



## **Evaluation of the Enhancing Education Through Technology Program Final Report**





# **Evaluation of the Enhancing Education Through Technology Program: Final Report**

U.S. Department of Education  
Office of Planning, Evaluation and Policy Development  
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## Executive Summary

The purpose of this report is to provide descriptive information about educational technology practices related to the core objectives of the U.S. Department of Education’s Enhancing Education Through Technology (EETT) program. The EETT program is part of the *No Child Left Behind Act of 2001 (NCLB)* and, like other elements of *NCLB*, targets “high-need school districts.”<sup>1</sup> The authorizing legislation specifically states three goals for the program: (a) to improve student academic achievement through the use of educational technology, (b) to ensure that every student is technologically literate by the eighth grade, and (c) to encourage the effective integration of technology in teacher training and curriculum development to establish research-based instructional methods that can be widely implemented as best practices. From the program’s inception in FY 2002 through FY 2008, approximately \$3.4 billion was allocated to EETT. In FY 2008, the program was funded at approximately \$267 million.

This report is structured around the EETT program objectives and specific performance measures developed by the U.S. Department of Education to meet the requirements of the *Government Performance and Results Act (GPRA)* of 1993, which are aligned with, but not identical to, the goals stated in the legislation. *GPRA* requirements address each of the following EETT program priorities: teachers’ and students’ access to technology, technology-related professional development, technology integration, and student technology literacy.<sup>2</sup> The report uses data collected from nationally representative samples of states, districts and teachers, including

- 52 state educational technology directors who were surveyed about school years 2002–03 and 2006–07.
- 1,028 district technology directors who were surveyed about school years 2003–04 and 2006–07.
- 4,934 teachers (drawn from the district sample) who were surveyed about school year 2004–05 and 1,515 teachers (also drawn from the district sample) who were surveyed about school year 2006–07.<sup>3</sup>

In addition to providing national estimates of educational technology in elementary and secondary schools, the report provides responses for high- and low-poverty districts and for

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<sup>1</sup> High-need districts are defined in the legislation as those serving large numbers or percentages of poor students and serving at least one school in need of academic improvement or requiring assistance acquiring or using technology. Schools “in need of academic improvement” (also identified as “in need of school improvement”) are defined in *NCLB* as schools that receive federal Title I funds (based on the percentage of students from low-income families) and that have not made state-defined adequate yearly progress (AYP) for two consecutive school years. There is no definition for “technology need” in the legislation, and states develop their own criteria for this standard.

<sup>2</sup> Additional *GPRA* measures address the operational efficiency of the program and are outside the scope of this report.

<sup>3</sup> A larger sample of teachers was drawn for the 2005 data collection to provide robust, schoolwide estimates of technology use (rather than estimates of individual teachers’ use of technology) to inform case study selection for a NETTS substudy.

teachers in high- and low-poverty schools to address the focus of the EETT program on the needs of high-poverty schools and districts. High-poverty schools are defined in this report as schools that were in the top poverty quartile of schools in the nation; low-poverty schools are defined as schools in the bottom two poverty quartiles, as defined by percentages of students eligible for free and reduced-price lunch (FRPL) in 2004–05. Because there are many sources of support for educational technology at the federal, state and local levels, the report’s findings should not be interpreted as solely representing the effect of EETT.

## **Key Findings**

This report’s key findings are organized by *GPR*A measures for the EETT program (see Exhibit ES-1).<sup>4</sup> Findings are described in greater detail in the text that follows. The percentages associated with teacher technology competency, technology integration, and student technology literacy must be interpreted with care because standards guiding states and assessment techniques vary considerably.

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<sup>4</sup> Information regarding the administration of the EETT program is provided in Appendix A.

<b>Exhibit ES-1. GPRA Indicators for EETT</b>		
<b>GPRA Topic and Objective</b>	<b>GPRA Measure</b>	<b>Key Findings<sup>a</sup></b>
<b>Technology access:</b> To help ensure that students and teachers in high-poverty, high-need schools have access to educational technology comparable to that of students and teachers in other schools.	The percentage point difference in Internet access between classrooms in high- and low-poverty schools.	The prevalence of Internet access in high- and low-poverty schools was equivalent in both school year 2004–05 and school year 2006–07.
<b>Technology-related teacher professional development:</b> To provide professional development opportunities for teachers, principals, and school administrators to develop capacity to effectively integrate technology into teaching and learning.	The percentage of teachers who meet their state technology standards.	About half of the states (27) had defined standards for teacher technology competency, and only some of these measured teachers' technology skills. For the 11 states that reported data, percentages ranged from 8 to 100.
<b>Technology integration:</b> [To encourage districts to] fully integrate technology into the curricula and instruction in all schools to enhance teaching and learning.	The percentage of districts receiving Educational Technology State Grants funds that have effectively and fully integrated technology.	Half of the states (26) reported not having a definition of full integration of technology or did not collect data related to the percentage of districts meeting the standard. For the 15 states that reported percentages, percentages ranged from 0 to 100. <sup>b</sup>
<b>Student technology literacy:</b> [To increase] the percentage of students who meet state technology literacy standards by the end of the eighth grade.	The percentage of students who meet state technology standards by the end of the eighth grade.	Six states reported conducting statewide assessments of student technology proficiency; 25 states reported relying on districts to measure their students' technology skills. For the 12 states that reported data, percentages ranged from 10 to 100.

**Exhibit reads:** The federal government has developed four *GPRA* objectives and related measures that are aligned with the main purposes of the EETT program. For the last three of the four *GPRA* measures addressed in this report, about one-quarter of states provided data.

<sup>a</sup> Unless otherwise stated, data are for school year 2005–06, the most recent year for which data were available.

<sup>b</sup> The NETTS district survey item that addressed this *GPRA* measure did not ask states to differentiate between districts receiving EETT funds and those that do not. Therefore, reported percentages are for all districts in the state, not those receiving EETT funds specifically.

Data source: U.S. Department of Education (2007a); 2007 NETTS State Survey.

## Technology Access

- **High-speed Internet access in K–12 classrooms.** Many of the current instructional uses of the Internet require bandwidth that would be unmanageable at dial-up speeds. Overall, 63 percent of teachers reported in 2006–07 that students had high-speed Internet access in their classrooms.<sup>5</sup> For all groups, classroom access to the Internet rose by a statistically significant amount (see Exhibit 3 in the main text). There was no statistically significant difference between teachers in high-poverty schools and those in low-poverty schools in terms of reported student access to high-speed Internet in classrooms in either 2004–05 or 2006–07. This lack of statistical significant difference was also true of Internet access more generally; classroom access reported by teachers in high-poverty schools and teachers in low-poverty schools was statistically equivalent.<sup>6</sup>

Since school-level poverty status was not a significant predictor of high-speed Internet access, the NETTS teacher survey data were augmented with data from the U.S. Department of Education’s Common Core of Data (CCD) in order to examine the impact of other school characteristics. The analysis found differences associated with the grade level at which teachers worked, suggesting that elementary teachers were most likely to have high-speed Internet access in their classrooms. Seventy-two percent of teachers in elementary grades, compared with 55 percent in middle school grades and 49 percent in high school grades, reported having high-speed Internet access within their classrooms.<sup>7</sup> Differences in subject taught and in school location (rural, suburban, urban) were not significant predictors of classroom Internet access.

