came from five of the six regional educational technology consortia areas. The Southwest United States was not represented, and a somewhat

FACTORS	FACILITIES		INTEGRATION		APPLICATIONS		FIELD EXPERIENCE	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
416 SCDEs 1998	30.7	7.9	17.3	6.0	15.9	3.3	9.5	3.6
22 respondents 1999	38.2	3.9	22.7	3.8	18.5	1.7	12.7	2.3

Table 1

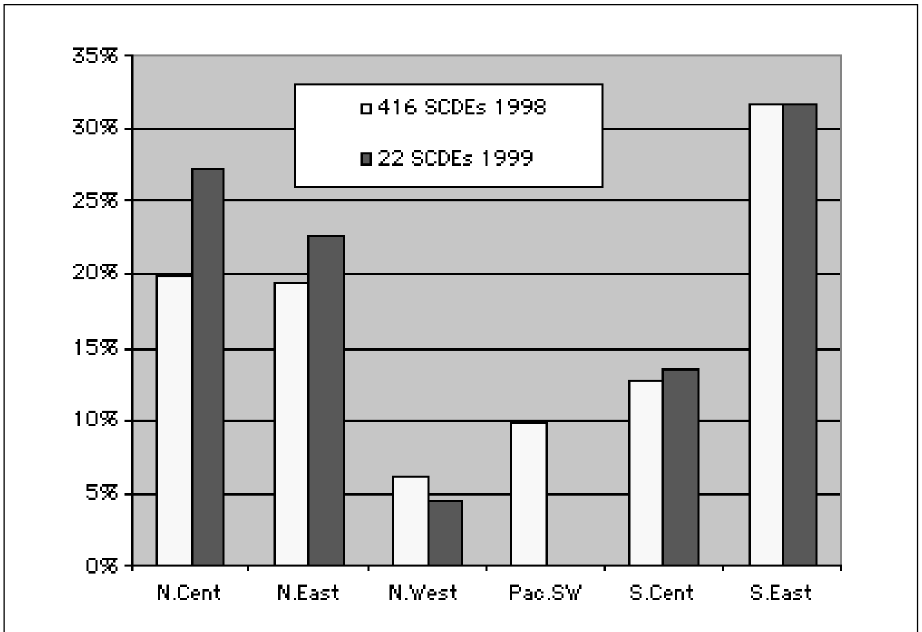

Figure 1. Percentage of respondents by region.

higher percentage of institutions came from the North Central and Northeast United States (Figure 1). These differences are probably an artifact of the small sample. Overall mean ratings for schools in different regions were similar, although some regions were stronger or weaker on particular factors.

The proportion of public versus private institutions (55% vs. 45%) was the same in both samples. Compared to the full sample, the high-rating SCDE respondents had a somewhat higher median number of graduates in 1998 (136 vs. 120) and a higher percentage of NCATE affiliation (86% vs. 62%).

Procedure

A research assistant and I coded each open-ended response from each respondent on the 1999 survey. Types of responses were not specified in advance; we were both free to propose categories of responses and to sort respondents' comments into those categories. Units of response could be sentences, phrases, or (in the case of respondents who tended to write in lists) individual words. On most questions, we proposed similar meanings for 60%–80% of the response units on the first reading. Combining or subdividing categories so that both readers used the same list of categories brought the agreement to 80% or more.

One exception was the question about conditions that helped with field experience programs. We agreed on only 43% percent of the units on the first reading. In this case, we started over after first reaching consensus on a common set of categories. Agreement after the second reading was 55%, and combining categories brought that to 83%.

I made the final decision on the remaining units. It turned out that many of the unresolved differences were due to misreading which level of education a respondent was discussing: inservice versus preservice, college classrooms versus K–12 classrooms, student teachers versus master teachers versus college faculty, and so forth. (I take this as a cautionary tale: if it is easy to confuse researchers who are looking for these distinctions, consider how much more care is needed when educators communicate with policy makers and the general public.)

Results

The types of responses for each item were tallied to identify common themes. Tables 2a–5a, 7, and 9 show the numbers and percentages of respondents providing each type of answer to each question. (Note that the percentage of respondents for each answer is independent of percentages for other answers; the column totals are not meaningful). The discussion following each table includes excerpts from the narrative responses. Tables 6 and 8 show the ratings respondents gave for the usefulness of various sources of technology training and for technology plans.

