PLANNING AND EVALUATION SERVICE

Analysis of the 1999-2000 Annual Performance Reports for Preparing Tomorrow's Teachers to Use Technology

U.S. DEPARTMENT OF EDUCATION ~ OFFICE OF THE UNDER SECRETARY
DOC. # 2001-23

Analysis of the 1999-2000 Annual Performance Reports for Preparing Tomorrow's Teachers to Use Technology

Final Report

Prepared for:
U. S. Department of Education
Planning and Evaluation Service
Washington, D.C.

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2001

This report was prepared for the U.S. Department of Education under Contract No. 282-98-0021. The views expressed herein are those of the contractor. No official endorsement by the U.S. Department of Education is intended or should be inferred.

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This report is available on the Department's Web site at: www.ed.gov/offices/OUS/PES/higher.html#pt3.

ACKNOWLEDGEMENTS

This report is one component of the evaluation of the U.S. Department of Education's (ED's) Preparing Tomorrow's Teachers to Use Technology (PT3) grant program. This report summarizes data from the PT3 1999-2000 Annual Performance Reports collected by Mathematica Policy Research, Inc. (MPR). Many individuals from the U.S. Department of Education and Mathematica Policy Research, Inc., have made important contributions to this research.

We would like to thank the numerous staff from ED who provided guidance and feedback regarding the development of this report. Specifically, we would like to acknowledge the contributions from the PT3 program office staff and the staff in the Planning and Evaluation Service.

At MPR, the PT3 project director, Wendy Mansfield, provided valuable input to and oversight for this report. We would also like to acknowledge Sophia Kuan, who was responsible for programming the Web-based report and providing technical assistance throughout the data collection. Research analysts Justin Humphrey and Melissa Thomas were responsible for collecting and analyzing the data and writing this report.

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EXECUTIVE SUMMARY

This report presents the first-year findings from the 1999-2000 Annual Performance Reports of the Preparing Tomorrow's Teachers to Use Technology (PT3) program sponsored by the U.S. Department of Education (ED). Specifically, it discusses each PT3 program indicator and describes how grantees' activities and accomplishments address the program goals and objectives.

INTRODUCTION

Preparing teachers to use technology effectively to improve students' learning is a major challenge facing our nation's schools. Technology preparation calls for not only re-educating the existing teaching force to take advantage of available new technologies but also ensuring that teacher preparation programs are graduating technology-proficient new teachers. In an effort to help educators meet this challenge, the U.S. Department of Education has established the Preparing Tomorrow's Teachers to Use Technology grant program. The PT3 program assists consortia of public and private entities in developing teacher preparation programs that prepare prospective teachers to use technology for improved instructional practices and student learning opportunities in the classroom. The PT3 program offers support to teacher preparation programs across the nation through three types of grants:

- Capacity Building grants assist grantees for one year in laying the initial groundwork for a teacher preparation reform strategy. Activities may include faculty development, curriculum redesign, and the formation of cross-disciplinary collaborations among university departments and between institutions of higher education and K-12 schools.

- Implementation grants provide support to grantees for three years to engage in systemic teacher preparation reform by implementing or significantly expanding a program to improve preservice teachers' technology proficiency. Activities may include strong and extensive faculty development through the application of high-quality learning resources and cross-disciplinary collaborations and strong partnerships with local educational agencies that place postsecondary faculty and K-12 educators in joint learning activities.

- Catalyst grants assist grantees for three years in stimulating large-scale innovative improvements for preparing technology-proficient teachers. Activities may include technical assistance to teacher preparation programs, support for alternative teacher-development career paths, development of new standards in the use of technology, and evaluation of teacher training reform efforts.

During fiscal year 1999, ED awarded 138 Capacity Building, 64 Implementation, and 23 Catalyst grants for a total of 225 grants.

METHODOLOGY

ED began the process of annual data collection in 1999 by defining specific and measurable outcomes for each of the PT3 indicators that would demonstrate the extent to which grantees meet the program's goal and objectives. Once the outcomes were finalized, individual questions were created to capture the results of each outcome with the accumulation of the questions being the annual performance reports. The questions were designed to obtain baseline data and to allow grantees to report their progress on the PT3 program indicators. Following approval from the Office of Management and Budget, the performance report was developed into a Web-based program to facilitate data collection and to enhance the quality of the data collected.

All 225 1999 PT3 grant recipients were asked to submit an annual performance report to ED via the Web for the reporting period October 1, 1999, to September 30, 2000. Lead organizations of each consortium were asked to complete the report for themselves and for any nonteacher preparation program partners in their consortium. Each partner designated as a school, college, or department of education was also asked to complete the annual performance report.

The consortium-level data reviewed in this report are based on responses by at least one partner at 91 percent of consortia. In 72 percent of consortia, the lead organization and every partner teacher preparation program completed the report. Eighty-two percent of all teacher preparation programs completed the report (including teacher preparation programs that were also lead organizations), as did 88 percent of lead organizations.

A total of 335 teacher preparation programs completed annual performance reports – based on the number of teacher preparation program *respondents* and not distinct teacher preparation programs. For example, if a teacher preparation program participates in three different grants and reported three sets of performance data, it is counted as three respondents rather than one.

Results are presented overall and by grant type at both the consortium level and at the teacher preparation program level. When reporting results at the consortium level, data from the lead organization and all of the teacher preparation programs within a consortium that responded were combined to represent a consortium.

On several of the performance report items, grantees were given the option of reporting whether or not an activity was conducted as a result of the grant. The number of responses for each answer choice is presented in the appendix tables. Because the report provides data to assess the PT3 program, however, the responses discussed in the text refer only to those who reported that an activity was conducted *as a grant activity* unless otherwise noted.

All information detailed in this report was extracted from grantees' responses to the PT3 Web-based performance report. Accordingly, the report's findings are subject to the limitations of self-reported data.

TECHNOLOGY REFORMS IN TEACHER PREPARATION

During the first year of PT3 funding, most grantees focused on three major activities: providing technology professional development (91 percent), redesigning education curricula (87 percent), and applying technology in new ways (89 percent). Grantees less frequently engaged in other

major activities, including expanding field experiences (59 percent) and adding or expanding graduation requirements (22 percent).

Technology Professional Development

Providing professional development to education and arts and science faculty, preservice students, and K-12 teachers was the most common activity that grantees undertook. Often this professional development included making an education or university technology specialist available to faculty at the faculty member's convenience to discuss individual technology issues or using a technology specialist, education faculty member, or K-12 teacher to facilitate technology workshops.

Education Faculty and Professional Development

Ninety-one percent of consortia and 77 percent of teacher preparation programs undertook this activity for education faculty. In all, 251 teacher preparation programs provided professional development to 3,682 education faculty members, about 20 percent of education faculty at all PT3 teacher preparation programs and 26 percent of faculty at the 251 teacher preparation programs engaging in this activity.

Fifty-two percent of teacher preparation programs provided professional development to education faculty and then assessed their technology proficiency. Fifty-six percent of education faculty at these institutions and 6 percent of all PT3 education faculty (1,093 faculty members) were rated as technology-proficient (based on the individual programs' own definition of technology proficiency). The most frequent assessment instruments used were self-assessments (91 percent of programs used this instrument) followed by observation of education faculty (41 percent).

Arts and Science Faculty and Professional Development

In all, consortia provided training activities to 1,564 arts and science faculty members. The most common type of professional development was providing university or education technology specialists to work with faculty members on technology issues at the faculty member's convenience. Almost as frequent were optional workshops facilitated by technology specialists.

In addition to education and arts and science faculty members, more than 7,600 K-12 teachers participated in technology professional development. Sixty-eight percent of consortia provided professional development to K-12 teachers. Finally, more than 13,245 preservice students participated in these technology-training activities.

Curricula Redesign

Almost as many PT3 grantees undertook redesigning education courses to integrate more technology into the curriculum. Eighty-seven percent of all consortia and 69 percent of all teacher preparation programs provided PT3 grant funds to support faculty in this process. A total of 2,169 education faculty redesigned 2,713 classes (5 percent of the 55,552 education classes at all PT3-funded teacher preparation programs) to include more technology. Eighty-one percent of these redesigned classes have been implemented.

In addition to redesigning education classes, grant activities also focused on redesigning curricula for arts and science classes in which preservice students enroll. More than 570 arts and science faculty redesigned 763 classes to integrate technology into the curriculum. More than 80 percent of the redesigned classes were implemented.

Incentives
In order to facilitate these curricula changes, programs often offered incentives to faculty as a direct result of the grant. Eighty-two percent of consortia and 67 percent of teacher programs provided incentives to faculty. The most common incentives included professional development opportunities in technology workshops (94 percent of programs offering incentives), stipends (76 percent), and equipment for instructional (81 percent) or professional use (69 percent).

Expanding Field Experiences
Fifty-nine percent of consortia and 42 percent of programs added, expanded, or modified their field experiences to place preservice students in K-12 classrooms in which educational technology tools and technical support are available and currently used by K-12 teachers. The most frequent technology tools included in at least half of preservice students' field experiences were e-mail (81 percent of programs), software packages for word processing (75 percent), the Internet or Web-based materials (72 percent), and software additional packages including presentation software (61 percent).

Learning Resources
Eighty-nine percent of all consortia and 78 percent of all teacher preparation programs had faculty who are applying technology in new ways. Among these teacher preparation programs, the most common new application of technology by faculty is requiring students to use the Internet to conduct research (at least half of faculty at 68 percent of these programs) and to obtain course materials such as syllabi (at least half of faculty at 47 percent of these programs). Faculty are also using presentation software and other multimedia components to develop classroom presentations (at least half of faculty at 36 percent of these programs) and requiring that their students do the same (at least half of faculty at 27 percent of these programs).

Graduation Requirements
Twenty-two percent of all consortia and 18 percent of all teacher preparation programs added or expanded graduation requirements to require that preservice students demonstrate technology proficiency. Of those teacher preparation programs modifying their graduation standards, the most common changes included requiring preservice students to plan and deliver instructional units that integrate a variety of software applications and learning tools (78 percent) and requiring students to use computer-based technologies, such as telecommunications and the Internet, to enhance personal and professional productivity (78 percent). Seventy percent of these programs also required that preservice students apply computers and related technologies to support instruction in their specific grade level and subject areas.

Technology Proficiency and New Teachers
The major anticipated outcome of the PT3 program is improving the ability of preservice students to teach with technology. Forty-two percent of all programs are assessing the technology proficiency of their preservice students as a grant activity. Another 32 percent are assessing their students, but not as a grant activity. Sixteen percent of students at programs that assessed the technology proficiency of their students (either as a grant activity or not as a grant activity) were rated as technology proficient. This represents 6 percent of students at all PT3 teacher preparation programs. It would be misleading to assume, however, that the remaining 84 percent of preservice students were unable to demonstrate technology proficiency. Some teacher preparation programs did not require all their preservice students to demonstrate their technology proficiency.

The proportion of technology proficient students is higher for those students in their graduating year. Thirty-nine percent of graduating students at programs that assessed technology proficiency and 13 percent of graduating students at all teacher preparation programs in PT3 consortia were rated as proficient.

Institutional Change

More than half of all grantees (57 percent) included a college of arts and science in their consortia to facilitate institution-wide change in the curricula for preservice teachers. The most frequent collaboration between education and arts and science faculty occurred during professional development activities.

Ninety-two percent of consortia included at least one K-12 school or district in their partnership. Redesigning field experiences offered the most frequent point of collaboration between teacher preparation programs and K-12 schools and districts. More than 90 percent of consortia relied on K-12 schools to provide clinical experiences for their preservice students, and almost 80 percent had K-12 teachers model the effective use of technology in instruction for preservice students.

CONCLUSION

The common focus across all three grant types on the professional development of faculty highlights this activity as the primary means in the first year of the grant for preparing preservice teachers to integrate technology into their teaching. The results reported by consortia within each grant type, however, indicate that grantees have also applied PT3 funds to the different purposes for which the grant types were intended. Recipients of Capacity Building grants, which were designed to lay the foundation for a teacher preparation reform strategy, were highly engaged in establishing partnerships with K-12 schools and districts and providing professional development to education faculty. Recipients of Implementation grants, which were designed to support consortia in implementing or significantly expanding a teacher preparation program to improve preservice teachers' technology proficiency, most frequently provided professional development to faculty and redesigned education curricula. Recipients of Catalyst grants, which were designed to foster large-scale innovative improvements for preparing technology-proficient teachers, were most likely to use their PT3 funds to modify graduation requirements to incorporate technology standards and to provide professional development to faculty.

During the first year of PT3 funding, grantees implemented activities that targeted a broad and varied group of educators and initiated the restructuring of teacher preparation programs to better prepare new teachers to integrate technology into K-12 instruction. In the remaining years of the grant, it is anticipated that more faculty and students will become involved in grant activities as current reforms are expanded and additional reforms are implemented, creating teacher preparation programs that help meet the demand for technology-proficient new teachers.

I. INTRODUCTION

A. OVERVIEW OF THE PROGRAM

Preparing future teachers to effectively use technology to improve students' learning is a major challenge facing our nation's schools. Technology preparation calls not only for re-educating the existing teaching force to take advantage of new technologies, but also for ensuring that teacher preparation programs are graduating technology-proficient new teachers. To help educators meet this challenge, the U.S. Department of Education (ED) established the Preparing Tomorrow's Teachers to Use Technology (PT3) grant program. In 1999, ED awarded 225 grants to consortia of public and private entities to assist in developing teacher preparation programs that prepare prospective teachers to use technology for improved instructional practices and student learning opportunities. Consortia received one of three types of grants:

- ***Capacity Building grants*** (which were offered only in 1999) assist grantees for one year in laying the initial groundwork for a teacher preparation reform strategy. Activities may include faculty development, curriculum redesign, and the formation of cross-disciplinary collaborations among university departments and between institutions of higher education and K-12 schools.
- ***Implementation grants*** provide support to grantees for three years to engage in systemic teacher preparation reform by implementing or significantly expanding a program to improve preservice teachers' technology proficiency. Activities may include strong and extensive faculty development through the application of high-quality learning resources and cross-disciplinary collaborations and strong partnerships with local educational agencies (LEAs) that place postsecondary faculty and K-12 educators in joint learning activities.
- ***Catalyst grants*** assist grantees for three years in stimulating large-scale innovative improvements for preparing technology-proficient teachers. Activities may include technical assistance to teacher preparation programs, support for alternative teacher-development career paths, development of new standards in the use of technology, and evaluation of teacher training reform efforts.