## Technology-Related Teacher Professional Development

- **Content of technology-related professional development.** More than two-thirds of districts reported providing technology-related professional development on the following topics: using technology in student grading (81 percent), enhancing student learning in mathematics (73 percent) and enhancing student learning in reading (69 percent). Districts receiving EETT funds followed a similar pattern, with EETT districts providing professional development on using technology for grading students (87 percent), enhancing student learning in mathematics (75 percent) and enhancing student learning in reading (69 percent). Teachers in low-poverty schools were more likely to report receiving professional development that (a) introduced computers and the Internet

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<sup>5</sup> “High-speed” Internet access is defined by the Federal Communications Commission as “access [to] the Internet and Internet-related services at significantly higher speeds than those available through ‘dial-up’ Internet access services”. (see <http://www.fcc.gov/cgb/consumerfacts/highspeedinternet.html>, accessed on November 3, 2008). On the 2007 teacher survey, teachers were given examples such as cable, DSL and wireless.

<sup>6</sup> These estimates may appear lower than other reports (see, for example, NCES 2006). The source of the differences between NETTS data and NCES data specifically can be explained as follows. First, NCES data address “instructional rooms,” including libraries, computer labs, etc. The data reported here speak directly to a teacher’s primary classroom. In addition, the data reported here refer specifically to student access, which is not addressed by the NCES report.

<sup>7</sup> These differences were significant at the 99 percent level.

(40 percent and 32 percent, respectively), (b) addressed how to use technology to enhance student learning in science (38 percent and 29 percent, respectively), and (c) taught how to use technology for grading (64 percent and 54 percent, respectively). However, relatively few districts reported using EETT funds for professional development on using technology to grade students; 18 percent of districts reporting using their formula funds and 13 percent of districts reported using their competitive funds for this purpose. Districts were more likely to use their formula funds to offer professional development regarding the use of technology to enhance student learning in math and reading, with 44 percent of districts using their formula funds for this purpose and less than 40 percent using their competitive funds for these purposes.

- **Teacher-Reported Frequency of Professional Development.** Overall, 86 percent of teachers indicated that they had some form of technology-related professional development in 2006–07 or the preceding summer. Teacher data reinforced the widespread availability of professional development that addresses how to use technology for grading, with 60 percent of teachers (more than for any other single topic) reporting that they engaged in this type of professional development in 2006–07. The next three most often cited topics for the technology-related professional development that teachers had received were the use of technology in developing curriculum and lesson plans (58 percent of teachers), the use of technology to locate instructional materials on the Internet (54 percent of teachers) and the use of technology to support new teaching methods (54 percent of teachers).
- **Needs of teachers in high-poverty schools.** Teachers in high-poverty schools were consistently more likely than those in low-poverty schools to express a need for additional technology-related professional development in school year 2006–07. The biggest gap in needs between teachers in high-poverty schools and those in low-poverty schools was in the use of technology to meet the needs of English language learners, with 42 percent of teachers in high-poverty schools expressing a need for professional development in this area, compared with 28 percent of teachers in low-poverty schools. A similar gap by school poverty level (11 percentage points) existed in teachers’ perceived need for additional professional development in improving students’ technology literacy.
- **Quality of technology-related professional development.** Seven characteristics often cited as elements of best practices for teacher professional development were identified through review of the literature: (a) directly related to the content taught by the teacher, (b) included other members of the school community, (c) was consistent with the technology goals in the district, (d) provided an opportunity for meaningful engagement with colleagues and materials, (e) addressed different levels of teachers’ knowledge, skills and interest, (f) was delivered over multiple sessions, and (g) included follow-up activities (Means et al. 2004). When asked to describe their most useful technology-related professional development experience in 2006–07, 20 percent of teachers indicated that this professional development did not include *any* of the seven research-suggested characteristics (see Exhibit 9 in the main text). The most commonly reported feature of teachers’ self-described “most useful” professional development activity was “directly related to the content taught,” with 50 percent of teachers reporting this feature. Teachers

were least likely to report that their most useful professional development activity included follow-up activities, with 24 percent of teachers reporting this feature.

- **Percentage of teachers meeting technology standards.** One of the *GPRA* measures for the EETT program is “the percentage of teachers who meet their state technology standards.” Only 27 states (52 percent) had minimum technology competency standards for teachers in 2006–07, and states were generally not collecting data regarding the *GPRA* measure of the percentage of teachers meeting state technology standards. Among the 11 states that reported data, the definitions and measurement of teachers’ technology competency varied greatly. Percentages of teachers meeting standards in a given state ranged from 8 percent to 100 percent.<sup>8</sup>

Thirty-five percent of districts reported having technology standards for teachers. Among the districts reporting technology standards for teachers, 69 percent also reported either assessing or planning to assess whether teachers met standards (24 percent of districts overall). Many of these districts (21 percent overall) provided data regarding the percentage of teachers who met district proficiency standards in 2005–06. On average, these districts reported that 71 percent of their teachers met standards. However, the data are not normally distributed, and the modal district response suggests that a high proportion of teachers in particular districts met district standards. About two out of every five districts that reported a percentage of teachers indicated that 91 percent to 100 percent of teachers met district technology standards.

### **Integration of Technology Into Teaching and Learning**

- **Districtwide integration of technology.** The *GPRA* measure for technology integration is “the percentage of districts receiving Educational Technology State Grants funds [EETT funds] that have effectively and fully integrated technology.” Under federal guidelines, states develop their own criteria for this measure. However, as reported on the 2007 state survey, most states either had not adopted a definition of effective integration of technology or did not measure the percentage of districts meeting the statewide definition. Among the 15 states that did report this measure, the percentages ranged from 0 percent to 100 percent. The average percentage of districts meeting state definitions was 56 percent.<sup>9</sup>
- **Teacher and student use of technology for teaching and learning.** Larger percentages of teachers reported using technology for a variety of professional practices on a weekly basis in 2006–07 than in 2004–05 (see Exhibit 18 in the main text). The biggest gains were in teachers’ use of technology to “develop curricula or assignments in reading, math, or other subjects” and to “present reading, math, or other subject concepts to

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<sup>8</sup> The mean response for the percentage of teachers meeting standards across reporting states was 61 percent. The median response was 62 percent; the modal response was 100 percent.

<sup>9</sup> The mean response for the percentage of districts meeting their states’ definitions of “effectively and fully” integrated technology was 56 percent. The median response for states was 50 percent. The modal response was 100 percent.

students.” The only two exceptions to this trend were using technology to test students, which decreased, and using technology to collaborate with experts or teachers in other locations, which did not change during this two-year period. During the same time frame, the frequency of students’ use of technology for schoolwork, as reported by teachers, did not change. The only significant difference between the two years was an increase in the use of technology to prepare for standardized tests (see Exhibit 19 in the main text).

## Student Technology Literacy

- **Assessing student technology literacy.** One of the *GPRA* measures for the EETT program is “the percentage of students who meet state technology standards by the end of the eighth grade.” Forty-four states had either stand-alone technology standards for students or technology standards that were integrated into other student academic standards. Six states reported conducting statewide assessments of student technology literacy in 2005–06, up from just two states in 2002–03. Twenty-five states reported relying on districts to assess student technology literacy. For the 12 states that reported data, the average percentage of students meeting technology literacy standards was 64 percent; percentages ranged from 10 percent to 100 percent.<sup>10</sup> Given the small number of states assessing student technology literacy and the very different assessment approaches and grade levels tested, aggregated state-reported student proficiency rates must be viewed with particular caution.