Technology Facilities: Helped and Hindered

These data are presented in Tables 2a and 2b.

Two factors stood out in helping institutions provide students and staff with adequate facilities: Commitment (mentioned by 82% of respondents) and money (mentioned by 73%). Finances were also the most commonly cited hindrance (55%) to providing facilities.

> Our college has always been committed to provide faculty and students with access to technology. As teacher educators, we are aware of wonderful resources for the students in IT. Our area schools also have high expectations for teachers and their use of IT. This combination has produced a willingness on the part of our administration and board of trustees.

Another element—organizational infrastructure and technical support—was included as part of facilities on the original 1998 survey. However, seven respondents felt support was important enough to mention on its own.

> With all the new technology in the Education Center, the dean, in his wisdom, used money to hire a technical staff for the complex [as well]. The Education complex includes the Education Center, the P.E. building and the Psychology Building. We have two full time people and student help for technical support for university system-wide needs such as BANNER, a Student Information System.

Various elements were reported by different institutions as helping drive technology improvements. The most important of these was building renovations, which provided opportunities to rewire and upgrade classrooms. By the same token, facilities that were difficult to upgrade (either because they were too old or being built too quickly) were cited by one-quarter of respondents as an important hindrance.

> The University is growing faster than we can provide space and technology. Wiring in buildings and among buildings (networking) had to be addressed. Additionally, the campus is expanding in many directions so the requirements for cabling has also increased along with the cost. Monies have to be used wisely.

Other "drivers" included long-range planning, the pressure of NCATE accreditation requirements, and the general integration of technology in the program.

Integration: Helped and Hindered

These data are presented in Tables 3a and 3b.

The most helpful technique for promoting integration of technology into teacher education was reported to be professional development for college faculty (mentioned by 68% of respondents). Related to the first point, faculty initiative and skill in using technology was also described as being important to integration (36%).

> The capacity for faculty to privately learn to use hardware and software [was important]. We provided faculty with a PC in each office so they could experiment. Experienced faculty gave time—they shared their expertise.

Lack of professional development was only mentioned by two institutions. A greater concern for most respondents was technology infrastructure and facilities. Approximately one-half of the respondents felt their facilities limited their ability to integrate technology; the other half felt their facilities were a strength.

HELPED YOUR INSTITUTION PROVIDE TECHNOLOGY FACILITIES FOR STUDENTS AND TEACHERS (22 RESPONDENTS)

	n	%
Interest, leadership, commitment	18	82
Financial resources	16	73
Infrastructure and technical support	7	32
Building renovations and upgrades	5	23
Integration of technology into curriculum	3	14
Influence of or integration with K–12 technology programs	3	14
Long-range planning	3	14
Training, professional development	2	9
Integration of technology with other departments; sharing	2	9
Accreditation standards	1	5

Table 2a

HINDERED YOUR INSTITUTION IN PROVIDING TECHNOLOGY FACILITIES (20 RESPONDENTS)

	n	%
Lack of financial resources or budget allocations	11	55
Size or age of facilities	5	25
Personnel; lack of technically experienced faculty	4	20
Lack of commitment to technology	2	10
Lack of time	2	10
Lack of planning or poor planning	2	10
Lack of technology in K–12 schools	1	5
"Mainframe mentality"	1	5

Table 2b

HELPED FACULTY AND STUDENTS INTEGRATE TECHNOLOGY INTO CLASSROOM PRACTICE (22 RESPONDENTS)

	n	%
Training and professional development	15	68
Technology infrastructure	11	50
Expectations of teachers, administrators, NCATE	9	41
Personnel: faculty initiative and skill	8	36
Incentives for faculty	5	23
Technology skills of incoming students	2	9
Student coursework	2	9
Support from K–12 schools	1	5

Table 3a

> As more and more classes are being taught in the computer labs, there is more pressure on the existing labs and the library computers for access. Sometimes it is hard for students to find access to a computer if they don't have their own.