During fiscal year 1999, 138 Capacity Building grantees were awarded a mean of $135,000; 64 Implementation grantees were awarded a mean of $390,000; and 23 Catalyst grantees were awarded a mean of $640,000.[1]

B. EVALUATION OBJECTIVES AND INDICATORS

The main goal of the PT3 program is to increase the knowledge and ability of future teachers to use technology in improved teaching practices and student learning opportunities and to enhance the quality of teacher preparation programs. The PT3 program has four objectives to support this primary goal, and ED has identified specific indicators to measure grantees' progress toward meeting each of these objectives. The objectives and their supporting indicators are:

- ***Objective 1:*** Strengthen teacher preparation programs so that they provide high-quality training in the use of technology for instructional purposes.
  - *Indicator 1.1 Curriculum redesign* – The percentage of funded teacher preparation programs that redesign their curriculum to incorporate best practices in the use of technology in teacher education will increase.
  - *Indicator 1.2 Technology-proficient faculty* – The percentage of faculty members in funded teacher preparation programs that effectively use technology in their teaching will increase.
  - *Indicator 1.3 Graduation requirements* – The number of funded teacher preparation programs that will require teacher candidates to demonstrate proficiency in the effective use of technology in teaching and learning will increase.
  - *Indicator 1.4 Learning resources* – The percentage of teacher preparation programs that use Web-based, multimedia learning resources, course materials, and teaching tools will increase.

- ***Objective 2:*** Increase the technology skills and proficiency of new teachers for improved classroom instruction.
  - *Indicator 2.1 Technology proficient new teachers* – The percentage of new teachers who are proficient in using technology and integrating technology into instructional practices will increase.

[1] http://www.ed.gov/offices/OPE/PPI/teachtech/pt3sum.html

- ***Objective 3:*** Create institutional change in the preparation of future teachers to use technology.
  - *Indicator 3.1 Sustained program activities* – A greater percentage of consortia members will continue to implement reform in preservice teacher training for at least two years following the termination of federal funding.
  - *Indicator 3.2 Interdisciplinary partnerships* – The percentage of teacher preparation programs that communicate, collaborate, and partner with schools of arts and science on a regular and formal basis will increase.
  - *Indicator 3.3 K-16 partnerships* – The percentage of teacher preparation programs that communicate, collaborate, and partner together with K-12 community on a regular and formal basis will increase.

- ***Objective 4:*** Create statewide change in the preparation of future teachers to use technology.
  - *Indicator 4.1 State teacher certification standards* – The number of states that include technology proficiency as a component of their initial teacher certification standards will increase.

ED developed these objectives and indicators over several months. Its aim was to produce challenging and ambitious objectives that meet the overall goal of the program and to produce indicators that are clear, concise, and measurable. Though these indicators cover a wide array of activities, they do not encompass all of the activities that grantees are conducting.

C. ORGANIZATION OF THIS REPORT

This report presents the first-year findings and analysis of grantees' data collected through the 1999-2000 Annual Performance Reports of the PT3 program. Specifically, it discusses each PT3 program indicator and describes how grantees' activities and accomplishments address the program goals and objectives. Results are discussed overall and by grant type at both the consortium level and at the teacher preparation program level. Narrative passages from open-ended items on grantees' annual performance reports supplement the statistical results.

Following this brief overview of the PT3 grant program and the 1999 grantees, Chapter II describes in detail the development of the performance report and the process for collecting performance data. Chapter III presents the performance report results for each of the four PT3

program objectives. The final chapter highlights the key findings and discusses the implications of these results. Appendix A, Overview of the Teacher Preparation Programs, provides a general description of the teacher preparation programs involved in the PT3 grant. Appendix B, Results of the Annual Performance Reports, includes data overall and by grant type for all of the items on the annual performance report at both the consortia and teacher preparation program level.

II. METHODOLOGY

A. DEVELOPMENT OF THE PERFORMANCE REPORT

Collecting data to assess the extent to which grantees are meeting the program's objectives provides information for program improvement and for accountability. ED reports these results to Congress and the public as required by the Government Performance and Results Act of 1993 (GPRA). GPRA directs federal departments to improve the effectiveness of their programs by engaging in strategic planning, setting outcome-related goals for programs, and measuring program results against those goals.

ED began the process of annual data collection by defining specific and measurable outcomes for each of the PT3 indicators. The outcomes were developed through a review of the literature on the use of technology in teacher training and a review of activities described in all 225 grantees' applications. They were also developed through verbal feedback during site visits to a small number of grantees and from feedback to a Web posting of the draft outcomes. In finalizing the outcome measures, great effort was made to describe outcomes relevant to the broad range of activities grantees are conducting under the overarching goal of the PT3 program.

Once the outcomes were finalized, individual questions were created to capture the results of each outcome, with the accumulation of the questions being the annual performance reports. The questions were designed to obtain baseline data and to allow grantees to report their progress on the PT3 program indicators. Six grantees participated in a pretest of the performance report questions (two of each of the three grant types). Changes were made to the performance report based on comments from the pretest grantees, and the report was submitted for clearance to the federal Office of Management and Budget (OMB). Following approval from OMB, the performance report was developed into a Web-based program to facilitate data collection and to enhance the quality of the data collected. The Web-based version was then pretested by three

additional grantees (one of each grant type), as well as by PT3 program staff and ED's Planning and Evaluation Service staff. Based on comments from pretest grantees and from ED, formatting changes were made, and the final version of the PT3 Web-based performance report was posted on the Web on October 31, 2000.

B. DATA COLLECTION

The 225 PT3 grant recipients were asked to submit an annual GPRA performance report to ED via the Web site for their 1999-2000 program activities. Materials explaining the PT3 Web-based performance report were mailed to the 225 lead organizations of each consortium in late October. These materials included a letter detailing the purpose of the data collection, a set of instructions specifically for lead organizations to complete the PT3 Web-based performance report (including their log-in identification number and password), and an individualized set of instructions for *each* teacher preparation program within the lead's consortium (including their unique log-in identification number and password). Lead organizations were instructed to give a copy of the letter and the individualized teacher preparation program instructions to each program within their consortium.

Lead organizations were asked to complete the report for themselves and for any nonteacher preparation program partners in their consortium. Grantees were instructed to access the Web site and submit their data for the reporting period October 1, 1999 - September 30, 2000. Grantees were given the option to complete a hard copy of the report if they were unable to access the Web-based version; however, all of the grantees that completed the report did so via the Web. Telephone and e-mail "help lines" provided assistance to grantees regarding the performance report. In late November, an e-mail was sent to each of the lead organizations notifying grantees that they would be able to access the report for only a few more days and urged them to verify that all of the members of their consortium had completed the report. A

few days later, another e-mail targeted only to grantees with nonresponding partners followed. Data collection ended in mid-December.

C. RESPONSE RATES

The consortium-level data reviewed in this report are based on responses by at least one partner at 91 percent of consortia (see Table 1). This included 96 percent of Catalyst consortia, 95 percent of Implementation consortia, and 88 percent of Capacity Building consortia. At 72 percent of consortia, every partner reported annual performance data (not shown in table).

TABLE 1. Number and Percentage of Consortia Reporting Annual Performance Data[2]

	Consortia*		
	Number of Consortia	**Number reporting**	**Percent reporting**
All Grants	225	204	91%
Capacity Building	138	121	88%
Implementation	64	61	95%
Catalyst	23	22	96%

*At least one partner within the consortium completed the report.

When disaggregating by partners who are teacher preparation programs, 82 percent of all teacher preparation programs completed the report (this includes teacher preparation programs that were also leads; see Table 2), as did 88 percent of lead organizations.

[2] Figures do not include six partners who completed descriptive questions in Section I but did not respond to questions in later sections relating to indicators.

TABLE 2. Number and Percentage of Partners Reporting Annual Performance Data[3]

	All Grants	Capacity Building	Implementation	Catalyst
All Partners				
Number of partners	448	194	112	142
Number reporting	360	145	97	118
Percent reporting	80%	75%	87%	83%
Teacher Preparation Programs				
Number of partners	409	177	105	127
Number reporting	335	137	95	103
Percent reporting	82%	77%	90%	81%
Lead Organizations				
Number of partners	225	138	64	23
Number reporting	198	118	59	21
Percent reporting	88%	86%	92%	91%

The total number of teacher preparation programs reporting (335) is based on the number of teacher preparation program *respondents* and not distinct teacher preparation programs. For example, if a teacher preparation program is participating in three grants and reported three sets of performance data, it is counted as three respondents rather than one.

All information detailed in this report was extracted from grantees' responses to the PT3 Web-based performance report. Accordingly, the report's findings are subject to the limitations of self-reported data.

D. DESCRIPTION OF THE DATA

Results are presented overall and by grant type at both the consortium level and at the teacher preparation program level. When reporting results at the consortium level, data from the lead organization and all of the teacher preparation programs within a consortium that responded were combined to represent a consortium. When reporting results at the teacher preparation program level, data from each teacher preparation program were included in the appropriate grant type category. For some items, only data from lead organizations are reported.

[3] Figures do not include six respondents who completed descriptive questions in Section I but failed to complete questions relating to indicators in later sections.

Several partners were members of multiple grants. Five of these partners indicated that they were unable to separate their performance report results for the different grants: One was in two Implementation grants, and the remaining four were each in a Catalyst and Implementation grant.[4] For the latter four partners, data were included in the results for both grant types at the consortium and program level. Their data, however, were included only once at the overall program and overall consortium level. Data from 25 of 198 lead organizations that were not also teacher preparation programs were excluded from the program-level analysis. The analysis in this report was conducted on five levels:

- ***Consortium-level data, overall consortia.*** This data set representing 204 consortia is based on results from 360 teacher preparation programs and non-teacher preparation program lead organization respondents. It includes 355 sets of observations. The difference between the number of respondents and number of sets of observations is explained by the five grantees participating in multiple grants that were unable to separate their performance report results for the different grants. Each was counted as a respondent for each grant in which they participated in, but each contributed only one set of observations to the overall level.
- ***Consortium-level data, by grant type.*** This data set representing 204 consortia is based on results from 360 teacher preparation programs and nonteacher preparation program lead organization respondents. It includes 359 sets of observations. There is one fewer data set because one grantee participated in two Implementation grants and submitted one report for both. Data for this grantee were counted only once at the grant type level.
- ***Teacher Preparation Program-level data, overall programs.*** This data set includes data from 335 teacher preparation program respondents and is based on 330 sets of observations. It does not include any non-teacher preparation program lead organizations. The difference between the number of respondents and number of sets of observations is explained by the five grantees participating in multiple grants that were unable to separate their performance report results for the different grants. Each was counted as a respondent for each grant in which they participated in, but each contributed only one set of observations at the overall level.
- ***Teacher Preparation Program-level data, by grant type.*** This data set includes data from 335 teacher preparation program respondents based on 334 sets of observations.

[4] Because this was the first annual performance report that grantees were asked to complete, the five grantees may not have known early enough for record-keeping purposes that they would be asked to report performance report data separately for each grant in which they participated.

It does not include any nonteacher preparation program lead organizations. One grantee participated in two Implementation grants and submitted one report for both. Data for this grantee were counted only once at the grant type level.

- ***Lead organizations only.*** This data set is based on the 198 lead organizations (both teacher preparation program and non-teacher preparation program leads) that provided data.

On several of the performance report items, grantees were given the option of reporting whether or not an activity was conducted as a result of the grant. For example:

Did education faculty redesign curricula to integrate technology?

- ❑ Yes, as a grant activity
- ❑ Yes, but NOT as a grant activity
- ❑ No
- ❑ Data not available

In this report, the number of responses for each answer choice is presented in the appendix tables. Because the report provides data to assess the PT3 program, however, the responses discussed in the text refer only to those who reported that an activity was conducted *as a grant activity* unless otherwise noted. Additional data on items related to the objectives can be found in Appendix B.

III. TECHNOLOGY REFORMS IN TEACHER PREPARATION

A. TECHNOLOGY-PROFICIENT FACULTY

According to the research, one of the major barriers to the integration of technology in teacher education is the low level of faculty comfort and proficiency with technology. Because most faculty members themselves are underprepared to teach with technology, many teacher preparation programs are challenged in trying to prepare their preservice students to use technology in the classroom.[5]

1. Education Faculty and Professional Development

To overcome this barrier, nearly all grantees provided professional development to education faculty,[6] and this was the most common activity engaged in by both consortia and teacher preparation programs. More than nine of 10 consortia (92 percent) had at least one teacher preparation program provide professional development to education faculty to integrate technology into the curriculum (see Figure 1). This was true across all grant types.

At the teacher preparation program level, 77 percent provided professional development to education faculty to integrate technology into the curriculum (see Figure 2). Teacher preparation programs in Capacity Building and Implementation grants were more likely to provide professional development (87 percent and 88 percent, respectively) than were Catalyst programs. The lower proportion of Catalyst programs is indicative of the fact that, in general, Catalyst grantees focused on broader objectives than those aimed at individual teacher preparation programs. An additional 25 percent of Catalyst programs are providing technology professional development, but not as a grant activity.