Across the country, 59 percent of districts reported assessing eighth-graders’ technology proficiency in 2005–06, but only about one-third of these districts, or 21 percent of all districts, reported the percentage of students meeting standards. These districts reported, on average, that 88 percent of their eighth-grade students met the district’s technology literacy requirements. By 2007–08, 85 percent of districts expected to be assessing students’ technology literacy in the eighth grade.

## Implications for Future Policy

The *GPRA* objectives and measures used to monitor the EETT program on a national level are used to frame the data presented in this report. The *GPRA* objectives include two program inputs of effective technology use—technology access and technology-related professional development—and two intermediate goals of educational technology use—technology integration and student technology literacy.

The EETT program seeks to ensure that students and teachers in high-poverty, high-need schools have access to educational technologies comparable with that of students and teachers in other schools. The analysis presented in this report suggests that this goal is being met. Although districts are authorized to use EETT funds to increase access to technology, relatively few districts receiving EETT funds appear to use EETT funds for this purpose. These data suggest that the focus of educational technology policy should continue to shift from access to issues of

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<sup>10</sup> The median response was 76 percent.

how teachers are supported and how technology is used. This focus on instructional use should drive future decisions about what technology supports are needed.

Preparing teachers to use technology effectively is a focus of the EETT program. Districts receiving EETT funds must either allocate 25 percent of funds to technology-related teacher professional development or show that significant technology-related professional development is already under way. The good news is that most districts do indeed provide technology-related professional development on a wide range of topics. However, most of the professional development that teachers received in 2006–07 (whether funded by EETT or not) did not appear to incorporate these seven research-suggested characteristics (see Exhibit 9 in the main text). This finding suggests an important opportunity to improve the quality of professional development to ensure effective experiences that can transform teaching.

*GPRA* measures related to professional development, technology integration and student technology literacy all require (a) state-based infrastructures that can rigorously measure teacher and student technology proficiency and (b) district capacity to “fully and effectively” integrate technology. Although some progress is certainly evident in particular states and districts, the majority of states still do not have the definitions, measures and processes in place that would allow for reliable estimates within and across states.

If one moves beyond specific *GPRA* measures to consider the EETT program and educational uses of technology more broadly, trends do emerge. Schools across the country are increasingly equipped with high-speed Internet access. Between 2005 and 2007, more teachers reported using technology frequently, but teacher reports about student technology use in classrooms were relatively unchanged. If the full potential of educational technology is to be realized, then educational policy must continue to encourage robust student uses of technology.

# 1. Introduction

The Enhancing Education Through Technology (EETT) program is the most comprehensive federal program that supports improving student academic achievement in elementary and secondary schools through the use of educational technology. The EETT program also seeks

- to ensure that every student is technologically literate by the time he or she finishes the eighth grade, regardless of the student's race, ethnicity, gender, family income, geographic location or disability, and
- to encourage the effective integration of technology resources and systems with teacher training and curriculum development to establish research-based instructional methods that can be widely implemented as best practices.

To accomplish these goals, the program, which is administered by the U.S. Department of Education, provides funds by formula to states to promote access to educational technologies, to provide technology-related teacher professional development, to integrate technologies in ways that improve students' academic preparation, and to conduct rigorous program evaluations. States allocate funds to local districts through competitive and formula grant processes (see Appendix A). In FY 2008, the program was funded at approximately \$267 million. From its inception in FY 2002 through FY 2008, the EETT program provided approximately \$3.4 billion in funding for educational technology.

The EETT program is part of the *No Child Left Behind Act (NCLB)* of 2001 and, like other elements of *NCLB*, targets "high-need school districts." High-need districts need to meet two criteria, as defined in the legislation. To qualify for high-need status, districts must serve large numbers or percentages of low-income students and either serve one or more schools in need of academic improvement or have a substantial need for assistance in acquiring or using technology. Schools "in need of academic improvement" (also identified as "in need of school improvement") are defined in *NCLB* as schools that receive federal Title I funds (which are allocated based on the percentage of students from low-income families) that have not made state-defined adequate yearly progress (AYP) for two consecutive school years. There is no legislative definition of "technology need," and states develop their own criteria for this standard.

## Study Purpose

The National Educational Technology Trends Study (NETTS) examines the implementation of the EETT program and educational technology use in states, districts and schools receiving funds from this program. It further provides nationally representative statistics regarding the use of educational technologies in all public elementary and secondary schools across the country, not just those receiving EETT funds.

The purpose of this report is to provide descriptive information about education technology practices related to the core goals and strategies of the EETT program. It provides data and analysis related to four of the five issues targeted by the EETT program's performance objectives, as established by the U.S. Department of Education to meet the requirements of the *Government Performance and Results Act (GPRA)* of 1993. These performance objectives

address each of the following EETT program priorities: teachers’ and students’ access to technology, technology-related professional development, technology integration, and student technology literacy (Exhibit 1).<sup>11</sup> Additional *GPRA* measures address the operational efficiency of the program and are outside the scope of this report.

**Exhibit 1. GPRA Indicators for EETT**

<b>GPRA Topic</b>	<b>GPRA Objective</b>	<b>GPRA Measure</b>
Technology access	To help ensure that students and teachers in high-poverty, high-need schools have access to educational technology comparable with that of students and teachers in other schools	The percentage point difference in Internet access between classrooms in high- and low-poverty schools
Technology-related teacher professional development	To provide professional development opportunities for teachers, principals and school administrators to develop capacity to effectively integrate technology into teaching and learning	The percentage of teachers who meet their state technology standards
Technology integration	[To encourage districts to] fully integrate technology into the curricula and instruction in all schools to enhance teaching and learning	The percentage of districts receiving Educational Technology State Grants funds that have effectively and fully integrated technology
Student technology literacy	[To increase] the percentage of students who meet state technology literacy standards by the end of the eighth grade	The percentage of students who meet state technology standards by the end of the eighth grade

**Exhibit reads:** Minimizing the gap in teacher and student access to educational technology between high-poverty and other schools is one of four GPRA objectives developed for the EETT program. Progress toward this objective is measured by the percentage point difference in Internet-access in classrooms in high- and low-poverty schools. Data source: U.S. Department of Education (2007a).

Within program guidelines, districts have flexibility in spending the majority of their EETT funds. This flexibility includes the option to combine EETT monies with other sources of funds such as federal E-rate, Title I and other programs as well as with funds from state technology programs, capital bonds and private investments. Although the flexibility of the EETT program has important advantages for grantees, it complicates efforts to trace the specific uses of EETT funds in districts and schools. In recognition of the difficulty of tracing accurately the use of EETT funds at the school level, the *GPRA* objectives for EETT concern the priorities central to

<sup>11</sup> *GPRA* is designed to reduce government waste and inefficiency by encouraging programmatic strategic planning and systematic reporting of performance measures related to program goals.

the program—technology access, teacher professional development, technology integration, and student technology literacy—rather than use of funds per se. The NETTS evaluation and this report have been structured around these priorities. Information concerning EETT program administration and distribution of funds to districts can be found in Appendix A.

Because there are many sources of support for educational technology at the federal, state and local levels, the report’s findings should not be interpreted as representing the effect of EETT.