Forces helping drive integration efforts included expectations of teachers (for technology use by students), administrators (for technology use by teachers), and NCATE (for technology use by programs). The growing use of technology in K–12

HINDERED FACULTY AND STUDENTS FROM INTEGRATING TECHNOLOGY INTO CLASSROOM PRACTICE (21 RESPONDENTS)

	n	%
Lack of infrastructure	11	52
Lack of time	6	29
Lack of enthusiasm or buy-in	4	19
Lack of mentors or examples in practice	3	14
Lack of K–12 technology capacity	3	14
Other competing requirements of the program or institution	3	14
Lack of financial resources	2	10
Lack of training or professional development	2	10
No hindrances	1	5

Table 3b

HELPED YOUR INSTITUTION PROVIDE TECHNOLOGY-RELATED FIELD EXPERIENCES FOR STUDENTS (22 RESPONDENTS)

	n	%
Integration of technology field experience into the college program	7	35
A high level of K–12 facilities and support	6	30
Effective mentors (college supervisors and K–12 teachers)	6	30
Funding (grants and bond measures) for facilities and training	6	30
Dedication and willingness to learn; initiative	5	25
Professional development at K–12 and college levels	5	25
NCATE standards	1	5

Table 4a

HINDERED YOUR INSTITUTION IN PROVIDING TECHNOLOGY-RELATED FIELD EXPERIENCES (18 RESPONDENTS)

	n	%
Lack of K–12 teachers using technology, whether it is present	11	61
Lack of technology in K–12 schools	8	44
Lack of time, lab access, or other resources in the college	4	22
Lack of coordination by the college or university	2	11
Lack of initiative by students	1	6

Table 4b

schools also provides more opportunities to apply integration skills (see the Field Experience section), as well as an increasingly computer-adept student body coming out of high school.

> We have few or no hindrances [with integration]… Most students come to campus with proficiency in most of these areas. Fellow students, staff, and faculty provide assistance. Students have adequate access to computers.

Field Experience: Helped and Hindered

These data are presented in Tables 4a and 4b.

The conditions reported to support technology-related field experience were diverse, with similar numbers of respondents (five to seven) mentioning integration with the college coursework, levels of technology in K–12 schools, availability of mentor teachers and supervisors, initiative on the part of students, and training for K–12 teachers and college faculty. There was much greater agreement on the main limitation on field experience programs: the lack of capacity in K–12 schools. That includes both lack of hardware and lack of teachers using technology (whether it is present).

> Faculty in the schools are not well trained and do not provide proper role models. Our students have to be pioneers.

Other hindrances included lack of technology facilities at the college, failure by the college to coordinate field experience opportunities, or failure by individual student teachers to take advantage of technology in the schools.

Application Skills: Helped and Hindered

These data are presented in Tables 5a and 5b.

Most respondents agreed on what helped their students master basic computer skills: the technology training courses provided in their programs.

> Computer courses are essential to develop the basic knowledge base (teach tools, applications, issues, etc.) but technology must be used in methods courses by students and faculty in increasingly more sophisticated ways.

The other main influence on student technology skills was the overall use of technology in the program: the expectations of faculty and the access and support provided by the institution.

> I believe that all teacher education students should take a beginning class in computer applications as well as a class in specific ways IT can be incor-

porated into the classroom. These should be early enough that students can utilize the information in their methods courses as well as other courses required for their major.

One remarkable characteristic of this part of the survey was that for one-third of the respondents, there *were* no serious obstacles to students developing application skills. The SCDEs that did report hindrances listed lack of infrastructure as the leading problem, followed by lack of technology coursework, lack of time to develop courses, and lack of faculty who could integrate technology into other courses.

Sources of Training

When we asked respondents to rate various sources of technology training for preservice teachers, results tended to mirror responses to the application skills item described previously. Technology courses within the teacher training program were rated as essential by most respondents, followed by training integrated into other education coursework and informal individual learning. High school experience and training from outside the program were not considered essential by most respondents (Table 6).

Role of Technology Coursework

Given the importance attached to technology courses within the education program, what is the actual role of those courses? Our respondents emphasized two points: first, the courses build confidence and skills; second, they need to be followed up with actual use of technology in other coursework. Eight of the respondents reported that the formal courses were basically a transition to the integration of technology; they may even be phased out over time. Also mentioned were the ideas that integration should be specifically taught as well as modeled and that technology training was "preparation for the future," not necessarily for immediate integration (Table 7).