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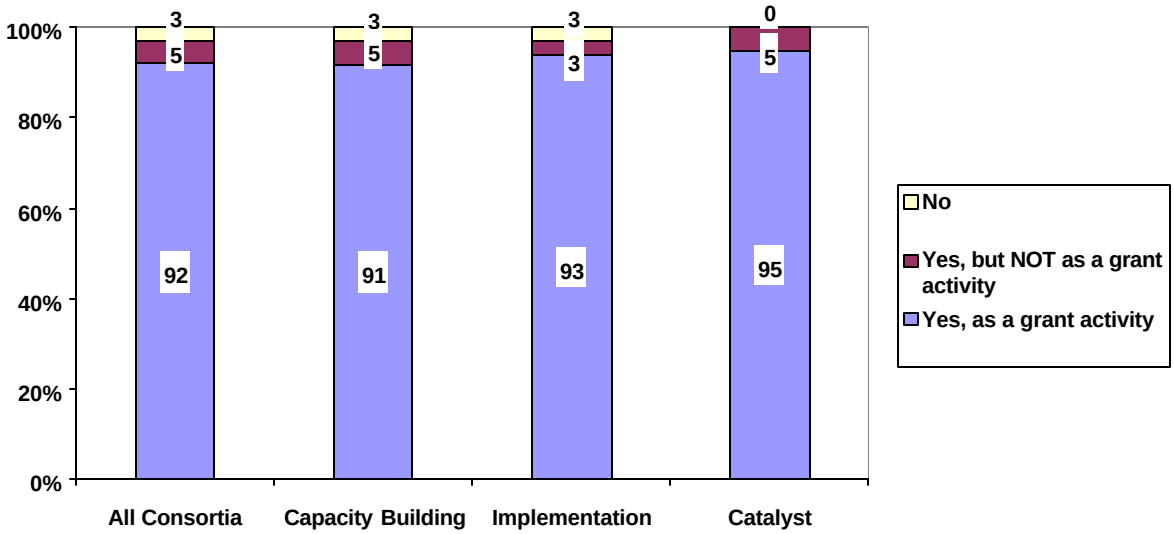
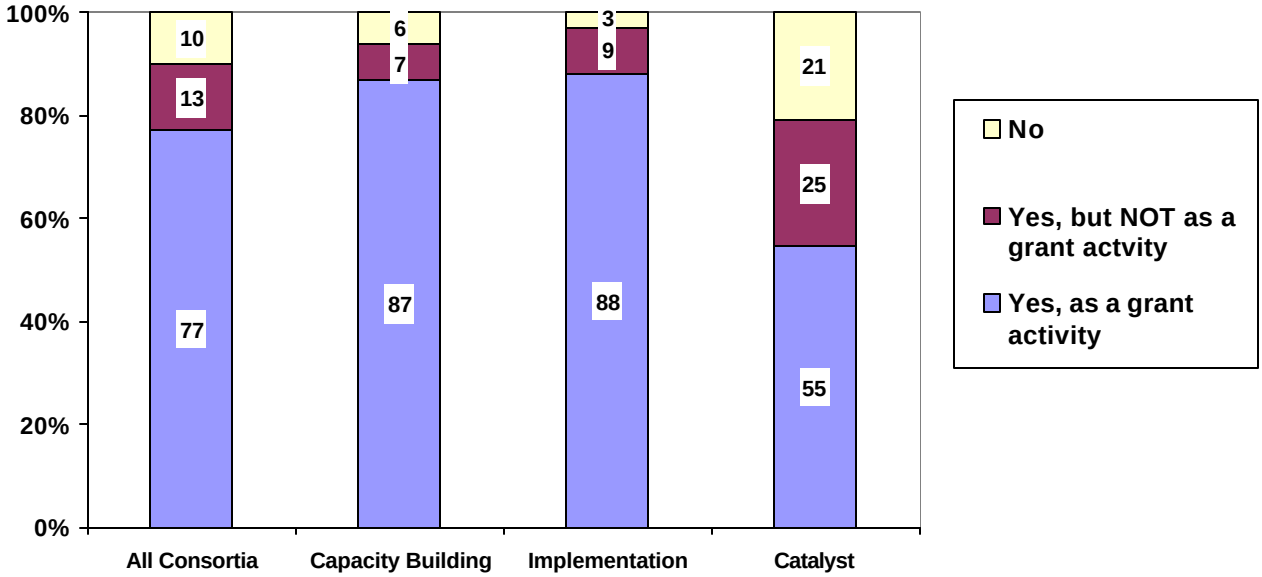
[5] Office of Technology and Assessment: U.S. Congress, April 1995. *Teachers and Technology: Making the Connection*, OTA-HER-616. Washington, DC: Government Printing Office.

FIGURE 1. Percentage of Consortia* that Provided Professional Development to Teacher Preparation Program Faculty to Integrate Technology into the Curriculum



** At least one partner within the consortium reported providing professional development.*
Note: Percentages may not sum to 100 due to rounding.

FIGURE 2. Percentage of Teacher Preparation Programs that Provided Professional Development to Education Faculty to Integrate Technology into the Curriculum



Note: Percentages may not sum to 100 due to rounding.

[6] "Faculty" include full-time tenured faculty, assistant non-tenured faculty, general faculty, and adjunct faculty.

The 251 teacher preparation programs provided professional development to 3,683 education faculty members, averaging 15 faculty members per program (see Table 3). This represents 20 percent of faculty members at all PT3 teacher preparations programs and 26 percent of faculty at the 251 institutions providing professional development.

TABLE 3. Number of Education Faculty Who Participated in Professional Development to Integrate Technology

	Total	Mean	Median	Minimum	Maximum
All Programs *(N=251)*	3,683	15	10	0	90
Capacity Building *(N=117)*	1,602	14	11	1	70
Implementation *(N=82)*	1,416	17	13	2	73
Catalyst *(N=56)*	747	13	6	0	90

Capacity Building programs trained 1,602 faculty members (22 percent of all education faculty in Capacity Building grants), the highest total among all three grant types, with an average of 14 faculty members per program. Catalyst grantees provided professional development to less than half as many faculty members (747 faculty members) but had an average of faculty per consortium almost as high (13). This represents 14 percent of education faculty at all teacher preparation programs in Catalyst grants. Implementation programs trained 1,416 faculty members (25 percent of all education faculty in Implementation grants) and had the highest average of faculty per program (17 faculty).

Consortia and teacher preparation programs relied on a wide variety of formats and facilitators for professional development activities. Seventy-four percent of consortia and 64 percent of teacher preparation programs relied on education and university technology specialists to provide drop-in technical support. This involved making a specialist available to faculty at the faculty member's convenience to discuss individual technology issues. At one teacher preparation program, each education faculty member involved in grant activities had a technology specialist available to him or her for 100 hours during the semester.

Almost as many consortia (71 percent) used an education or university technology specialist to facilitate optional workshops, and 65 percent used them to provide individual training to an individual faculty member at a scheduled time on specific technology issues. The optional workshops generally included arts and science faculty, K-12 teachers, and preservice students in addition to education faculty. Often, the workshop participants were joined in pairs or triads, with one member of these different participant groups involved in the team. Although not used by as many partners, education faculty were also important in providing professional development to other faculty members, helping to reduce the cost of providing professional development activities. In some cases, workshop participants were responsible for developing a technology product that would later be shared with other workshop groups or actually implemented in an education class or K-12 classroom.

Catalyst grantees provided a range of support to teacher preparation programs both in and outside of their consortium to support professional development activities. Some Catalyst grants provided Web-based resources to assist other programs in providing professional development to their faculty. One consortium developed video scenarios featuring prekindergarten through 12th-grade teachers effectively integrating technology into the classroom. The videos can be searched by several categories such as content area, grade level, and technology incorporated. Another consortium's Web site provided a discussion board, a database of online resources, a directory of "master" trainers, and support materials for different training modules in addition to streamlining video, which is planned for the upcoming year.

2. Education Faculty Proficiency and Assessment

The goal of professional development activities is to produce technology-proficient education faculty who can better prepare preservice students to teach with technology. Overall, 171 of 326 teacher preparation programs (52 percent) that provided professional development on

technology also assessed the technology proficiency of education faculty members. Fifty-six percent of education faculty who participated in professional development and whose technology proficiency was assessed and 6 percent (1,093 faculty members) of all PT3 education faculty were rated as technologically proficient (see Table 4).

TABLE 4. Number of Education Faculty Who Participated in Professional Development to Integrate Technology and were Rated as Technologically Proficient

	Total	Mean	Median	Minimum	Maximum
All Programs *(N=121)*	1,093	9	7	1	47
Capacity Building *(N=69)*	590	9	7	1	47
Implementation *(N=35)*	349	10	7	1	31
Catalyst *(N=19)*	189	10	5	1	44

Sixty-five percent of faculty at the 19 Catalyst programs were rated as technology proficient, as were 56 percent of education faculty at 69 Capacity Building teacher preparation programs, and 53 percent of faculty at the 35 Implementation teacher preparation programs were rated as technology proficient.

On average, teacher preparation programs that provided professional development and assessed their faculty had nine education faculty members who were rated as proficient. This average was nine for Capacity Building programs and 10 for both Implementation and Catalyst teacher preparation programs.

By far the most common instrument (overall and among the three grant types) used to assess faculty's technology proficiency was the self-assessment, which typically provided a list of technology competencies or skills and asked faculty members to rate their ability in those skills (see Table 5). Ninety-six percent of teacher preparations programs that assessed technology proficiency administered this instrument. The next most common instrument overall, and among all three grant types, was observation of education faculty. In this assessment type, a technology specialist or other individual observed a faculty member using technology and rated the faculty member based on a rubric. Forty-one percent of all programs assessing technology proficiency

relied on this tool. Ten percent used the portfolio assessment, which aligned the contents of a faculty member's portfolio with specific technology competencies to assess education faculty technology proficiency, and 8 percent administered a written exam.

TABLE 5. Percentage of Teacher Preparation Programs that Reported Using the Following Instruments to Assess Faculty on their Technology Proficiency

	Self-assessment	Observation	Portfolio assessment	Exam
All Programs	96	41	10	8
Capacity Building	97	47	8	8
Implementation	96	38	9	11
Catalyst	91	28	16	3

3. Professional Development for Arts and Science Faculty

Preservice students typically enroll in a large number of arts and science classes. As a result, consortia often included schools, colleges, or departments of arts and science in their consortia and had arts and science faculty members participate in professional development activities. Seventy-nine percent of consortia and 75 percent of teacher preparation programs partnering with a college of arts and science provided professional development to arts and science faculty. Consortia provided training to a total of 1,564 arts and science faculty, an average of almost 15 faculty members per consortium. As with education faculty, the most common professional development facilitator was an education or university technology specialist, and the most common format was the optional workshop.

4. Professional Development for K-12 Teachers and Other Individuals

K-12 teachers clearly play a role in the development of preservice teachers and "providing some inservice training to cooperating teachers to increase their knowledge and confidence in

using computers" can help improve preservice education.[7] More than half of all consortia acknowledged this by including K-12 teachers in their professional development activities. Sixty-three percent of consortia and 50 percent of teacher preparation programs with K-12 partners provided professional development to K-12 teachers. Consortia provided training to 7,660 K-12 teachers, an average of over 60 K-12 teachers per consortium.[8] K-12 teachers were most likely to participate in optional workshops provided by the teacher preparation programs and facilitated by technology specialists, education faculty members, and outside trainers.

Other participants in professional development activities included 13,245 preservice students,[9] 260 community college faculty, 1,026 faculty members from nonconsortium-member institutions, and 695 faculty members outside of education and arts and science.[10] Examples of other colleges involved in grant activities outside education and arts and science include engineering, business, and computing and technology.

B. CURRICULUM REDESIGN

Recent research suggests that one of the best strategies for preparing preservice teachers to use technology fully is to "ensure that preservice teachers experience effective uses of educational technologies in all phases of their coursework rather than only in an isolated course

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[7] Stuhlmann and Taylor, 1999. "Preparing Technically Competent Student Teachers: A Three Year Study of Interventions and Experiences." *Journal of Technology and Teacher Education*, 7(4). Charlottesville, VA: Association for the Advancement of Computing in Education.

[8] The median number of K-12 teachers trained is 20. The large difference between the median and mean is due to several consortia training a large number of K-12 teachers, including one with a total of 1,576. The range in K-12 teachers reflects different funding levels among the three grant types and varying levels of service focused on K-12 schools and districts.

[9] The professional development activities include workshops and other formal training activities that are not part of the student's teacher preparation curriculum.

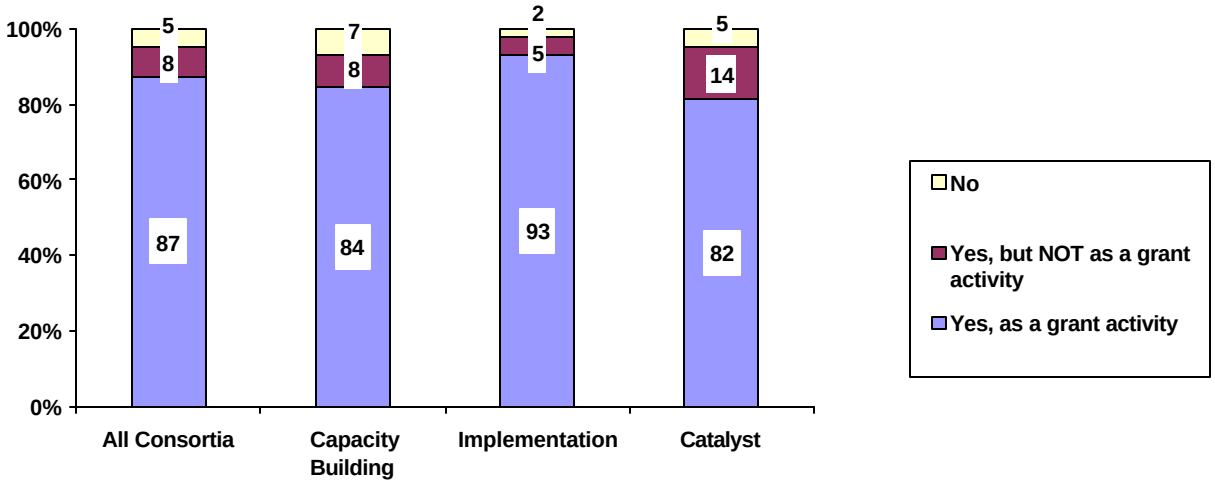
[10] The number of preservice students, community college faculty, faculty members from nonconsortium-member institutions, and faculty members outside the education and of arts and science departments is based on responses from 198 lead organizations only.

or two."[11] Grantees' activities reflected an appreciation of this strategy. PT3 partners reported on redesigning curricula to incorporate best practices in the use of technology in teacher education, the number of faculty engaged in curriculum redesign, the number of courses redesigned, and how technology was integrated into the courses. The redesigned curricula encompassed preservice students' field experiences and college of arts and science courses.

1. Courses and Faculty

Redesigning curricula was another frequent grant activity. Nearly nine in every 10 consortia (87 percent, or 177 of 204 consortia) have at least one teacher preparation program where education faculty redesigned curricula to integrate technology (see Figure 3). Overall, 69 percent of teacher preparation programs (228 of 330 programs) had education faculty that redesigned curricula (see Figure 4). At both the consortium-level and teacher preparation program level, this activity occurred most frequently among Implementation grants.

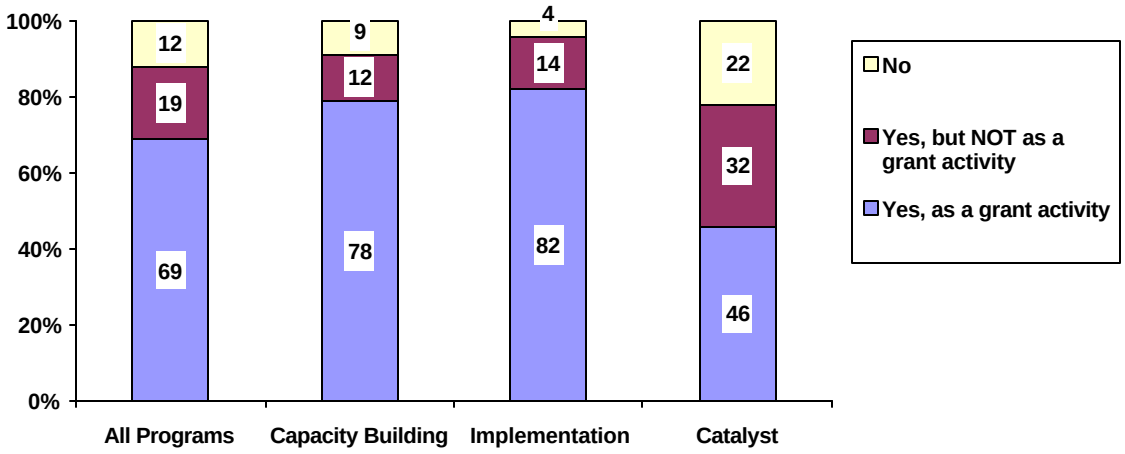
FIGURE 3. Percentage of Consortia* that Redesigned Curricula to Integrate Technology



** At least one partner within the consortium reported redesigning curricula.*
Note: Percentages may not sum to 100 due to rounding.