## Conceptual Framework for EETT

The conceptual framework for EETT (see Exhibit 2) illustrates the intended relationship between EETT investments and advances for students, including increased student technology literacy and, ultimately, student academic achievement. Specifically, this framework describes the expected relationships between investments in hardware, software and the Internet; support for technology-related teacher professional development; and the attainment of EETT goals. The framework suggests that increases in access and professional development are directed at technology integration, which is the mechanism through which improvements in students’ technology literacy and increases in students’ academic achievement may be realized.<sup>12</sup>

### Funding for Educational Technology

On the left side of the conceptual framework is **EETT funding**, shown as a complement to **other educational technology funding**. Part of the challenge associated with evaluating the EETT program is that it does not provide a defined set of goods or services. Rather, it is a funding source, which, as shown in the framework, states and districts can use to purchase or develop a wide variety of supports. In addition, as already mentioned, EETT program funds can be combined with other funds in districts and schools. In places with few or no additional funds for technology, EETT’s role is likely to be more evident than in places with many additional sources because districts with many sources of funding may use EETT money to support existing programs and operations not explicitly identified as part of the EETT program.

### Program Inputs

EETT provides direct funding for **professional development** and for **access to hardware, software and technical support** that affect the types and uses of technologies that teachers and students have available to them in schools. The EETT legislation requires that districts spend at

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<sup>12</sup> In general, the purpose of a conceptual framework is to pictorially represent how resources and activities are intended to achieve program objectives and goals. The conceptual framework is included in this report to help orient readers to the conceptual linkages between activities that are funded by the EETT program and therefore are addressed in this report. Use of conceptual frameworks for this purpose is consistent with mainstream evaluation practices. Coffman (1999) describes a conceptual framework (also called a “logic map” or “conceptual model”) in the following way: “[It] illustrates a program’s theory of change, showing how day-to-day activities connect to the results or outcomes the program is trying to achieve. Similar to a flowchart, it lays out program activities and outcomes using boxes and, using arrows to connect the boxes, shows how the activities and outcomes connect with one another.” (p. 2). The conceptual framework should not be construed to imply or otherwise indicate actual effects of the EETT program.

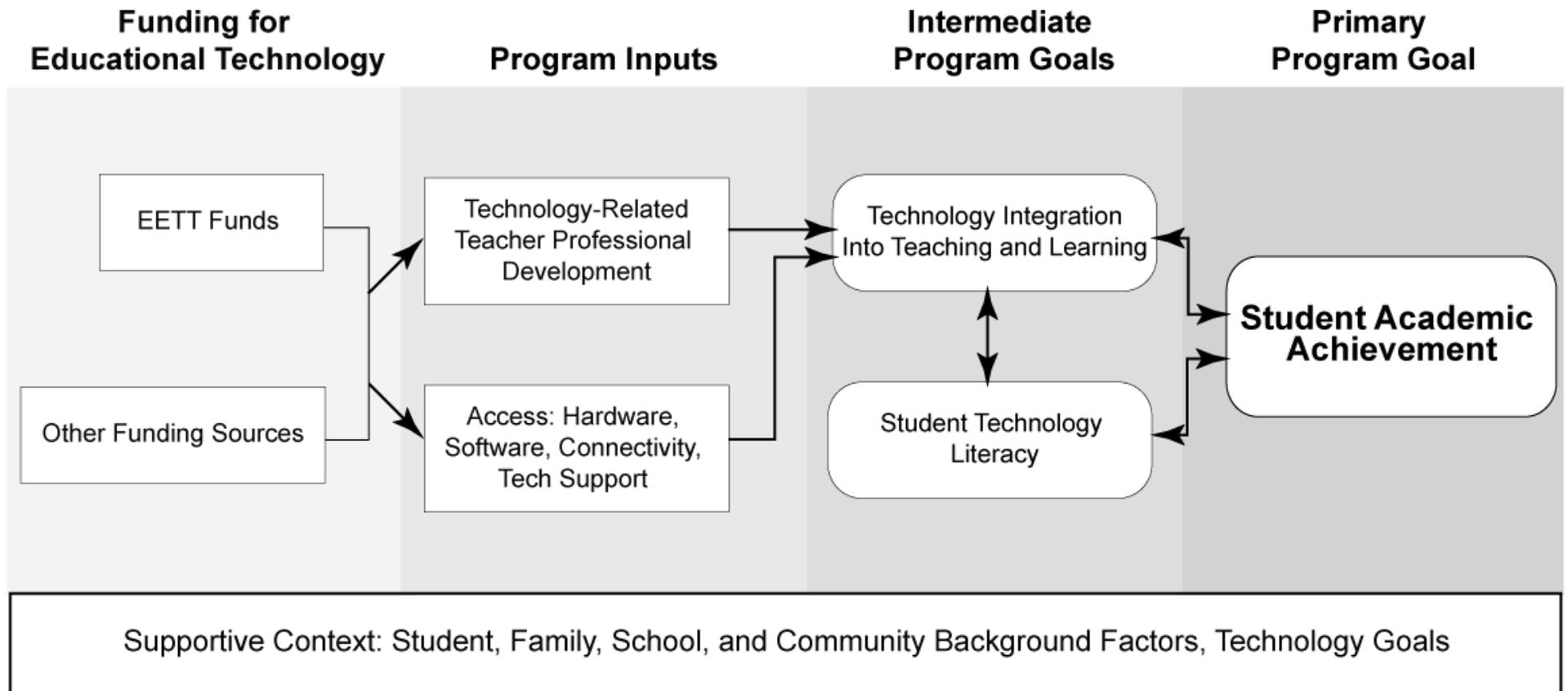
least a quarter of their EETT dollars on technology-related professional development, unless they can show that they already offer substantial technology-related teacher professional development.

### **Intermediate Program Goals**

The framework shown in Exhibit 2 suggests that the EETT program has three goals: technology integration into teaching and learning, student technology literacy, and improved student academic achievement. Although student academic achievement is arguably the most important of these three outcomes, it is addressed last because achieving improved academic achievement through technology use relies to some extent on accomplishing the other two goals.

**Technology integration in teaching and learning** is the principal mechanism through which technology can contribute to students' academic achievement. Mere access to technology is not enough to influence student academic outcomes. Rather, technology must be used in ways that support curricular goals and give students opportunities to use technology in their learning. As one report from the National Research Council found, "In general, technology-based tools can enhance student performance when they are integrated into the curriculum and used in accordance with knowledge about learning.... But the mere existence of these tools in the classroom provides no guarantee that student learning will improve; they have to be part of a coherent education approach" (Bransford, Brown and Cocking 2000, 216). Technology integration can take a variety of forms, including assessments embedded in computer-based activities; administrative software for teachers; computer-based lesson plans and assignments that are available anytime, anywhere; research-based educational software for students; distance education; and a plethora of other tools and resources available online or offline.

Exhibit 2. Conceptual Framework for EETT



**Exhibit reads:** In the conceptual framework for EETT, funding for educational technology is used for professional development and technology access to achieve intermediate goals that enable attainment of the primary program goal—student academic achievement.

Although student academic achievement is the ultimate outcome not only for EETT but also for *NCLB* as a whole, the proximal student outcome for EETT is **student technology literacy**. Student technology literacy includes concepts related to factual and conceptual knowledge about technology, critical thinking and decision making, and technical capabilities (National Research Council 2006), and this knowledge is also sometimes referred to as “21st-century skills” (see, for example, Partnership for 21st Century Skills, 2008). These skills allow students to use technology “to collaborate, to communicate, to solve problems, to create, and to continue to learn” (Kozma 2005, p. 1)). In places where students are not exposed to technologies at home or in their community, the role of schools in developing technology literacy is particularly important because schools may be the only places where these students have an opportunity to become familiar with computers and the Internet.