Technology Planning

The perceived value of technology planning apparently exceeds the practice of

HELPED YOUR STUDENTS ACHIEVE PROFICIENCY WITH WORD PROCESSING, E-MAIL, THE WORLD WIDE WEB, AND ELECTRONIC GRADEBOOKS (22 RESPONDENTS)

	n	%
Technology-specific course requirements	17	77
Integration of technology into the program and expectations of proficiency	11	50
Technology infrastructure	4	18
Ongoing training and support (formal and informal)	3	14
Strong student background in technology	1	5

Table 5a

HINDERED YOUR STUDENTS IN ACHIEVING PROFICIENCY WITH WORD PROCESSING, E-MAIL, THE WORLD WIDE WEB, AND ELECTRONIC GRADEBOOKS (20 RESPONDENTS)

	n	%
Lack of infrastructure	9	45
Few or no hindrances	7	35
Not enough coursework, or courses offered too late in the program	4	20
Lack of interest of skill in technology integration on the part of faculty	4	20
Lack of time for training and program development	2	10
Large and diverse classes for students	1	5

Table 5b

RATE THESE SOURCES OF TECHNOLOGY TRAINING AS TO HOW IMPORTANT EACH IS FOR STUDENTS IN YOUR PROGRAM.

SOURCE OF TRAINING	# RESPONDENTS	1	2	3	4	MEAN RATING*
Technology courses within the education program.	22	0	1	5	16	3.7
Technology integrated into other education coursework.	22	0	3	7	12	3.4
Informal learning from peers or self-study	17	0	4	4	9	3.3
Prior training in high school or community college.	21	0	9	9	3	2.7
Technology integrated into other non-education coursework.	22	1	9	9	3	2.6
Technology courses from outside the program.	22	5	10	6	1	2.1

* Σ (rating x no. responses)/no. respondents

1 = Unimportant. 2 = Useful. 3 = Important. 4 = Essential.

Table 6

WHAT IS THE ROLE OF REQUIRED COMPUTER COURSES IN TRAINING NEW TEACHERS? (22 RESPONDENTS)

	n	%
A starting point to build confidence and basic skills	12	60
Should be followed by integration into other coursework	11	55
Should be minimized or eliminated in favor of integration	8	40
A resource; provide support and tools for other coursework	4	20
Should specifically teach integration	3	15
Necessary for preparing students for the future	3	15

Table 7

HOW ESSENTIAL IS A FORMAL TECHNOLOGY PLAN? (22 RESPONDENTS)

NOT NEEDED (1)	USEFUL (2)	IMPORTANT (3)	ESSENTIAL (4)	MEAN RATING*
0	1	5	16	3.7

* ∑ (rating x no. responses)/no. respondents

Table 8

WHAT ARE THE KEY CHARACTERISTICS OF A USEFUL TECHNOLOGY PLAN? (22 RESPONDENTS)

	n	%
Includes specific goals and objectives	13	65%
Includes integration with curriculum	11	55%
Involves all stakeholders	10	50%
Provides adequate facilities and support	10	50%
Provides for needs assessment, evaluation, and revision	10	50%
Provides for professional development	7	35%
Provides for adequate funding	5	25%
Is realistic	2	10%
Provides for actual implementation of the plan	2	10%
Includes incentives for following the plan	1	5%

Table 9

planning. Only half of the high-scoring respondents reported having technology plans, but all but one rated technology plans to be "Essential" or "Important" (Table 8).

All respondents—whether they had a plan—had ideas about what a useful technology plan should look like. At least half of the respondents said a plan should have specific goals and objectives, attend to integration of technology (not just provide hardware and software, although that is important), involve all important stakeholders, and be based on needs assessment and ongoing evaluation. Another feature mentioned was professional development. A variety of factors having to do with the practicalities of making a plan work were mentioned by several respondents. These included funding, incentives, and an implementation scheme (Table 9).

Discussion

The responses to the 1999 survey tend to support our theory that infusing technology into teacher preparation requires a comprehensive approach that attempts to balance facilities, faculty professional development, coursework, and field experience. Responses in each area often referred to other aspects of capacity. For instance, integration was said to depend partly on having adequate technology facilities. Facilities, in turn, depend on a level of integration that creates demand. Student application skills are said to be related to both integration and facilities, but integration can itself be hindered by a lack of student computer skills.