[11] J. Cooper and G. Bull, Summer 1997. "Technology and Teacher Education: Past Practice and Recommended Directions." *Action in Teacher Education*. Vol. XIX, No. 2.

FIGURE 4. Percentage of Teacher Preparation Programs that Redesigned Curricula to Integrate Technology



Note: Percentages may not sum to 100 due to rounding.

The number of education faculty members involved in redesigning courses to integrate technology ranged from zero to 99 per consortium, with an average of 13 and a total of 2,169 faculty (see Table 6). This represents 12 percent of the 18,251 faculty at PT3 teacher preparation programs that completed the annual performance report and 18 percent of the 12,045 faculty at the 218 programs that provided detailed data on education faculty who redesigned curricula.

TABLE 6. Number of Education Faculty Who Redesigned Courses to Integrate Technology: Consortium-Level Data

	N	Total	Mean	Median	Minimum	Maximum
All consortia	169	2,169	13	10	0	99
Capacity Building	96	917	10	8	0	46
Implementation	57	986	17	12	1	99
Catalyst	17	322	19	15	3	43

For these 218 programs, an average of 10 faculty per teacher preparation program redesigned curricula (see Table 7). Implementation programs have the highest average number of faculty who redesigned curricula (13), while Capacity Building and Catalyst programs have lower averages (9 and 7, respectively).

TABLE 7. Number of Education Faculty Who Redesigned Courses to Integrate Technology: Program-Level Data

	N	Total	Mean	Median	Minimum	Maximum
All programs	218	2,169	10	7	1	99
Capacity Building	101	917	9	7	1	38
Implementation	76	986	13	9	1	99
Catalyst	44	322	7	4	1	36

Teacher preparation programs redesigned a total of 2,713 education courses (based on the 215 programs that provided detailed data on redesigned curricula; see Table 8). This is 5 percent of the 55,552 education courses at the PT3 teacher preparation programs that completed the annual performance report and 7 percent of the 38,018 education courses at programs that redesigned curricula. On average, 13 courses per program were redesigned, with a range from 0 to 200[12] and a median of 8.

TABLE 8. Number of Education Courses that were Redesigned and the Number of Redesigned Courses that were Implemented: Program-Level Data

	N	Total	Mean	Median	Minimum	Maximum
Education courses redesigned:						
All programs	215	2,713	12.6	8	0	200
Capacity Building	101	1,085	10.7	10	0	31
Implementation	73	1,259	17.2	10	1	200
Catalyst	44	428	9.7	5	0	50
Education courses implemented:						
All programs	207	2,184	10.6	6	0	150
Capacity Building	95	834	8.8	7	0	31
Implementation	72	1,090	15.1	8	1	150
Catalyst	43	311	7.2	4	0	45

A total of 81 percent (2,184 courses) of the 2,713 redesigned courses were implemented (based on the 207 programs that provided data on implementing redesigned courses), with an average of 11 courses per program. This represents 4 percent of the 55,552 education courses at

[12] When reporting numbers of courses, grantees may have counted each section of a course separately, resulting in large numbers of education courses.

the PT3 teacher preparation programs that completed the annual performance report and 6 percent of the 36,860 education courses at the 207 programs that implemented redesigned courses.

Catalyst grantees assisted teacher preparation programs in redesigning their education curricula in various ways. In some cases, these grantees provided electronic resources to facilitate the integration of technology into the education curricula. For example, one Catalyst grantee developed a Web site that provided online video vignettes featuring faculty and K-12 teachers integrating technology into the classroom. Education faculty could model these resources as they integrated technology into their own classrooms.

Other Catalyst grantees were working with the current International Society for Technology in Education standards to help develop teacher preparation program-wide models for the integration of technology in the curriculum. For example, during one professional development workshop, teams of education faculty proposed a technology issue to address during the workshop. Trained higher education faculty and professional staff developers worked individually with each team to design different approaches to the problem, such as developing curricula matrices to better understand where and how technology can be integrated into the curriculum, creating a plan to integrate the new International Society for Technology in Education standards into the curriculum, addressing state technology standards in the curriculum, and planning an initial certification program to prepare preservice teachers to integrate technology into the K-12 classroom. Each faculty member could then take the plan back to his or her teacher preparation program to begin implementing it.

2. Technology Tools

According to the research, one of the key factors in determining how preservice students teach is the way in which they are taught.[13] For this reason, it is important that college faculty integrate technology tools into instruction to encourage preservice students to integrate technology into their instruction with K-12 students. By having faculty model the use of these tools in the college classroom, preservice students learn how to teach with these tools and experience how they can enhance students' learning.

Grantees incorporated a variety of technologies in redesigning curricula. These technologies included, but were not limited to, electronic communications such as e-mail or the Internet; multimedia such as scanners, digital cameras, and CD-ROM; software packages such as spreadsheet, word processing, database, presentation, and reference tools; teaching tools; and portfolio tools.[14] The tools integrated most frequently among teacher preparation programs that redesigned curricula included the Internet or Web-based materials and e-mail. In about seven of every eight teacher preparation programs that conducted this activity (88 percent), at least half of the faculty used the Internet or Web-based materials in their redesigned courses or integrated e-mail into their courses. The technology tool used least frequently was a portfolio tool: At less than 25 percent of programs did at least half of the faculty integrate portfolio tools into their redesigned curricula. At least half of the education faculty at teacher preparation programs included software packages for word processing (75 percent of programs), additional software packages such as presentation software (69 percent of programs), multimedia tools (52 percent of programs), and content-specific software (41 percent of programs).

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[13] "Technology Counts '99: Building the Digital Curriculum," *Education Week*, September 23, 1999.

[14] Software designed specifically for developing electronic portfolios, which contain examples of preservice students' lesson plans and classroom activities.

3. Incentives

A lack of institutional support for and encouragement of technology use can be a major barrier among teacher preparation program faculty to integrating technology into the curricula. In particular, according to research, a lack of rewards for faculty, such as tenure, merit pay, or promotion tied to the use of technology, may be a major factor in slowing the integration of technology into the preservice curriculum.[15] To overcome this barrier, 82 percent of consortia and 67 percent of teacher preparation programs offered incentives to faculty to redesign their curricula to integrate technology. The incentive offered most frequently (by 94 percent of programs providing incentives) was increased professional development opportunities, such as workshops. The incentive offered least frequently (by 38 percent of programs) was release time to allow faculty to teach fewer courses, gaining additional time for other activities such as redesigning curricula. Other incentives included technological equipment for instructional use (81 percent), stipends (76 percent), and technological equipment for professional use (69 percent).

During site visits to a small number of PT3 grantees, education faculty noted that one of the main factors motivating faculty to redesign curricula and participate in professional development was institutional support in the form of incentives such as career advancement.[16] Integrating technology into the curricula is considered a contributing factor in making tenure decisions or determining career advancement at 44 percent of all preparation programs. More frequently, integrating technology into the curricula is a contributing factor in hiring decisions at 75 percent of all teacher preparation programs.

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[15] Office of Technology and Assessment: U.S. Congress, April 1995, *Teachers and Technology: Making the Connection*, OTA-EHR-616.

4. Courses Delivered Through Technology

Education courses were made available to students through a variety of technological means, either by offering courses online or by conducting courses through one-way or two-way audio-video conferencing. At 52 percent of consortia and 38 percent of programs, courses were delivered to students through technological means as a grant activity. Though almost all of those teacher preparation programs (93 percent) had Web-enhanced courses, the proportion offering courses through other technological means was not as common: 50 percent have Web-based courses; 47 percent use two-way audio-video conferencing; and 22 percent use one-way audio-video conferencing.

For some grantees in rural areas, distance education allowed them to offer a greater number and a wider variety of courses to both preservice and K-12 students. Grantees collaborated across colleges and universities as well as across K-12 classrooms to conduct joint activities with their preservice and K-12 students using these technologies.

5. Preservice Field Experience

The field experience is a critical aspect of preservice technology preparation because it provides students the "opportunity to observe the use of educational technology and to practice teaching with technology in K-12 schools."[17] Although redesigning field experiences occurred less frequently than did curriculum redesign or professional development, 59 percent of consortia and 42 percent of programs added, expanded, or modified their field experiences to place preservice students in K-12 classrooms in which educational technology tools and technical

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[16] U.S. Department of Education, 2001. *Follow-Up Site Visit Report on Preparing Tomorrow's Teachers to Use Technology: First-Year Objectives, Activities, and Outcomes from a Sample of 1999 Grantees.* Washington, D.C.: U.S. Department of Education.

[17] President's Committee of Advisors on Science and Technology, Panel on Technology, March 1997. *Report to the President on the Use of Technology to Strengthen K-12 Education in the United States*. Washington, DC: Executive Office of the President.

support are available and currently used by K-12 teachers. E-mail was the technological tool preservice students used most frequently in their field experiences, and at least half of preservice students at those programs that modified field experiences were placed in K-12 schools where they used e-mail (at 81 percent). At least half of preservice students used the following technological tools in their field experiences: software packages for word processing (75 percent of programs), the Internet or Web-based materials (72 percent), software packages including presentation software (61 percent), multimedia tools (50 percent), content-specific software (50 percent), teaching tools (31 percent), and portfolio tools, such as software designed specifically for developing electronic portfolios (29 percent). Some preservice students used these tools to create lesson plans and design Web-based activities for K-12 students both on their own, and in collaboration with their K-12 cooperating teacher. To encourage further use of technology by preservice students in their field experience, a few grantees established "electronic libraries" where preservice students could "check out" technology equipment and content-specific software to use in the K-12 classroom. Some preservice students viewed video clips of K-12 teachers using technology in instruction and then evaluated the teacher's use of technology in the classroom.

Preservice students designed a variety of technology-based projects and activities for K-12 students. For example, preservice students at one institution could enroll in a course called "Girls, Women and Technology." In this course, preservice students studied the presence of women in technology fields and the obstacles to choosing careers in this area. Preservice students then acted as mentors to sixth-grade girls in an after-school program. The sixth-graders developed a "living scrapbook" about strong women in their family, which required researching women with careers in technology. Together, the preservice student and sixth-grader created the scrapbook using "Microworlds," presentation software that required programming. The preservice students learned the technology as they helped the sixth-graders plan and develop

their projects. The course will culminate with the students demonstrating their projects at the institution and a reception at the K-12 school, which family members attend to view the projects.

6. Arts and Science Faculty and Curricula

To promote institution-wide change in the curricula for preservice teachers, grantees focused not only on education faculty and education curricula, but also on arts and science faculty and curricula. Arts and science faculty redesigned curricula to integrate technology at 74 percent of consortia and 72 percent of education programs that partnered with a college of arts and science. A total of 573 arts and science faculty redesigned curricula, with a mean of 6 faculty members per program (based on the 93 programs providing data on arts and science faculty). Those faculty redesigned a total of 763 arts and science courses, an average of 8 courses per program (based on the 91 programs providing detailed data). Of the redesigned arts and science courses, 87 percent were implemented to integrate technology.

C. LEARNING RESOURCES

Grantees' activities focused on improving the learning resources for preservice students by increasing the frequency with which faculty used technology tools to communicate with students and to integrate Web-based, multimedia materials and resources into their coursework.

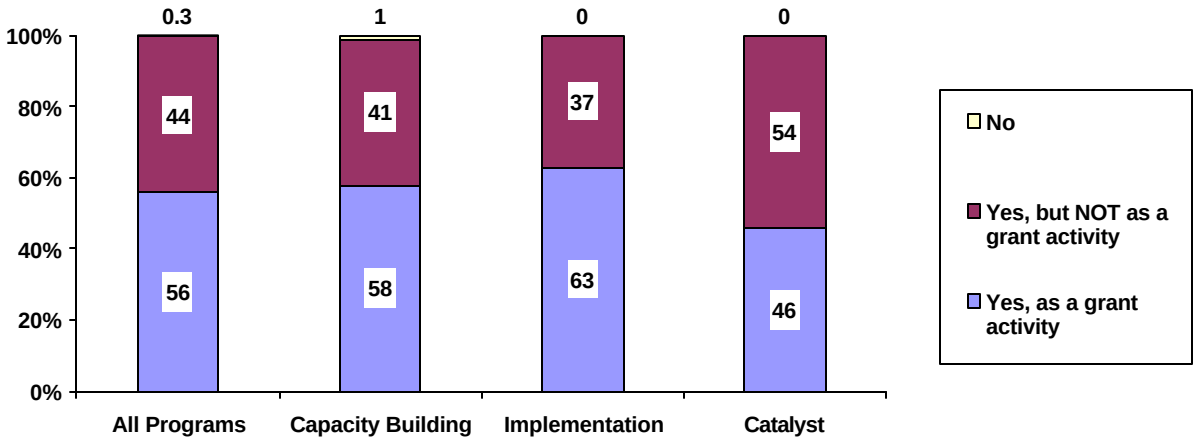
1. Technology for Communication

One way that faculty integrated technology into curricula was by communicating with students through e-mail, the Internet, and ListServs. Sixty-four percent of consortia and 56 percent of teacher preparation programs had education faculty that used technology to communicate with students as a grant activity. This includes 63 percent of programs in Implementation grants, 58 percent of programs in Capacity Building grants, and 46 percent of

programs in Catalyst grants (see Figure 5). Nearly all remaining preparation programs reported that faculty used technology to communicate with students but *not* as a grant activity.[18]

The technology item faculty used most frequently to communicate with students was e-mail, which at least half of the faculty used at 93 percent of teacher preparation programs that integrated technology into the curricula as a grant activity.

FIGURE 5. Percentage of Teacher Preparation Programs with Faculty Who Used Technology to Communicate with Students



Note: Percentages may not sum to 100 due to rounding.