### **Primary Program Goal**

**Improved academic achievement**<sup>13</sup> can potentially result from the use of technology in two ways. First, the integration of technology can lead to experiences that help students learn better and faster, including test preparation activities and formative assessment, individualized instruction, and more engaging curriculum. Second, as students develop technology literacy, they also can learn to access and analyze information, an important skill that can benefit students in higher education and the labor market. As students develop critical-thinking skills, their capacity to engage and succeed in formal and informal educational environments can potentially increase.

### **Supportive Contexts**

Although **student, family, school and community factors**, including students’ access to technology at home, are not addressed directly through the NETTS evaluation, these factors nonetheless directly affect the funding available for educational technology and the degree to which students come to school prepared to use technology effectively. These factors include the socioeconomic status of the community that a school serves and the degree to which parents and other community members are themselves technologically literate and value technological abilities. In addition, technologically savvy students and families are able to provide nonfinancial supports such as technical support and leadership, which may not be available in all places.

### **Principal Data Sources**

The main sources of data for this report are three surveys administered in 2007: one at the state level (state technology directors), one at the district level (district technology coordinators) and one at the classroom level (teachers). Respondents were asked about educational technology activities in school year 2006–07. The survey of state educational technology directors was conducted online with 50 states, the District of Columbia, and Puerto Rico, and the survey response rate was 100 percent.<sup>14</sup> A nationally representative sample of 1,039 district technology coordinators received the district survey, and 94.3 percent of them responded. The teacher survey was administered to a random sample of 2,509 teachers, clustered within the sampled districts,

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<sup>13</sup> An exploration of the effect of technology on student academic achievement is outside of the scope of the NETTS evaluation, although this effect remains central to the purposes of the EETT program.

<sup>14</sup> These 52 respondents are referred to as “states” throughout this report.

and had a response rate of 85.6 percent. Comparable data gathered through NETTS surveys of states in winter 2003–04 (about activities in school year 2002–03), of districts in spring 2005 (about activities in school year 2003–04), and of teachers in fall 2005 (about activities in school year 2004–05) are also used in analyses examining change over time for key educational technology indicators.

In addition to providing national estimates related to educational technology in elementary and secondary schools, the report compares responses for high- and low-poverty districts and teachers in high- and low-poverty schools to address the focus of the EETT program on the needs of high-poverty schools and districts. High-poverty schools are defined in this report as schools that were in the top poverty quartile of schools in the nation; low-poverty schools are defined as schools in the bottom two poverty quartiles, as indicated by the percentage of students eligible for free and reduced-price lunch (FRPL) in 2004–05. This conservative approach is less likely to find statistically significant differences between high- and low-poverty groups than an approach comparing the 25 percent of schools serving the most children in poverty and the 25 percent of schools serving the fewest. Additional information concerning data sources and analyses is available in Appendix B.

### **Organization of This Report**

This report is organized around the *GPRA* objectives enumerated above. Two of these objectives represent inputs to the educational system: (a) goods and services that increase access to technologies in schools and (b) technology-related teacher professional development. Data pertaining to these objectives are presented first, followed by data concerning two legislative goals of the program: (a) integration of technology into teaching and learning and (b) student technology literacy. An examination of technology’s effect on student academic achievement, the primary goal of the EETT program, is beyond the scope of this report.



## 2. Technology Access

One of the *GPRA* objectives for the EETT program is “to help ensure that students and teachers in high-poverty, high-need schools have access to educational technology comparable to that of students and teachers in other schools.” Measures of technology access have historically relied on broad indicators such as the number of computers in a school or whether the school has any Internet access. In terms of these broad indicators, nearly universal technology access had been achieved by the time the EETT program commenced. There has been virtually no difference in *school* access to the Internet by school poverty level since 1999 (Parsad and Jones 2005). By fall 2005, nearly 100 percent of public schools in the United States had access to the Internet (Wells and Lewis 2006).

Although these broad indicators of technology access were useful in the early stages of technology acquisition, they do not directly address the availability of technology for instructional purposes. Evaluation of the EETT program required more fine-grained measures of technology access related to student and teacher use. The *GPRA* technology access measure for the EETT program is “the percentage point difference in Internet access between *classrooms* in high- and low-poverty schools.” The text below also addresses *high-speed* Internet access in classrooms as a useful refinement of the *GPRA* measure because many of today’s instructional uses of the Internet require bandwidth that would be unmanageable at dial-up speeds. “High-speed” Internet access is defined by the Federal Communications Commission as “access [to] the Internet and Internet-related services at significantly higher speeds than those available through ‘dial-up’ Internet access services.”<sup>15</sup>

### Trends in Internet Access

In 2007, 63 percent of teachers reported that students had high-speed Internet access in their classrooms, an increase of 9 percentage points from 2005; high- and low-poverty schools had similar levels of high-speed access in both 2005 and 2007.

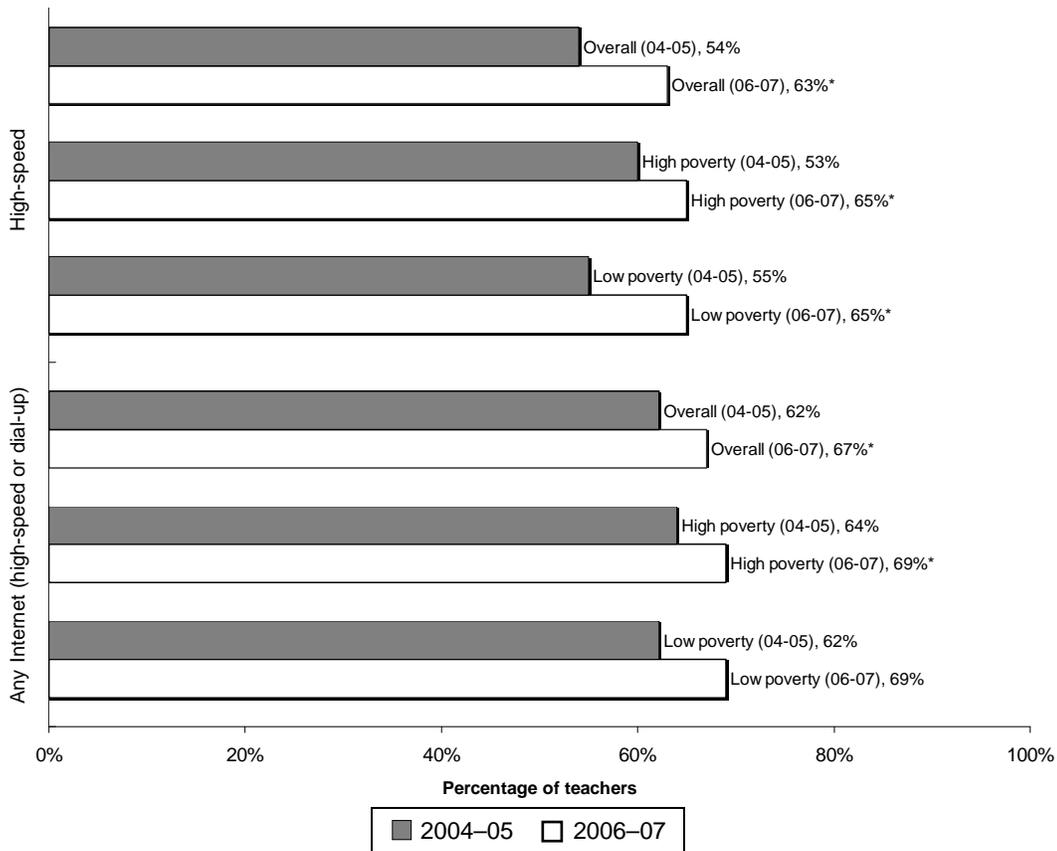
From 2004–05 to 2006–07, there was a statistically significant gain overall in teacher reports of high-speed Internet access for students in classrooms, with almost 10 percent of teachers gaining high-speed Internet access in their classrooms in this two-year span (see Exhibit 3). According to NETTS Teacher Survey data, 54 percent of teachers reported that students had high-speed Internet access in their classrooms in 2004–05. By 2006–07, 65 percent of teachers reported that high-speed Internet access was available for student use.<sup>16</sup>

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<sup>15</sup> See <http://www.fcc.gov/cgb/consumerfacts/highspeedinternet.html> (accessed on November 3, 2008). On the 2007 teacher survey, teachers were given examples such as cable, DSL and wireless.