Outside of the factors themselves, some helping/hindering agents were mentioned under several categories. Money, of course, was a common need, mentioned in all areas except student skill with applications. Professional development was mentioned under all four factors. We did not ask about how to do professional development, but others have identified time as a barrier to faculty learning new technology skills and integrating them into instruction (Strudler et al., 1995). In the present survey, time was mentioned (although not specifically tied to professional development) under all factors except student application skills.

In 1998, we noted that although many institutions were proud of their technology course offerings, there was little correlation between the courses and the reported levels of integration, student skills, or other factors. In 1999, the high-rating respondents held technology courses in high esteem as a way to build student skills, although they were rarely mentioned as contributing directly to integration or field experience.

When we looked at the original 1998 surveys for these respondents only, we found a higher correlation between required technology coursework and three of the other factors (Table 10). It is interesting to note that student computer skills—which were linked to technology courses in the 1999 narrative responses—comprised the one factor that did not correlate well with coursework on the 1998 survey.

It would seem that the role of technology coursework is not primarily to boost student skills in word processing and other applications. As we noted in 1998, students gain technology skills from a variety of sources. Rather, the coursework in these high-rating SCDEs probably is most valuable in supporting the integration of technology into the rest of the activities. Presumably, in these high-capacity environments, there is more technology to teach and more opportunity to apply what is taught.

The 22 high-rating respondents were no more likely than the rest of the original sample to have large numbers of course hours. (Three to four quarter hours was the median number of credits for both samples in both technology-specific course requirements and technology training integrated into other coursework.) However, the course hours seemed to be more related to the rest of the program.

Money, time, and course hours can all be quantified, budgeted, and scheduled. One of the important drivers of technology use mentioned by our respondents is harder to pin down—commitment. Our survey did not ask how colleges fostered commitment to technology innovations, but some of the respondents provided clues. One noted that commitment took the form of appointing a vice president of technology. Another reported that the administration began requiring technology to be included in faculty evaluation plans. In contrast to these top-down commitments, two sites reported that students voluntarily raised their own fees to support technology. Another respondent recounted how he and his colleagues made a presentation before their trustees to gain support for technology. One common thread in these comments seems to be the role of human initiative supported by administrative actions and access to information. As Rogers (1995) suggests in his analysis of diffusion of innovations, the actions of certain change agents are key to reaching a critical mass of adopters. That is, supporting the innovation actually means supporting the innovators.

Implications for Action

It is dangerous to make specific recommendations for change based on research that is based on correlations and self-reports. However, the 1998 and 1999 surveys suggest a course of action for technology in teacher education that at least provides a testable model. According to this paradigm:

1. Administrators and senior faculty at an SCDE would accept technology preparation of new teachers as an important issue to address in their institution. A technology plan would be one way of conveying vision, commitment, and expectations and of establishing the funding priorities for actually implementing new programs.
2. These leaders would conduct a needs assessment with faculty and students to identify the relative strengths and weaknesses of campus facilities, integration of technology into courses, availability of technology in field experience, and student technology skills. "Identify relative strengths" is another way of saying, "find the weak link." The goal is to augment those areas that limit the application of technology and to avoid spending resources on activities (such as additional technology-specific coursework) that will have limited effects as long as other factors are deficient.
3. The SCDE would inventory its resources and focus them on the area of greatest need. Respondents to the 1999 survey reported several successful strategies for dealing with their "weak links," including professional development, course design, building renovation, and technical support. However, the specifics of implementation go beyond the realm of survey research into program evaluation. Fortunately, those studies are already underway.

At this writing, 352 SCDEs—roughly one-quarter of teacher training institutions in the United States—have received Preparing Tomorrow's Teachers to Use Technology (PT^3) grants from the U.S. Department of Education. The objectives of PT^3 include redesigning curriculum for students, professional development for faculty, making technology and technology integration a part of graduation and certi-

	Facilities 1998	Facilities 1999	Integration 1998	Integration 1999	Applications 1998	Applications 1999	Field Experience 1998	Field Experience 1999	Technology Courses 1998	Technology Courses 1999	Integrated Technology Training 1998	Integrated Technology Training 1999
Facilities	1.0	1.0										
Integration	.41	.39	1.0	1.0								
Applications	.44	.28	.62	.59	1.0	1.0						
Field experience	.35	.53	.52	.38	.34	.27	1.0	1.0				
Technology courses	.16	.35	.17	.24	.11	.52	.16	.28	1.0	1.0		
Integrated technology training	.18	.43	.33	.35	.19	.05	.23	.49	.20	.15	1.0	1.0

Table 10

fication requirements, and increasing collaboration between teacher training programs, colleges of arts and sciences, and K–12 schools.