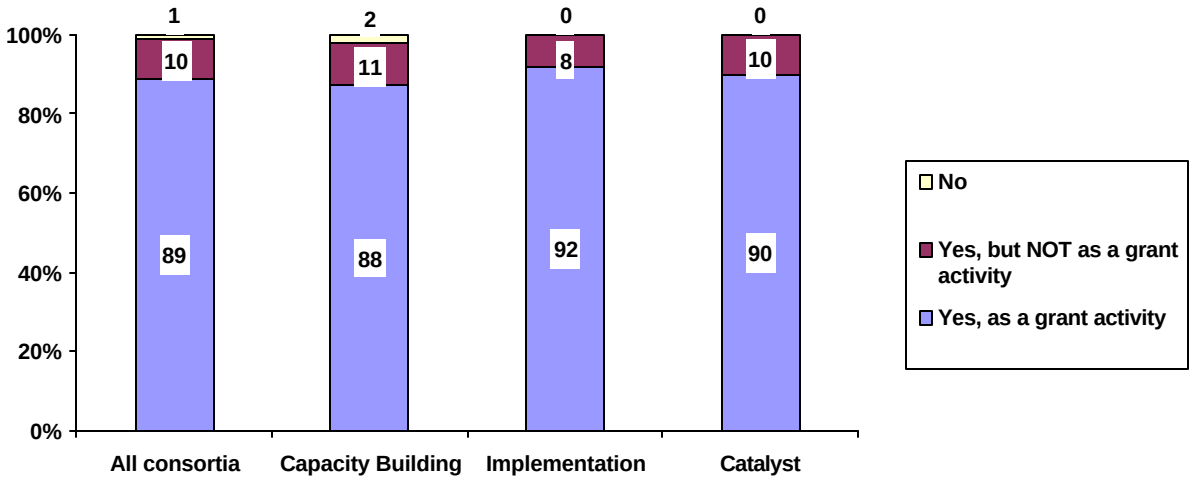
2. Integration of Technology in New Ways

In addition to using technology to communicate with students, faculty integrated technology into their courses in various ways to improve their instruction and student learning. Eighty-nine percent of consortia have at least one preparation program with faculty who applied technology to their courses in ways they had not done prior to the grant period (see Figure 6). Implementation consortia conducted this activity more frequently than either Capacity Building

[18] One hundred percent of Implementation and Catalyst programs and 99 percent of Capacity Building programs conducted this activity either as a grant activity or not as a grant activity.

or Catalyst consortia. Nearly all of the remaining consortia (10 percent) have at least one preparation program where faculty applied technology in new ways, but not as a grant activity.

FIGURE 6. Percentage of Consortia* that Report Having Faculty Who Applied Technology in their Courses in New Ways



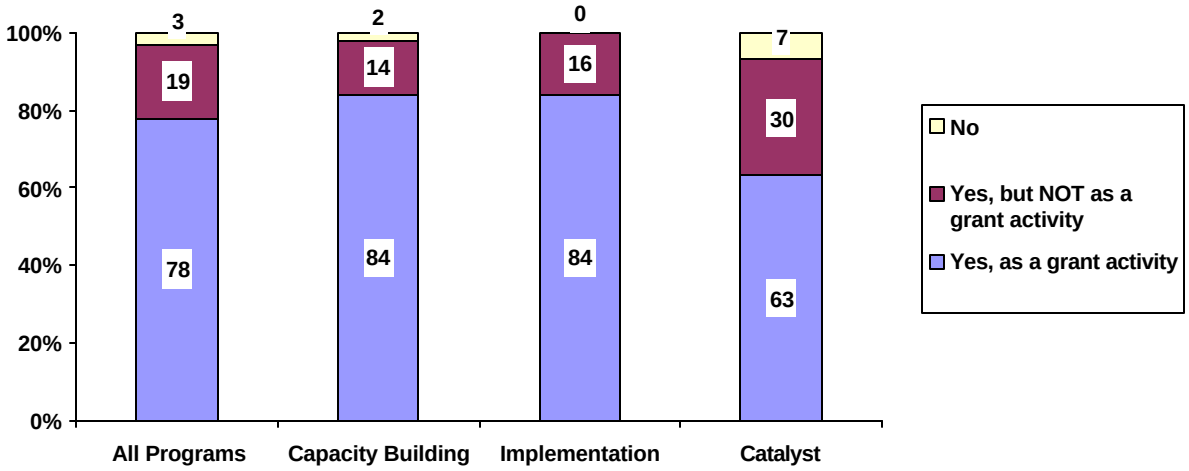
** At least one partner within the consortium reported faculty applying technology in new ways.*
Note: Percentages may not sum to 100 due to rounding.

More than three-fourths (78 percent) of teacher preparation programs overall noted that faculty integrated technology into their courses in new ways as a grant activity (see Figure 7). Eighty-four percent of programs in Implementation grants and in Capacity Building grants conducted this activity, while 63 percent of programs in Catalyst grants reported faculty integrating technology in new ways. An additional 19 percent of all preparation programs had faculty that integrated technology in new ways using non-PT3 funds.

Requiring students to use the Internet to conduct research, including accessing documents and online bibliographic services, was the most frequent way faculty applied technology to courses in new ways. At 68 percent of the programs that reported conducting this as a grant activity, at least half of their faculty applied technology to their courses in this way (see Table 9). Using the Web as an online resource for syllabi, lesson plans, and course materials was less

common: At least half of the faculty at 47 percent of the programs implemented this as a means of integrating technology into their courses. The least frequent method was to use asynchronous, editable learning modules or learning objects.[19] Nine percent of programs reported that at least half of the faculty used this as a means of applying technology to their courses. The same patterns are found by grant type for programs where education faculty applied technology to their courses in new ways.

FIGURE 7. Percentage of Teacher Preparation Programs that Report Having Faculty Who Applied Technology in their Courses in New Ways



Note: Percentages may not sum to 100 due to rounding.

[19] This includes interactive electronic tutorials to teach specific lessons or material.

TABLE 9. Proportion of Education Faculty Who Applied Technology in their Courses in Various Ways: Program-Level Data

	All Programs	Capacity Building	Implementation	Catalyst
Required students to use the Web to conduct research, including accessing documents and online bibliographic services				
None	1	0	0	4
Less than half	31	28	32	37
Half or more	50	53	51	42
All	18	19	16	17
Used the Web as an online resource for syllabi, lesson plans, and course materials				
None	4	3	3	8
Less than half	49	48	51	52
Half or more	34	34	39	25
All	13	15	7	15
Used presentation software and multi-media (including digital cameras and scanners) to create electronic presentations				
None	4	3	3	8
Less than half	60	59	55	71
Half or more	30	32	36	14
All	6	6	5	8
Required students to use presentation software and multi-media (including digital cameras and scanners) to create electronic presentations				
None	7	7	4	13
Less than half	65	67	63	65
Half or more	23	21	29	17
All	4	5	4	4
Used video for preservice students to observe K-12 teachers modeling integration of technology in classroom instruction				
None	28	31	24	28
Less than half	56	54	62	52
Half or more	13	13	12	15
All	2	2	1	4
Used asynchronous, editable learning modules or learning objects (interactive electronic tutorials to teach specific lessons or material)				
None	46	45	42	55
Less than half	45	47	48	39
Half or more	6	4	9	5
All	3	3	2	2

Note: Percentages may not sum to 100 due to rounding.

D. GRADUATION REQUIREMENTS

1. Modifying Requirements

Adding or expanding graduation requirements to include a technology component formalizes the prominent role that the integration of technology is beginning to play in preservice education. The addition of such requirements may also help to accelerate technology-related changes being made to the teacher preparation program.[20] In the first year of the grant program, modifying graduation requirements was infrequently undertaken by grantees. Twenty-two percent of consortia overall had at least one partner that added or expanded a graduation requirement for preservice students to demonstrate proficiency in the use of technology in teaching or learning (see Figure 8). This figure is generally supported by a review of a sample of the 225 PT3 grant applications, which revealed that 18 percent of grantees listed changing graduation requirements as one of their grant activities.[21] The smaller proportion of grantees undertaking this activity, compared with other activities, may reflect a perceived need to establish an environment conducive to changing graduation requirements by first increasing faculty and preservice students' use of and skill level with technology. An additional 23 percent of all consortia are expanding graduation requirements, but not as a grant activity. Among the 55 percent of consortia that did not add or expand graduation requirements, 58 percent stated that they plan to do so in the next two years.

A higher percentage of Catalyst consortia (32 percent) implemented this change than did either Implementation (25 percent) or Capacity Building consortia (18 percent). Catalyst consortia typically include a larger number of teacher preparation programs than either Implementation or Capacity Building consortia. Consequently, the possibility of having at least

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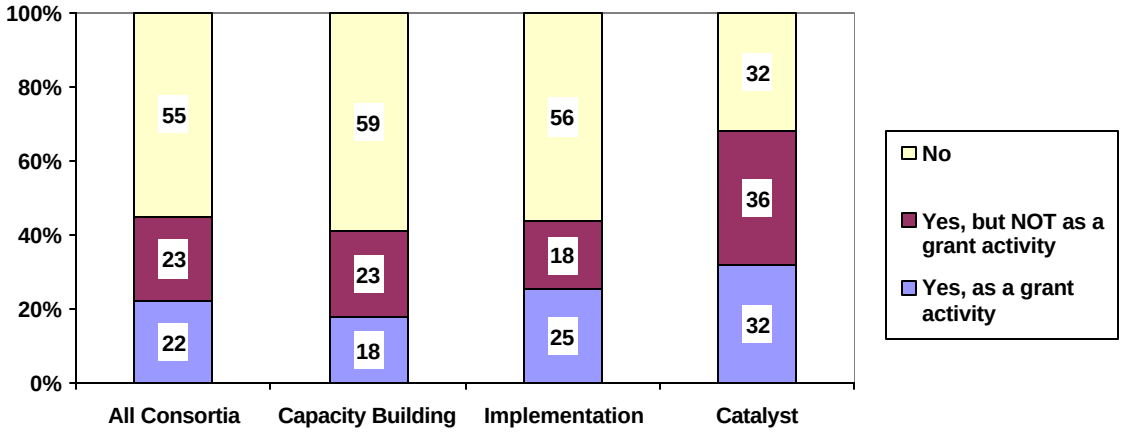
[20] *Education Week*, September 23, 1999.

one teacher preparation program that was modifying graduation requirements is greater for Catalyst consortia than for the other two grant types. Catalyst grantees – generally further along in their technology-readiness than either Implementation or Capacity Building grantees – tended to focus their activities on larger-scale changes, such as institution-wide changes.

FIGURE 8. Percentage of Consortia* that Reported Adding or Expanding a Graduation Requirement



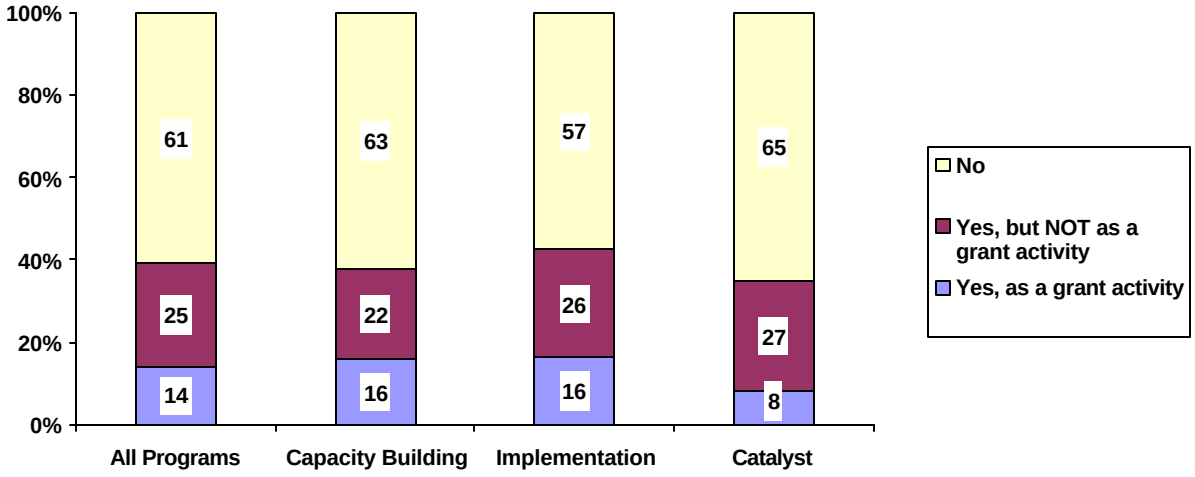
**At least one partner within the consortium reported adding or expanding requirements.*
Note: Percentages may not sum to 100 due to rounding.

Fewer teacher preparation programs modified graduation requirements than conducted any other activity. Fourteen percent of teacher preparation programs overall used grant funds to add or expand requirements for preservice students to demonstrate proficiency in the use of technology in teaching and learning. Another 25 percent of preparation programs modified graduation requirements using non-PT3 resources. This activity was most frequent among programs in Implementation or Capacity Building grants. Sixteen percent of programs in Implementation or Capacity Building grants added or expanded a requirement as a grant activity while eight percent of programs in Catalyst grants did so (see Figure 9). An additional 22

[20] U.S. Department of Education, 2000. *Preparing Tomorrow's Teachers to Use Technology: Grant Review and Analysis*. Washington, D.C.: U.S. Department of Education.

percent of programs in Capacity Building grants and 26 percent of programs in Implementation grants are modifying graduation requirements to include a technology component but not as a grant activity.

FIGURE 9. Percentage of Teacher Preparation Programs that Reported Adding or Expanding a Graduation Requirement



Note: Percentages may not sum to 100 due to rounding.

The graduation requirement added most frequently by consortia and teacher preparation programs was to require students "to plan and deliver instructional units that integrate a variety of software applications and learning tools." Seventy-eight percent of both consortia and teacher preparation programs that modified graduation requirements specified this as a new requirement for preservice students (see Table 10). Seventy-four percent of consortia and 78 percent of programs also added a requirement for preservice students "to use computer-based technologies such as telecommunications and the Internet to enhance personal and professional productivity." The requirement implemented least frequently was for students "to know about computer and technology uses in business, industry, and society," which 40 percent of consortia and 39 percent of programs that modified graduation requirements added. For those programs that did not add or expand graduation requirements, 62 percent stated that they plan to do so in the next two years.

TABLE 10. Percentage of Teacher Preparation Programs that Reported Adding or Expanding Various Graduation Requirements

	All Programs	Capacity Building	Implementation	Catalyst
To plan and deliver instructional units that integrate a variety of software applications and learning tools	78	79	87	57
To use computer-based technologies such as telecommunications and the Internet to enhance personal and professional productivity	78	79	80	71
To apply computers and related technologies to support instruction in teachers' grade level and subject areas	76	68	87	71
To develop technology lessons that reflect effective grouping and assessment strategies for diverse populations	71	68	80	57
To use software application packages to solve problems, collect data, manage information, make presentations, and make decisions	68	63	60	100
To know about computer and technology uses in business, industry, and society	39	47	27	43

Some Catalyst grantees have taken the lead in assisting teacher preparation programs in adding or modifying their graduation requirements to focus on technology. In several cases, Catalyst grantees are either formulating new state standards for technology education that will affect teacher preparation program graduation standards or they are developing performance assessments to help programs assess whether their students are technology proficient.