<sup>16</sup> These estimates may appear lower than other reports (see, for example, NCES 2006). The source of the differences between NETTS data and NCES data specifically can be explained as follows. First, NCES data address “instructional rooms,” including libraries, computer labs, etc. The data reported here speak directly to a teacher’s primary classroom. In addition, the data reported here refer specifically to student access, which is not addressed by the NCES report.

**Exhibit 3. Student Internet Access in Classrooms, as Reported by Teachers (School Years 2004–05 and 2006–07)**



**Exhibit reads:** Student access to high-speed Internet connections in classrooms increased by 9 percentage points between 2004–05 and 2006–07.

\*  $p < .05$  (significant difference from 2004–05).

Data sources: NETTS 2005 AND 2007 Teacher Surveys.

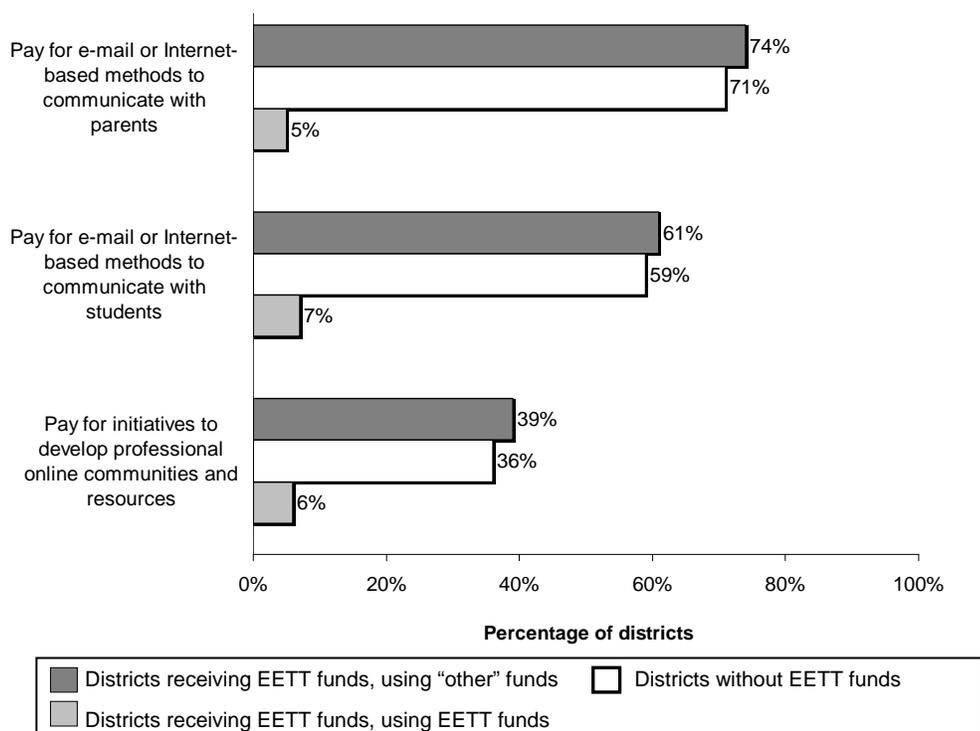
Since school-level poverty status was not a significant predictor of high-speed Internet access, the NETTS teacher survey data were augmented with data from the U.S. Department of Education’s Common Core of Data (CCD) to examine the impact of other school characteristics. The analysis found differences associated with the grade level at which teachers worked. Seventy-two percent of teachers in elementary grades, compared with 55 percent in middle school grades and 49 percent in high school grades, reported having high-speed Internet access within their classrooms.<sup>17</sup> Differences in subject taught by teacher and in school location (rural, suburban, urban) were not significant predictors of classroom Internet access.

<sup>17</sup> These differences were significant at the 99 percent level.

In terms of another technology access measure, student access to computers, teachers in high-poverty and low-poverty schools reported similar access patterns for 2006–07, with the exception of the availability of laptop computers for student use. Although 37 percent of teachers nationally reported that their students had access to laptops in their schools, there was a gap of 10 percentage points between student access to laptops in high-poverty schools (32 percent) and student access in low-poverty schools (42 percent).<sup>18</sup>

Although the fact that no gap in high-speed Internet access exists among all schools is a positive finding from the standpoint of one of EETT’s *GPRA* measures, the role of the EETT program specifically remains unclear. Relatively few districts that received either formula or competitive EETT grants in 2006–07 reported using EETT funds to pay for purchases related to Internet access, compared with districts that did not receive EETT funds (see Exhibit 4). Relatively low percentages of districts receiving EETT funds used their EETT funds specifically to pay for e-mail or Internet-based methods of communication, presumably because they had other funding sources for these activities. It is possible that more districts invested EETT funds to improve technology access earlier in the program, but data to address this issue are not available.

**Exhibit 4. District Purchases Related to Internet Access (School Year 2006–07)**



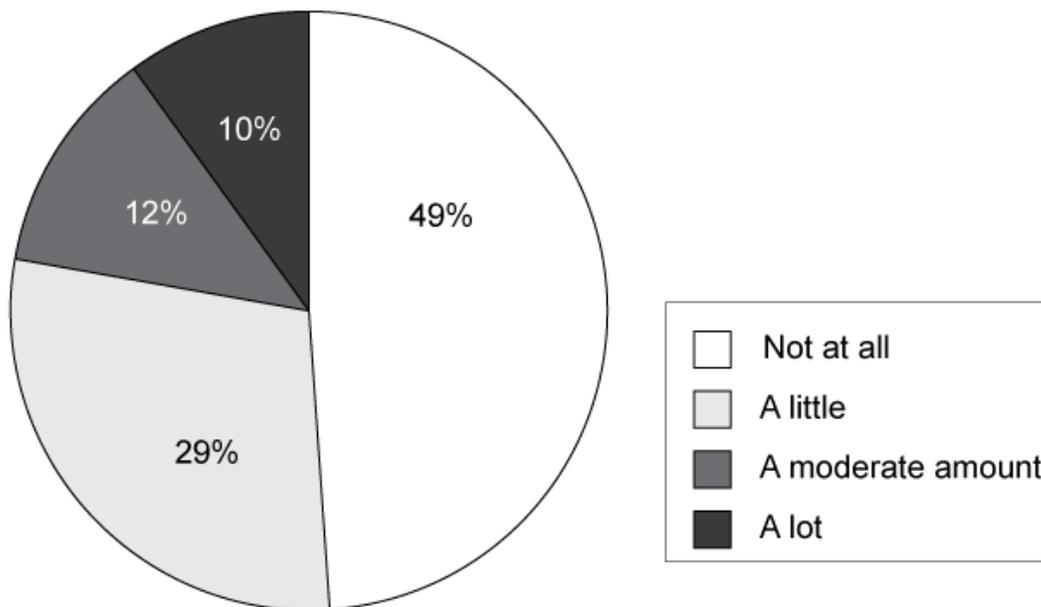
**Exhibit reads:** Although about 70 percent of districts report paying for e-mail or Internet-based methods to communicate with parents, only 5 percent of districts receiving EETT funds report using EETT funds for this purpose.