Formative evaluations of PT³ projects reveal creative approaches that bridge the categories identified in the 1998 and 1999 surveys. For instance, the introduction of Web-based course management elicits greater technology use and competence from both faculty and students (Southwest Missouri State University, 2000). Likewise, when K–12 teachers, preservice students, and college faculty participate in training together in a relationship of reciprocal mentoring, a program simultaneously addresses K–12 capacity, professional development, and student technology skills (Bielefeldt, 2000). As evaluations and research studies from these projects emerge, teacher training will have a large casebook of strategies to guide program development for years to come.

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Appendix A

INFORMATION TECHNOLOGY IN TEACHER EDUCATION

IT Capacity Questionnaire

The 1998 Milken/ISTE Survey on Information Technology in Teacher Education identified four factors in the IT preparation of new teachers:

- Facilities for students and teachers
  (including Internet access, classroom arrangement, numbers and technical features of computers, convenience of access, technical support, and continuing funding)
- Integration of technology in learning
  (Including faculty modeling of IT; computer-assisted instruction; the ability of new graduates to teach using technology for project-based learning and problem solving, for helping students with special needs, and for teaching about technology; and the ability of graduates to work in a variety of classroom technology configurations)
- Student ability to use applications
  (including word processing, e-mail, Web browsers, and electronic gradebooks)
- Field experience opportunities
  (including access to field experiences where IT is available, actual use of IT during field experiences, and the availability of supervisors and master teachers who can model and advise on classroom technology use)

1. We're interested in knowing more about how you achieved the high levels of capacity you reported in 1998. Please tell us what you consider to be the key elements that …

   1.1.1 helped your institution provide technology facilities for students and teachers.

   Use additional sheets as needed.

   1.1.2 hindered your institution in providing technology facilities.

   Use additional sheets as needed.

   1.2.1 helped faculty and students integrate technology into classroom practice.

   Use additional sheets as needed.

1.2.2 hindered faculty and students from integrating technology into classroom practice.

Use additional sheets as needed.

1.3.1 helped your students achieve proficiency with word processing, e-mail, the World Wide Web, and electronic gradebooks.

Use additional sheets as needed.

1.3.2 hindered your students in achieving proficiency with word processing, e-mail, the World Wide Web, and electronic gradebooks.

Use additional sheets as needed.

1.4.1 helped your institution provide technology-related field experiences for students.

Use additional sheets as needed.

1.4.2 hindered your institution in providing technology-related field experiences

Use additional sheets as needed.

2. In our 1998 survey, higher numbers of IT-specific course requirements did not correlate with higher reported capacity in other areas. In your opinion, what is the role of required computer courses in training new teachers?

Use additional sheets as needed.

3. Postsecondary students acquire their technology skills from a variety of sources. Please rate these sources of technology training as to how important each is for students in your program. Use the following scale:

1 = Unimportant, rarely used | 2 = Moderately useful, used by some students | 3 = Important, used by many students | 4 = Essential, used by most students

Source of training 1 2 3 4				
Technology courses within the education program				
Technology courses from outside the education program				
Technology training integrated into other education coursework				
Technology training integrated into other non-education coursework				
Prior training in high school or community college				
Informal learning from peers or self-study				
Other (describe):				

4.1 In your opinion, how essential is a formal technology plan to implementing information technology in teacher education?

◦ 1 Not needed ◦ 2 Not essential, but useful ◦ 3 Very important ◦ 4 Essential

4.2 In your opinion, what are the key characteristics of a useful technology plan?

Use additional sheets as needed.

5. Additional comments:

Use additional sheets as needed.

6. The information below will allow us to identify which institutions have responded, enable us to relate your answers to your earlier ITTE survey responses, and enable us to contact you for clarification. No individual respondents or institutions will be identified in reports coming out of this study. Thank you for your assistance with this research.

Name: ____________________

Institution: ____________________

Department: ____________________

Address: ____________________

City, State, ZIP: ____________________

Phone: ____________________

E-mail: ____________________