2. Assessing Proficiency

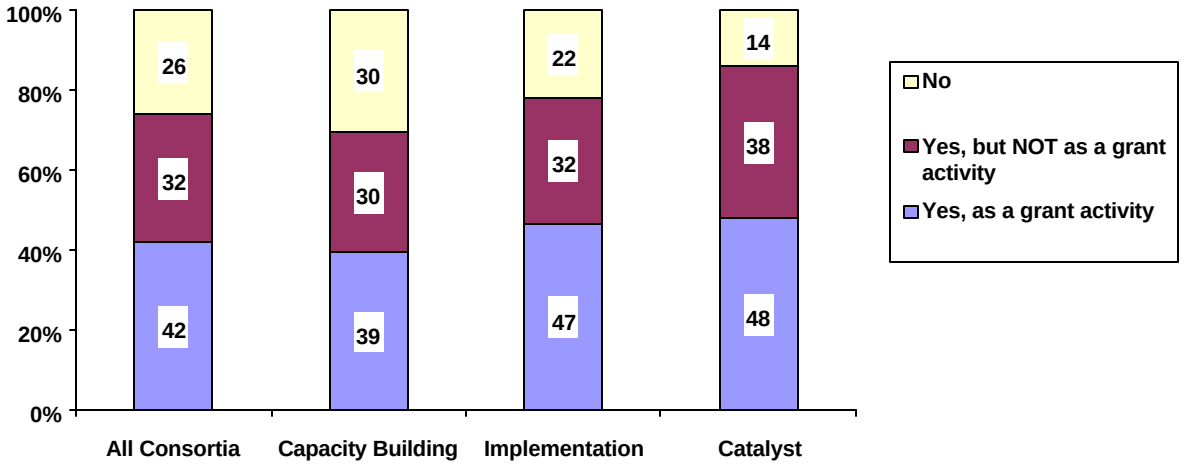
Those teacher preparation programs that modified graduation requirements to include items listed above in Table 9 used a variety of means to assess preservice students' performance on those requirements. The most frequently employed assessment was an in-class demonstration, which 98 percent of programs that assessed preservice students' technology proficiency implemented. Eighty-five percent of programs used a performance assessment, 83 percent used a portfolio assessment, and 78 percent used a self-assessment. Multiple choice or short answer exams were administered least frequently, with 31 percent of programs using this.

The predominance of instruments that require preservice students to physically manipulate technology to demonstrate their skills and apply those skills in a "real world" setting – rather than instruments that require merely recalling information about technology – suggests that grantees are committed to having preservice students master the actual integration of technology in their teaching.

E. TECHNOLOGY-PROFICIENT NEW TEACHERS

Because developing technology-proficient new teachers is the PT3 program's primary goal, grantees undertook a variety of initiatives, such as redesigning the education curricula to incorporate technology and providing professional development to faculty members, to achieve this goal. Assessing preservice students to determine the extent to which this goal was met, however, was a relatively infrequent grant activity, with less than half of the consortia (42 percent) using PT3 funds for such assessments (see Figure 10). Yet, when the nearly one-third of consortia that conducted such assessments *not as a grant activity* are included, almost three-fourths of all grantees required preservice students to demonstrate technology proficiency.

FIGURE 10. Percentage of Consortia* that Required Preservice Teachers to Demonstrate Proficiency in Using Technology in Teaching



** At least one partner within the consortium reported requiring preservice students to demonstrate proficiency*
Note: Percentages may not sum to 100 due to rounding.

The finding that 42 percent of grantees reported requiring preservice students to demonstrate technology proficiency as a grant activity is roughly supported by a previously conducted analysis of a sample of 1999 PT3 grant applications. The earlier analysis revealed that 49 percent of grantees intended to include the assessment of preservice students or faculty as an activity.[22]

There are a few reasons why grantees may not be administering assessments as frequently as other grant activities. First, other grant activities, such as redesigning the education curricula and providing professional development to faculty, require considerable resources and may have precluded consortia using grant funds to assess the technology proficiency of their students. Second, grantees may be waiting to assess proficiency as a grant activity until they have more fully implemented their PT3 reforms. Finally, some grantees had already been conducting assessments prior to PT3 funding (as indicated by the nearly one-third of grantees who assess students *not* as a grant activity) and did not include it as a specific grant activity.

One-third of teacher preparation programs require preservice students to demonstrate technology proficiency as a grant activity (see Figure 11). Thirty-seven percent of Capacity Building programs, 40 percent of Implementation programs, and 20 percent of Catalyst programs have this requirement.

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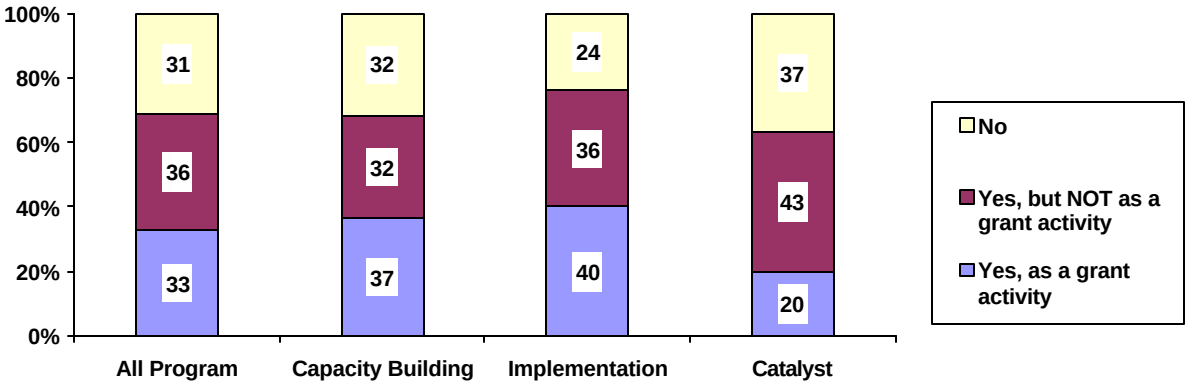
[22] U.S. Department of Education, 2000. *Preparing Tomorrow's Teachers to Use Technology: Grant Review and Analysis*. Washington, D.C.: U.S. Department of Education.

FIGURE 11. Percentage of Teacher Preparation Programs that Required Preservice Teachers to Demonstrate Proficiency in Using Technology in Teaching



Note: Percentages may not sum to 100 due to rounding.

Overall, 211 teacher preparation programs required that their preservice teachers demonstrate technology proficiency prior to graduation either as a grant activity or not as a grant activity. At the 65 percent of programs that provided specific data on the technology proficiency of their students, 16 percent of the 154,373 PT3 education students demonstrated proficiency in using technology (see Table 11).[23] This is 6 percent of the 400,701 preservice students at the PT3 programs that completed the annual performance reports. It would be misleading to assume, however, that 84 percent of preservice students were unable to demonstrate technology proficiency. Some teacher preparation programs did not require all their preservice students to demonstrate their technology proficiency. For example, only graduating students or students in a particular class may have been assessed.

Eighteen percent of the 57,897 preservice students in Capacity Building teacher preparation programs that assessed preservice student technology competency demonstrated their

[23] The PT3 Annual Performance Report did not include a specific definition of "technology-proficient." Therefore, the number of students and faculty that demonstrated technology proficiency is based on the grantees' own interpretation of "technology-proficient."

proficiency, 16 percent of the 41,271 students in Catalyst programs, and 13 percent of the 60,116 students in Implementation programs.

TABLE 11. Number of Preservice Students Who Demonstrated Proficiency in Using Technology: Program-Level Data

	Total	Mean	Median	Minimum	Maximum
All Programs *(N=138)*					
Proficient students	24,018	174	100	0	1,130
Total students	154,373	119	580	35	6,714
Percent proficient	15.6%				
Capacity Building *(N=66)*					
Proficient students	10,682	162	100	2	900
Total students	57,897	877	500	35	6,077
Percent Proficient	18.5%				
Implementation *(N=40)*					
Proficient students	7,788	195	110	0	600
Total students	60,116	1,503	880	60	6,266
Percent Proficient	13.0%				
Catalyst *(N=34)*					
Proficient students	6,620	195	89	4	1,130
Total students	41,271	1,069	493	35	6,714
Percent Proficient	16.0%				

As might be expected, the percentage of technology proficient students in their graduating year is much higher than the percentage of technology-proficient students overall. Thirty-nine percent of graduating students at 120 teacher preparation programs demonstrated technology proficiency (see Table 12). The 30 Catalyst programs had 51 percent of graduating students demonstrate technology proficiency, the highest percentage of all three grant types. Among the 60 Capacity Building programs, 42 percent of graduating preservice students demonstrated technology proficiency. At the 32 Implementation programs, 32 percent of preservice students demonstrated technology proficiency.

TABLE 12. Number of Graduating Preservice Students Who Demonstrated Proficiency in Using Technology: Program-Level Data

	Total	Mean	Median	Minimum	Maximum
All Programs *(N=120)*					
Proficient students	11,351	95	45	0	844
Graduating students	28,952	241	150	0	1,611
Percent proficient	39.2%				
Capacity Building *(N=60)*					
Proficient students	5,089	85	35	0	600
Graduating students	12,072	201	125	5	1,611
Percent proficient	42.2%				
Implementation *(N=32)*					
Proficient students	3,226	101	60	0	386
Graduating students	10,081	315	208	0	893
Percent proficient	32.0%				
Catalyst *(N=28)*					
Proficient students	3,491	116	60	0	844
Graduating students	6,799	226	130	18	844
Percent proficient	51.3%				

To determine the technology proficiency of their preservice students, teacher preparation programs used a wide variety of assessment tools. The most common assessment was the in-class demonstration or observation, which 97 percent of teacher preparation programs that assessed their preservice teachers administered. Teacher preparation programs also employed the performance assessment (84 percent), the self-assessment (76 percent) and the portfolio assessment (60 percent).

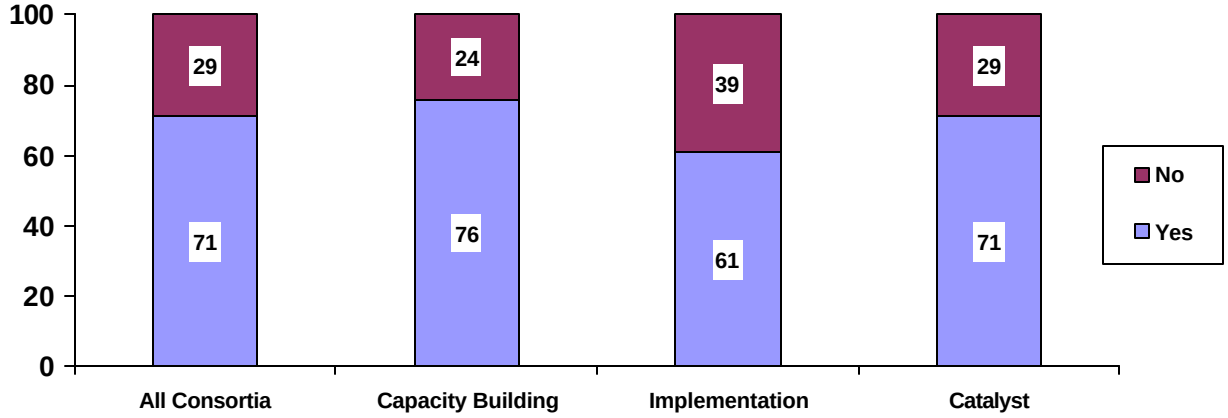
F. INSTITUTIONAL CHANGE

1. Sustained Program Activities

The U.S. Department of Education established as one of its objectives that the PT3 program create institutional change in the way teachers are prepared to use technology. More than seven of 10 consortia (71 percent) began this process by developing a written plan to continue preservice teacher training reforms after their current PT3 grant expires (see Figure 12). This

included 76 percent of Capacity Building consortia, 71 percent of Catalyst consortia, and 61 percent of Implementation consortia.

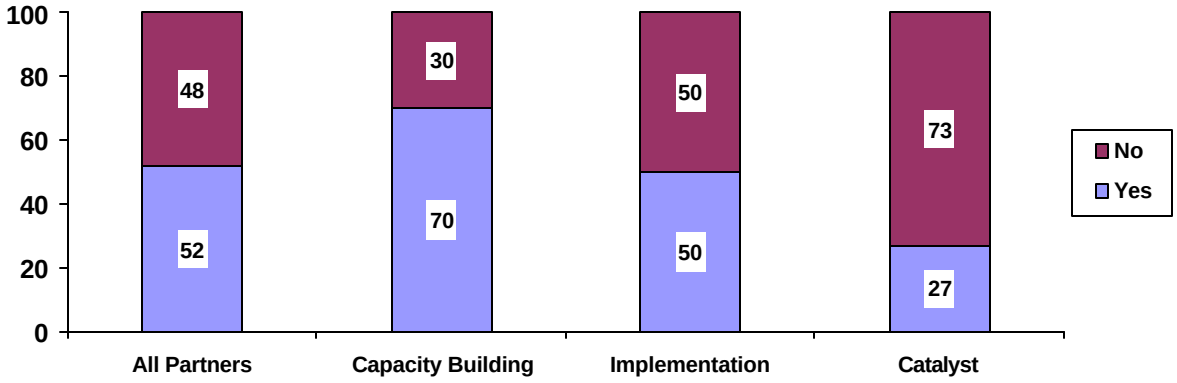
FIGURE 12. Percentage of Consortia* that Developed or Already Had a Written Plan to Continue Preservice Teacher Training Reforms After the Termination of Grant Funding**



** At least one partner within the consortium reported developing a written plan.*
*** Grantees were not asked to specify whether or not they undertook the activity as a grant activity.*
Note: Percentages may not sum to 100 due to rounding.

At the teacher preparation program level, slightly more than half of all teacher preparation programs (52 percent) have a written plan to continue preservice teacher training reforms after the termination of grant funding (see Figure 13). A higher percentage of teacher preparation programs from Capacity Building grantees have a plan (70 percent) than do Implementation (50 percent) and Catalyst programs (27 percent). This may be partly explained by the fact that funding for Capacity Building grants lasts one year rather than three years, and thus Capacity Building grantees are already at the end of their federally funded grant.

FIGURE 13. Percentage of Teacher Preparation Programs that Developed or Already Had a Written Plan to Continue Preservice Teacher Training Reforms After the Termination of Grant Funding*



** Grantees were not asked to specify whether or not they undertook the activity as a grant activity.*
Note: Percentages may not sum to 100 due to rounding.

Consortia plan to sustain activities begun with PT3 funding in various ways:

- **Curriculum changes** – For many teacher preparation programs, grant funding supported sustained changes in the education curricula. In many cases, these newly redesigned curricula become institutionalized because the changes were approved by the school's leadership, such as the dean of the school of education, the teacher preparation advisory committee, or the vice president for academic affairs.

- **Graduation standards** – Once the new graduation standards are approved by the university, they become a sustained impact of the grant activity. Many teacher preparation programs have also moved to require electronic portfolios that document a student's proficiency with teaching with technology.

- **Professional development** – The improved technology proficiency gained by education faculty is also a sustained improvement brought on by PT3 funding as long as those faculty continue to teach. In addition, many grantees adopted "train the trainer" models of professional development and now have in-house expertise they can use for future professional development activities.