Data source: NETTS 2007 District Survey.

<sup>18</sup> This difference was significant at the 99 percent level.

Nearly half of teachers across the country indicated that they experienced *no* barrier in the form of slow or unreliable Internet connections during 2006–07 (see Exhibit 5). Relatively few teachers (10 percent) indicated that inadequate Internet access was a *significant* obstacle to their use of technology. Looking at it from the equity perspective, there was no statistical difference in reports from teachers in high- and low-poverty schools concerning the degree to which poor Internet access or service quality created a barrier to technology use.

**Exhibit 5. Degree of Barrier Created by Slow or Unreliable Internet Connections, as Reported by Teachers (School Year 2006–07)**



**Exhibit reads:** About half of all teachers reported that slow or unreliable Internet access did not present any obstacle to their use of technology in 2006–07; 10 percent reported that slow or unreliable Internet access hindered their use of technology “a lot”; 12 percent reported that it hindered a moderate amount; and 29 percent reported that it hindered a little.

Data source: NETTS 2007 Teacher Survey.

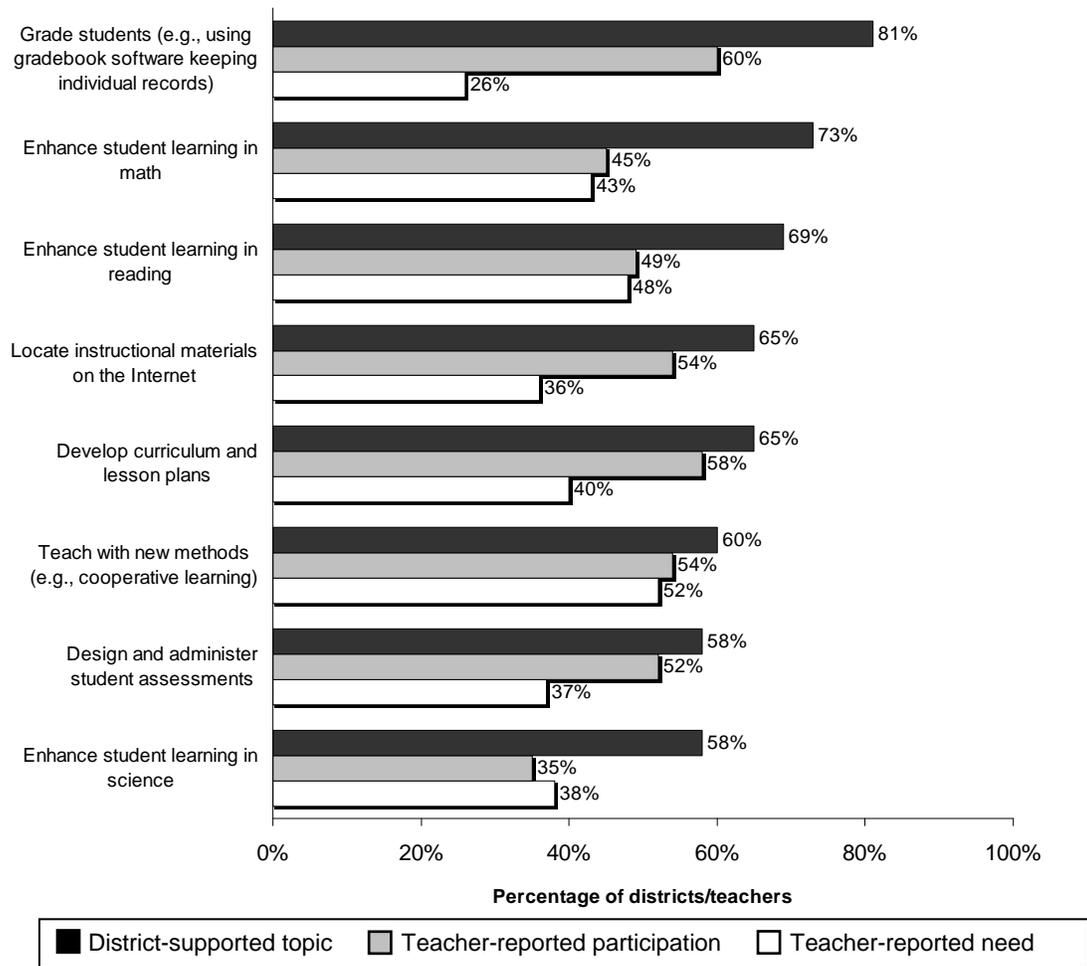
## Summary

In summary, student access to the Internet in classrooms was similar across high-poverty and low-poverty schools, according to teachers’ survey responses in 2004–05 and 2006–07. Similarly, computer access in the classroom was nearly equivalent across high- and low-poverty schools, with the exception of laptops, which may reflect differences in the ways that teachers in these schools used computers with their students. Although only a small proportion of districts receiving EETT funds reported using these funds for technology access, teachers in high- and low-poverty schools indicated similar satisfaction with their degree of access. Data from both 2004–05 and 2006–07 indicate that the *GPRA* objective of equitable Internet access in classrooms seems to have been accomplished.

### 3. Technology-Related Teacher Professional Development

A large body of literature addresses the need to support teachers' initial attempts to integrate technology into instruction (Brinkerhoff 2006; Donnelly et al. 2002; Ertmer 1999; Franklin 2007; National Center for Education Statistics 2002). Nationally, the majority of districts surveyed by NETTS reported providing professional development to support teachers' integration of technology during 2006–07. More than two-thirds of EETT funded districts reported providing technology-related professional development on using technology for student grading through use of gradebook software or other methods to keep individual records (81 percent), enhancing student learning in mathematics (73 percent), and enhancing student learning in reading (69 percent) (see Exhibit 6).

**Exhibit 6. District-Supported Technology-Related Professional Development (School Year 2006–07)**



**Exhibit reads:** Districts most frequently reported providing technology-related teacher professional development to support teacher use of technology to record student grades. Similarly, teachers most frequently reported participating in technology-related professional development related to maintaining student grades. Accordingly, using technology for grading students was the topic on which teachers were least likely to report that they needed additional training. Data source: NETTS 2007 District Survey and NETTS 2007 Teacher Survey.

Eighty-six percent of teachers reported participating in some form of technology-related teacher professional development in summer 2006 or school year 2006–07. Teacher data reinforced the widespread availability of professional development that addresses how to use technology for grading, with 60 percent of teachers (more than for any other single topic) reporting that they engaged in this type of professional development in 2006–07. The next three most often cited topics for the technology-related professional development that teachers had received were (a) the use of technology in developing curriculum and lesson plans (58 percent of teachers), (b) the use of technology to locate instructional materials on the Internet (54 percent of teachers), and (c) the use of technology to support new teaching methods (54 percent of teachers).