- **Funding** – Consortia are also looking for new funding sources to replace current grant funding at the end of the award period. Many consortia applied for additional funding under the PT3 program. This is particularly true of 1999 Capacity Building grantees who have applied or plan to apply for Implementation grants. Other grantees are seeking funding from other U.S. Department of Education grants or other federal agencies such as the National Science Foundation to support and sustain these activities.

- **Collaboration** – The collaborations among different consortium partners have helped to solidify relationships that were less formal before PT3 funding. For example, many teacher preparation programs have stronger links with K-12 schools in which their students have access to technology proficient teachers for field experiences. The relationships will continue after the termination of PT3 funding.

2. Interdisciplinary Partnerships

Involving arts and science partners in the consortium and promoting the integration of technology into the arts and science courses in which preservice students enroll is an effective strategy because preservice students take a large number of classes outside the education curriculum.[24] During site visits, grantees noted that the involvement of arts and science faculty in grant activities was important to ensure that preservice students experienced the modeling of technology integration in all subject areas and specifically, their content area.[25] Some also noted that the involvement of faculty from departments other than education demonstrated to faculty and students the importance of integrating technology in instruction.

As noted in previous chapters, more than half of all grantees (57 percent) included a college of arts and science to facilitate institution-wide change in the curricula for preservice teachers. Among the different grant types, 54 percent of Capacity Building consortia, 56 percent of Implementation consortia, and 73 percent of Catalyst consortia included at least one college of arts and science.

Colleges of arts and science participated in several different types of PT3 grant activities. The most frequent activity in which colleges of arts and science participated was faculty development workshops in technology (see Table 13). Ninety-one of the 113 grantees (81 percent) had arts and science faculty participate in professional development workshops. This was also the most frequent activity for arts and science faculty for both Capacity Building (81 percent) and Implementation (85 percent) grantees. As discussed in Section B of this chapter,

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[24] J. Cooper, and G. Bull, Summer 1997. "Technology and Teacher Education."

[25] U.S. Department of Education, 2001. *Follow-Up Site Visit Report on Preparing Tomorrow's Teachers to Use Technology: First-Year Objectives, Activities, and Outcomes from a Sample of 1999 Grantees.* Washington, D.C.: U.S. Department of Education.

some professional development models paired arts and science faculty members with education faculty and/or K-12 teachers for training activities.

TABLE 13. Percentage of Consortia* that Reported Being Involved with an Arts and Science Partner in Various Activities

	All Consortia	Capacity Building	Implementation	Catalyst
Faculty development workshops in technology	81	81	85	69
Curriculum redesign to incorporate best practices in the use of technology for preservice students	74	68	82	81
Integration of Web-based, multi-media resources in preservice education courses	74	73	79	69
Development of student assignments reflecting use of technology	74	75	71	81
Providing technical consultants/ educators for the SCDE	50	51	44	56

** At least one partner within the consortium reported these activities with an arts and science partner.*

Another activity in which arts and science faculty members were typically involved was integrating more technology into their curricula. Seventy-four percent of consortia had arts and science faculty participate in the three following activities: integration of Web-based, multimedia resources in preservice education courses; curriculum redesign to incorporate best practices in the use of technology for preservice students; and development of student assignments reflecting use of technology.

Grant activities that included arts and science faculty also helped promote collaboration between the arts and science and education departments. At one teacher preparation program, arts and science and education faculty made up an 11-member task force that oversees PT3 grant activities and motivates and guides faculty by piloting activities integrating technology into the respective faculty members' area. Arts and science faculty members from the Visual and Performing Arts and Mathematics departments were represented on the task force. At several teacher preparation programs, arts and science and education faculty team-taught education classes, modeling best practices in teaching with technology.

Forty-three percent of teacher preparation programs collaborated with an arts and science partner. Teacher preparation programs in Capacity Building and Implementation grants were most likely to include an arts and science partner (47 and 44 percent of programs, respectively), followed by teacher preparation programs in Catalyst grants (36 percent).

The proportions of teacher preparation programs with an arts and science partner participating in various activities mirrored the patterns at the consortium level. The most frequent activity in which colleges of arts and science were involved was faculty development workshops in technology (see Table 14) with 79 percent of programs conducting this activity. For both Capacity Building (86 percent) and Implementation (88 percent) teacher preparation programs, this was the most frequent activity in which arts and science faculty participated.

TABLE 14. Percentage of Teacher Preparation Programs that Reported Being Involved with an Arts and Science Partner in Various Activities

	All Programs	Capacity Building	Implementation	Catalyst
Faculty development workshops in technology	79	86	88	57
Curriculum redesign to incorporate best practices in the use of technology for preservice students	73	73	80	68
Integration of Web-based, multi-media resources in preservice education courses	73	76	78	62
Development of student assignments reflecting use of technology	73	79	73	62
Providing technical consultants/ educators for the SCDE	47	56	44	35

3. K-16 Partnerships

Placing future teachers in an environment where they can see how K-12 students use a wide range of technology on a daily basis is a key strategy for teacher preparation.[26] Because of K-12

[26] Office of Technology and Assessment: U.S. Congress, April 1995, *Teachers and Technology: Making the Connection*, OTA-EHR-616.

schools' and teachers' role in preservice students' technology field experiences, K-12 partnerships are critical for PT3 grantees. During site visits, grantees stated that by involving K-12 partners in grant activities, preservice students were able to see the application of technology in a K-12 classroom and become familiar with the technology available in the K-12 setting.[27]

PT3 consortia partnered more frequently with K-12 schools and districts than with a college of arts and science. Ninety-two percent of consortia included at least one K-12 school or district in their partnership. Ninety-five percent of Implementation consortia included a K-12 school or district, as did 93 percent of Capacity Building consortia and 82 percent of Catalyst consortia.

The most common role played by partner K-12 schools and districts was providing opportunities for preservice students to conduct their field experiences (92 percent; see Table 15). This was the most common activity for K-12 schools among all three grant types. Consortia also relied heavily on K-12 schools and districts to provide the technology infrastructure for teacher preparation activities, as 88 percent of consortia partnered with K-12 schools that shared software, multimedia and other technology tools with teacher preparation programs. In some cases, consortia sought out specific K-12 schools as partners because of their technology infrastructure and support specialists. Almost as many consortia (86 percent) used K-12 teachers to model the effective use of technology in instruction by K-12 teachers for preservice students. These two activities occurred more frequently with Capacity Building and Implementation grantees.

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[27] U.S. Department of Education, 2001. *Follow-Up Site Visit Report on Preparing Tomorrow's Teachers to Use Technology: First-Year Objectives, Activities, and Outcomes from a Sample of 1999 Grantees.* Washington, D.C.: U.S. Department of Education.

TABLE 15. Percentage of Consortia* that Reported Being Involved with K-12 Schools or Districts in Various Activities

	All Consortia	Capacity Building	Implementation	Catalyst
Providing clinical opportunities for preservice students	92	92	90	94
Sharing software, multi-media, and other technology tools	88	90	84	82
Modeling effective use of technology in instruction by K-12 teachers for preservice students	86	84	87	87
Providing professional development opportunities for current teachers to improve their technology skills through training at the SCDE	71	69	69	88
Providing mentors for preservice students	66	32	66	94
Modeling effective use of technology in instruction by K-12 teachers for SCDE faculty	61	64	55	56
Designing and developing of curriculum and/or graduation requirements for preservice students that reflect the technology needs of K-12 teachers	50	49	54	50
Assessing the technology proficiency of preservice students	50	54	41	57
Designing and developing of high-quality induction programs for program graduates	25	21	30	40

** At least one partner within the consortium reported these activities with a K-12 school or district.*

In some cases, teacher preparation programs developed a streaming video network so preservice students could observe K-12 teachers modeling the effective use of technology while still in their education classroom. These can be viewed in real-time as the K-12 teacher is teaching or saved for later use. In some cases, Catalyst grantees placed these "best practices" on a Web page so other consortia could have access to the videos. Other consortia chose to videotape K-12 teachers integrating technology in their classrooms and use the videos as teaching tools in education classes.

More than six of 10 consortia had at least one K-12 school or district that participated in professional development opportunities for K-12 teachers to improve their technology skills through training at the teacher preparation program (68 percent) or that provided mentors for preservice students (64 percent). In some cases, K-12 teachers not only participated in professional development activities, but they also helped to facilitate the professional

development activities at institutions of higher education. As noted in Section B of this chapter, K-12 teachers are often used to provide a "real-world" element in professional development activities.

At several teacher preparation programs, these activities worked in conjunction with each other. For example, K-12 teachers were teamed with preservice students for technology professional development activities. After becoming acquainted through these activities, the preservice student then completed his or her clinical field experience in the room of the partner K-12 teacher. This also increased the likelihood that preservice student would be in a classroom with a K-12 teacher who was modeling the effective use of technology.

More than 72 percent of all teacher preparation programs had a K-12 school or district as a partner. Of the 134 Capacity Building programs, 118 (88 percent) worked directly with K-12 schools. Seventy-four of 93 Implementation programs (80 percent) and 45 of 102 Catalyst programs (44 percent) also collaborated with K-12 districts.

The distribution of teacher preparation programs with K-12 partners participating in various activities was similar to those at the consortium level. Providing field opportunities (92 percent of all partners) and sharing software, multi-media, and other technology tools (86 percent) were the most frequently conducted activities with K-12 schools and districts (see Table 16).

TABLE 16. Percentage of Teacher Preparation Programs that Reported Being Involved with K-12 Schools or Districts in Various Activities

	All Programs	Capacity Building	Implementation	Catalyst
Providing clinical opportunities for preservice students	92	92	91	90
Sharing software, multi-media, and other technology tools	86	90	86	72
Modeling effective use of technology in instruction by K-12 teachers for preservice students	85	85	88	77
Providing professional development opportunities for current teachers to improve their technology skills through training at the SCDE	68	68	72	59
Providing mentors for preservice students	66	61	68	74
Modeling effective use of technology in instruction by K-12 teachers for SCDE faculty	58	63	58	34
Designing and developing of curriculum and/or graduation requirements for preservice students that reflect the technology needs of K-12 teachers	46	46	54	29
Assessing the technology proficiency of preservice students	45	52	39	32
Designing and developing of high-quality induction programs for program graduates	23	20	27	27

G. STATEWIDE CHANGE

Because there is no national set of standards or assessments for certifying new teachers, each state determines both its own licensure and certification requirements and options for certification.[28] With state requirements having widespread impacts on teacher preparation programs, some grantees focused on creating a statewide change in the preparation of future teachers to use technology. The results reported in this section were obtained from data provided by lead organizations only.

1. State Teacher Certification Standards

According to at least one lead organization in 41 of 46 states (89 percent) and in the District of Columbia, the state or D.C. has standards for initial teacher certification that address

[28] *Education Week*, September 23, 1999.

technology (see Table 17). In 24 of these 41 states (59 percent) and in D.C., however, lead organizations from the same state or from D.C. disagreed as to whether or not their state has such standards.

Several factors may account for such discrepancies. Grantees in the same state may have interpreted differently the item in the annual performance report on "certification standards that address technology." Some grantees may be unfamiliar with the latest changes to state requirements regarding technology and teacher certification. The conflicting responses may also reflect the fact that states have different certification requirements for teachers at the elementary and secondary levels. Finally, although some states may not have implemented technology requirements, some institutions within those states have created their own technology requirements. Those grantees may have reported on requirements for their institution, rather than for their state.

Because of the conflicting responses from grantees within the same states, caution is urged in interpreting the results. More consistent data may be obtained from future annual performance reports by asking grantees about specific technology standards within their state certification teacher standards.

To shed light on the current annual performance data on state teacher certification standards in technology, the results from the annual performance reports were compared with data from an external source. Based on the National Association of State Directors of Teacher Education and Certification (NASDTEC) Manual, as of January, 2000, 33 states and the District of Columbia had technology requirements for certification in either elementary or secondary education (32 states and the District of Columbia had requirements for elementary certification, and 29 states

plus D.C. had requirements for secondary certification).[29] For 27 of these 33 states and in D.C., at least one grantee reported in the annual performance reports that the state had technology requirements for initial teacher certification. For 14 of the remaining 17 states that NASDTEC described as not having such requirements as of January, 2000, at least one grantee indicated in the performance report that the state now had technology requirements. Given that the performance report data were collected after the NASDTEC data, it is reasonable that some of the states may have since added technology requirements.

Lead organizations reported that 19 states' initial certification standards address technology through the assessment of technology proficiency (see Table 17). Thirty-five states plus the District of Columbia require the completion of technology or technology-related courses for preservice students to receive initial certification.

TABLE 17. Percentage of States that Include Technology as Part of their Initial Certification or Licensure

	Yes	Total States	Percentage
Do your state's initial standards address technology?	41	46	89
Is technology addressed through assessment of technology proficiency?	19	41	46
Is technology addressed through completion of a course?	35	41	85
Is your state currently reviewing standards to include technology?	38	46	83

Thirty-eight of 46 states (83 percent) plus the District of Columbia, Mariana Islands, and Puerto Rico are in the process of reviewing initial certification or licensure requirements to add or expand technology requirements. Twenty-nine of the 38 states reported to be adding or

[29] National Association of State Directors of Teacher Education and Certification, 2000. *National Association of State Directors of Teacher Education and Certification Manual*. Mashpee, MA: National Association of State Directors of Teacher Education and Certification.

expanding technology requirements (76 percent) had lead organizations that provided conflicting data.

2. Grantee Efforts in State Standards

Fewer grantees are trying to add or expand technology requirements in state standards than are undertaking any other activity. Seventeen percent of lead organizations (33 of 190 leads) reported that their consortium is engaging in this activity (see Table 18). Capacity Building leads (20 percent) were most likely to report this as a grant activity. Seventeen percent of Catalyst leads and 12 percent of Implementation leads reported making efforts to add or expand technology requirements for their state's initial certification or licensure.

TABLE 18. Percentage of Lead Organizations that Reported Making Efforts to Add or Expand Technology Requirements for their State's Initial Certification or Licensure

	All Leads	Capacity Building	Implementation	Catalyst
Yes	17	20	12	17
No	83	80	88	83

H. HIGH-NEED POPULATIONS[30]

Because "students in low-income schools and rural areas will be denied full access to the power of new learning technologies if they do not have teachers who can help them use these tools to engage in challenging learning activities that help them meet new standards," ED encouraged applicants to include such high-need districts in their consortia.[31]

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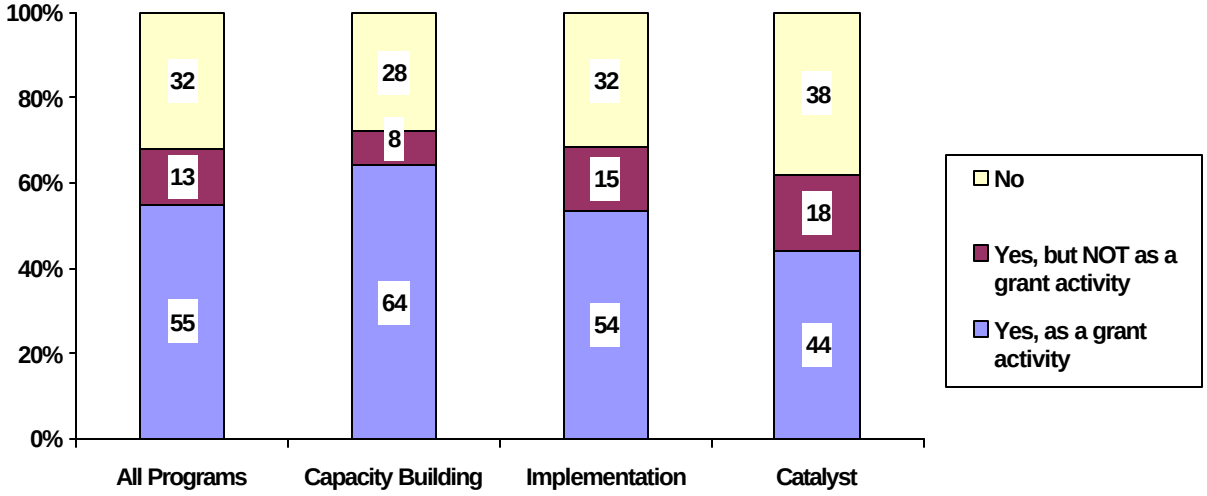
[30] Questions on the annual performance report regarding high-need populations did not address any particular PT3 indicator and were therefore optional. As a result, a considerable number of respondents provided incomplete information or skipped the section altogether. Thus, the data may or may not fully capture the extent to which grantees engaged in specific activities to narrow the digital divide.

[31] U.S. Department of Education, 2000. *Preparing Tomorrow's Teachers to Use Technology FY1999 Application Guidelines*. Washington, DC: U.S. Department of Education.

1. Bridging the Digital Divide

Fifty-five percent of teacher preparation programs targeted training activities to districts with high-need rural, urban, low-income, or minority students (see Figure 14). A higher percentage of Capacity Building grantees (64 percent) undertook this activity than Implementation or Catalyst grantees.

FIGURE 14. Percentage of Teacher Preparation Programs that Targeted Training Activities to Districts with High-Need Rural, Urban, Low-Income, or Minority Students: Program-Level Data



Note: Percentages may not sum to 100 due to rounding.

Teacher preparation programs used funds differently to help narrow the digital divide and to address grant activities toward high-need populations. In some cases, professional development focused on teaching with technology to diverse populations. Other teacher preparation programs used funds to provide technology components, such as laptops, that preservice teachers can use when conducting their field experiences in classrooms that are not equipped with updated technology.

Often, teacher preparation programs focused on distance education resources and training to help deliver K-12 classes to rural schools. Fifty-three teacher preparation programs served a total of 403 rural districts[32] and an average of almost eight districts per consortium. Sixty-six teacher preparation programs served a total of 137 urban districts,[33] an average of two districts per program. One teacher preparation program developed a manual that focused on how to apply technology to address issues such as urban environmental contamination and other environmental justice issues.

Forty programs served a total of 104 low-income districts.[34] These 104 districts had an average of 70 percent of their students eligible for the federally funded free or reduced-price lunch program. Finally, 56 programs served a total of 141 minority districts.[35] These 141 districts had an average minority population of 61 percent. One teacher preparation program focused its training efforts on teaching K-12 teachers and preservice students the software package Encarta Africana, which is software developed specifically for African and African-American cultures.

2. Technology and Students with Disabilities

Fifteen percent of teacher preparation programs (35 of 236 programs) provided technology-training activities targeted to students with disabilities. These activities often focus on how

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[32] A rural district was defined as an area with a population of less than 2,500 and defined as rural by the U.S. Bureau of the Census (National Center for Education Statistics, U.S. Department of Education).

[33] An urban district was a large central city (a designated central city of a Metropolitan Statistical Area (MSA) with population greater than or equal to 400,000 or a population density greater than or equal to 6,000 people per square mile) or a midsize central city (a designated central city of an MSA, but not designated as a large central city) (National Center for Education Statistics, U.S. Department of Education).

[34] A low-income district was defined as one in which at least 50 percent of students were eligible for the free- or reduced price lunch program.

[35] Minority districts include any district in which 20 percent or more of the students are American Indian or Alaskan Native; Asian or Pacific Islander; Hispanic, regardless of race (Mexican, Puerto Rican, Cuban, Central or South American, or other culture or origin); black (not of Hispanic origin). (Schools and Staffing, National Center for Education Statistics, U.S. Department of Education.)

technology can be used to improve instruction to students with disabilities. For example, one teacher preparation program is preparing its special education teachers to synthesize computer-based technology with arts-based education and intensive academics. Preservice students participate in training for pedagogical methods and develop software applications and materials designed especially for students with learning disabilities that can be used in mainstream classrooms.

IV. CONCLUSION

The results from the annual performance reports show that during the first year of the PT3 grant, grantees were able to implement a wide variety of activities targeted toward improving teacher preparation programs by integrating technology into instruction. Grant activities reached a broad and varied audience that included preservice students, preservice education faculty, K-12 faculty, and arts and science faculty.

PT3 grants enabled consortia to provide professional development to more than one of every 10 education faculty members and redesign curricula for one of every 20 preservice education courses. In their redesigned curricula, education faculty used technology, such as the Internet or other Web-based materials, to communicate with students and required students to use in their course assignments various technological tools, such as the Internet to conduct research and to access online documents and resources. With the use of grant funds, teacher preparation programs offered courses to students through various technological means, the most typical being a Web-enhanced course where portions of the course were available online. To encourage faculty to participate in these grant activities, grantees offered them a variety of incentives – the most popular being increased opportunities for professional development, such as workshops.

During the first year of the grant, grantees focused primarily on integrating the more basic technology tools, such as the Internet and e-mail, into the curricula. In-depth conversations with grantees during site visits, however, suggest it is likely that as faculty and students become more technology proficient during the next two years of the grant, the complexity of technology tools being integrated into courses will increase, and grantees will integrate more of the higher-level technology tools, such as portfolio tools and two-way audio/video conferencing.

Because the preservice student's education is not experienced solely in the teacher preparation program, grantees' reforms went beyond the programs and extended to colleges of

arts and science and K-12 schools. Grantees most frequently partnered with colleges of arts and science to provide professional development on technology to faculty, and grantees most frequently partnered with K-12 schools to provide clinical opportunities to preservice students. Grantees also recognized the importance of providing preservice students with a "hands-on" experience in using technology in the K-12 classroom by modifying or expanding their field experiences to include access to technology.

Bringing together education, arts and science, and K-12 faculty in grant activities has multiple benefits for preservice students. Research has shown that teachers teach as they are taught. As education and arts and science faculty become more technology proficient and continue to model the integration of technology into their courses and instruction, it is likely that preservice students will increase the integration of technology into their instruction with K-12 students. In discussions during site visits to grantees, preservice students noted that by improving their technological skills and seeing faculty model the use of technology in the classroom, they not only felt capable to integrate technology into their classroom, but also to teach K-12 students how to use the technology. As K-12 faculty become more proficient, preservice students will not only be able to collaborate with their cooperating teacher to create technology-based lesson plans and activities, but they will also be able to observe the use of technology in the K-12 classroom.

Grantees have already begun efforts to sustain reforms being made to teacher preparation programs after the current PT3 grant expires, developing written plans and assessing the technology proficiency of education faculty. Less frequently, grantees have started to require preservice students to demonstrate technology proficiency, and they have begun to modify both institution and state-level graduation and certification requirements to include a technology component.

The results reported by consortia within each grant type indicate that grantees have applied PT3 funds to the different purposes for which the grant types were intended, and at the same time the grantees share a common focus:

- Capacity Building grants were designed to lay the foundation for a teacher preparation reform strategy. Recipients of this type of grant were most likely to use their PT3 funds to establish partnerships with K-12 schools and districts and provide professional development to education faculty.

- Implementation grants were designed to support consortia in implementing or significantly expanding a teacher preparation program to improve preservice teachers' technology proficiency. Recipients of this type of grant were most likely to use their PT3 funds to conduct activities such as providing professional development to faculty and redesigning education curricula.

- Catalyst grants were designed to foster large-scale innovative improvements for preparing technology-proficient teachers. Recipients of this type of grant were most likely to use their PT3 funds to modify graduation requirements to incorporate technology standards and to provide professional development to faculty.

The common focus across all three grant types on the professional development of faculty highlights this activity as the primary means in the first year of the grant for preparing preservice teachers to integrate technology into their teaching.

Through these reforms during the first year of the grant, grantees have started to reshape the way that educators at all levels view the role of technology in education and have begun to modify teacher preparation programs to reflect that change. In the following years of the PT3 grant, it is likely that reforms currently in place will be expanded, additional reforms will be implemented, and more faculty and students will be involved in grant activities, helping to create teacher preparation programs across the country that will generate a much-needed pool of technology-proficient educators.

APPENDIX A. OVERVIEW OF TEACHER PREPARATION PROGRAMS

This appendix provides information on the size of the teacher preparation programs reporting the results of their PT3 grants. The 330 teacher preparation programs that completed the annual performance report represent about 24 percent of the 1,340 four-year teacher preparation programs in the United States.[36] The 400,701 education students at these programs constitute about 62 percent of the 649,000 education students.[37]

A. TEACHER PREPARATION PROGRAMS

Overall, the 330 teacher preparation programs that were partners or leads in PT3 grants included an average of 55 faculty members and 168 classes per teacher preparation program (see Table A1). The preparation program also enrolled an average of 1,214 education students (median of 720), with a mean of 273 in their graduating year (median 188). Teacher preparation programs in Implementation grants had a higher number of faculty, students, and courses than those in Capacity Building and Catalyst grants.

B. CONSORTIA

The 202 consortia with teacher preparation programs[38] included a mean of 90 faculty members and 275 education classes (see Table A2). There was an average of 1,984 students and of 445 graduating students at the consortium level. Catalyst grantees had the lowest total number of education faculty, students, and courses, but the highest average of each per consortium. This high average is explained by the fact that Catalyst grantees have a larger average number of

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[36] Integrated Postsecondary Educations Data System. Washington, DC: U.S. Department of Education.

[37] National Center for Education Statistics, 2001. *Digest of Education Statistics 2000*. Washington, DC: U.S. Department of Education. Education enrollment statistic is from 1995-96.

[38] Two consortia included only nonteacher preparation program lead organizations and no teacher preparation program respondents.

teacher preparation programs per consortium (5 programs per consortia) than do Implementation (2) and Capacity Building (1) grantees.

TABLE A1. Summary Statistics on Teacher Preparation Programs

	Total	Mean	Median	Minimum	Maximum
Education faculty					
All Programs *(N=330)*	18,251	55	35	0	1,100
Capacity Building *(N=137)*	7,360	54	28	2	1,100
Implementation *(N=94)*	5,689	61	55	0	160
Catalyst *(N=103)*	5,508	53	28	0	412
Education students					
All Programs *(N=330)*	400,701	1,214	720	0	17,090
Capacity Building *(N=137)*	164,427	1,200	600	30	17,090
Implementation *(N=94)*	134,953	1,436	955	0	7,200
Catalyst *(N=103)*	107,826	1,047	556	0	6,714
Graduating students					
All Programs *(N=330)*	89,913	272	188	0	1,611
Capacity Building *(N=137)*	37,071	271	173	5	1,611
Implementation *(N=94)*	30,612	326	278	0	1,100
Catalyst *(N=103)*	23,868	232	143	0	1,300
Education courses					
All Programs *(N=330)*	55,552	168	94	0	1,363
Capacity Building *(N=137)*	19,393	142	83	4	859
Implementation *(N=94)*	20,200	215	135	1	1,000
Catalyst *(N=103)*	16,773	163	65	0	1,363

TABLE A2. Summary Statistics on Consortia

	Total	Mean	Median	Minimum	Maximum
Education faculty					
All consortia *(N=202)*	18,251	90	57	3	1,100
Capacity Building *(N=119)*	7,350	62	33	3	1,100
Implementation (N=61)	5,689	93	70	10	561
Catalyst (N=22)	5,606	255	228	15	715
Education students					
All consortia *(N=202)*	400,701	1,984	1,050	32	18,199
Capacity Building *(N=119)*	164,177	1,380	700	32	17,090
Implementation (N=61)	134,953	2,212	1,401	150	18,199
Catalyst (22)	107,826	4,901	4,478	260	13,950
Graduating students					
All consortia *(N=202)*	89,913	445	250	0	3,142
Capacity Building (N=119)	37,029	311	189	10	1,611
Implementation (N=61)	30,612	502	327	0	3,142
Catalyst (N=22)	24,390	1,109	1,206	80	2,292
Education courses					
All consortia *(N=202)*	55,552	275	133	4	2,044
Capacity Building (N=119)	19,361	163	105	4	888
Implementation (N=61)	20,200	331	156	15	1,966
Catalyst (N=22)	17,185	781	710	23	2,044

APPENDIX B. RESULTS FROM ANNUAL PERFORMANCE REPORTS

This appendix provides responses to questions from Sections II through VI of the 1999 annual performance report. Highlights of data from Section I, which collected descriptive information on schools, colleges, and departments of education and their arts and science, K-12, and other partners, are summarized in Appendix A.

Results are provided at both the consortium and teacher preparation program levels. To provide a complete picture of the annual performance reports, we present the data largely in "unedited" form. Accordingly, the following should be noted:

- Appendix B includes results for all possible response items for each question, including the "Data Not Available" option. Though nonresponse is typically excluded from analysis tables, showing the number of grantees who do not have data available for particular items offers important information for future annual performance reports. The main body of the report follows the more standard practice of omitting the "Data Not Available" responses; percentages reported in the text are based only on those respondents providing data. Thus, some percentages in Appendix B will not match those in the body of the report.

- Item response rates for each question are noted in Appendix B. Because respondents received different questions based on their answers to previous questions, not all grantees received each question. The item response rate reflects the total number of respondents completing that question of those who should have received the question. Response rates may exceed 100 if a respondent noted that he or she did not undertake an activity but provided specific data on that activity in a later question. Response rates lower than100 indicate that a respondent noted that he or she undertook an activity but did not provide specific data for that activity in later questions. (In a small percentage of cases, we contacted grantees to clarify discrepancies in response to key indicators.)

- The response rates for items for which summary statistics are presented (total, mean, median, minimum, and maximum values) are based only on respondents who noted they undertook the activity as a grant activity. The response rates, however, include those who answered "Data Not Available." The total number of respondents answering "Data Not Available" is reported below the summary statistics.