On many topics, regardless of the poverty level of the school, there were no differences in teacher responses, with four exceptions in which teachers in low-poverty schools were more likely to report particular types of professional development than teachers in high-poverty schools: (a) participation in professional development activities that introduced computers and the Internet generally (40 percent of teachers in low poverty schools, 32 percent of teachers in high-poverty schools); (b) participation in professional development that addressed how to use technology to enhance student learning in science (38 percent and 29 percent of teachers, respectively), (c) participation in professional development regarding the use of technology for grading (64 percent and 54 percent of teachers, respectively), and (d) participation in professional development regarding learning how to teach online courses (17 percent and 12 percent of teachers, respectively).

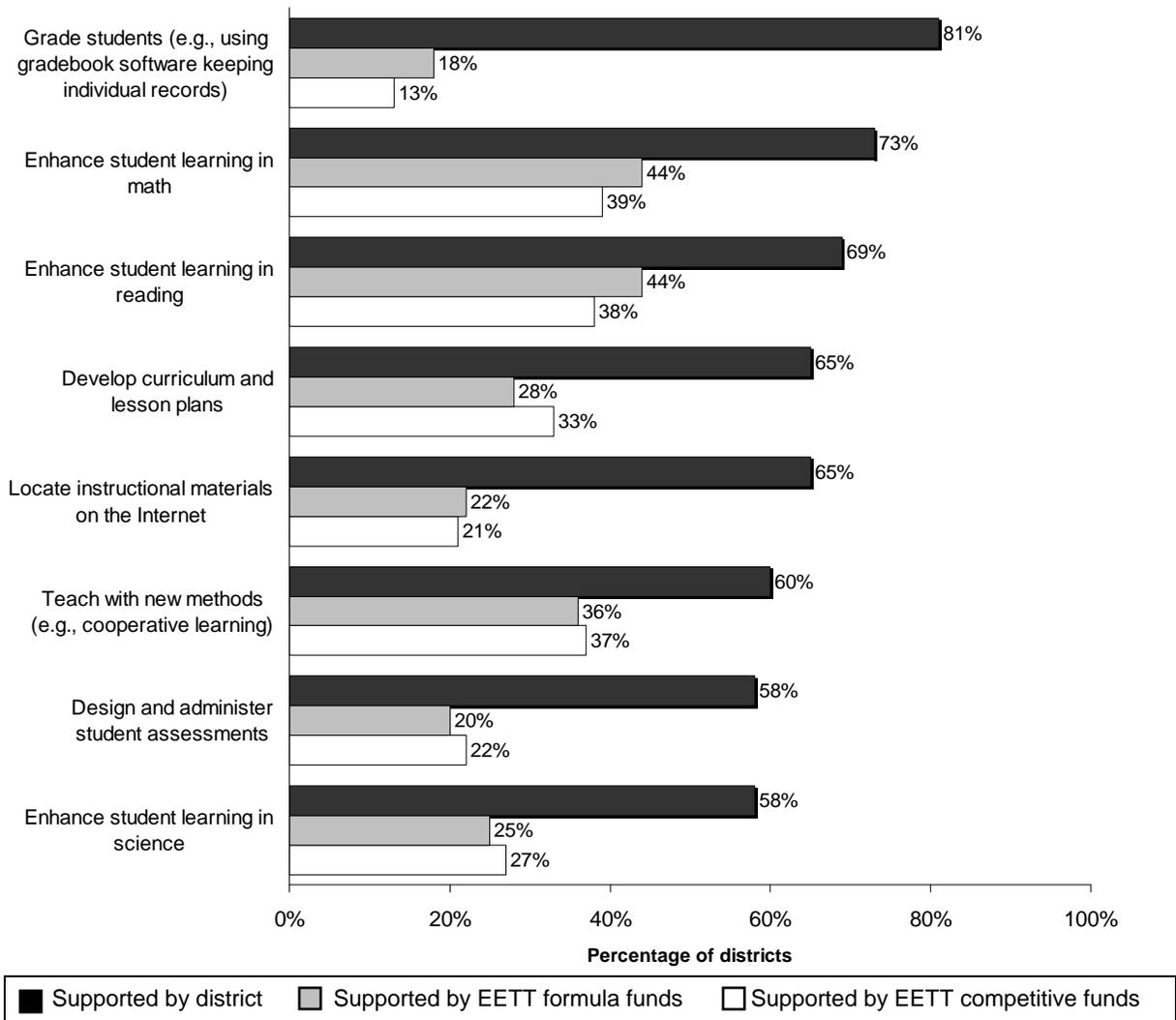
Exhibit 6 shows the topics on which districts reported providing technology-related professional development, those topics on which teachers said they received professional development, and those topics on which teachers reported needing more development. For the most part, the kinds of technology-related professional development that districts reported providing align well with the kinds of professional development that teachers indicated they received and with the areas in which teachers felt that more professional development would be beneficial. In a few instances, districts provided professional development in 2006–07 on topics in which markedly smaller percentages of teachers perceived a need for more training. For example, a vast majority of school districts (81 percent) invested in professional development for teachers on the use of technology for grading, and only 26 percent of teachers nationally indicated that they would benefit from more professional development in this area. In a similar vein, 65 percent of districts reported providing training on how to locate instructional materials on the Internet, and only 36 percent of teachers thought that they would benefit from more training in this area. One plausible explanation is that teachers no longer feel a need for training because districts have offered the training.

A very different situation emerges for more open-ended, complex topics related to instruction. Many teachers in the national sample indicated that they would benefit from additional professional development on technology-supported instructional approaches. More than half of teachers (52 percent) indicated that additional professional development regarding ways to use technology for new methods of teaching such as cooperative learning would be beneficial. The next most commonly cited topics for needed development were the use of technology to enhance student learning in reading (cited by 48 percent of teachers) and use of technology to enhance student learning in mathematics (43 percent). Interestingly, these more complex topics were among the most frequently reported uses of EETT funds by districts, with just more than one-third of districts using their formula or competitive funds to provide professional development on how to use technology to support new methods of teaching (see

Exhibit 7). More than a third of districts also reported using EETT funds to support professional development to enhance student learning in math, with 44 percent of districts using formula funds and 39 percent of districts using their competitive funds. Similar percentages used EETT funds to provide professional development to enhance student learning in reading, with 44 percent of districts using formula funds and 38 percent of districts using competitive funds.

These data suggest an opportunity for districts to begin reallocating resources away from professional development that focuses on routine uses of technology (such as for maintaining student grades) to support more professional development on instructional uses of educational technology. It stands to reason that for topics such as using a particular software program, which are relatively straightforward, a limited number of professional development sessions may suffice. However, teachers are likely to need multiple opportunities to engage with topics that could require fundamental changes in their instructional practices, for example, learning to use technology to support new teaching methods or to teach concepts in specific subject areas. As teachers develop some fluency in these more complicated topics, professional development that focuses on intermediate or even expert technology users may be particularly helpful. The barriers to professional development on more complex uses of technology include a limited body of research to guide practice regarding the particular forms of technology-based instruction that are effective.

**Exhibit 7. District Uses of EETT Funds to Support Professional Development  
(School Year 2006–07)**



**Exhibit reads:** Although 81 percent of districts reported supporting professional development to help teachers use technology to keep track of student grades, less than 20 percent of districts receiving EETT funds reported using EETT funds for this purpose.  
Data source: NETTS 2007 District Survey.

## **EETT Support for Technology-Related Teacher Professional Development**

A majority of districts reported using EETT funds to pay for professional development for teachers to assist them with the integration of technology into instruction. Findings from several case study districts suggest that support for technology-related professional development may be one of the EETT program's greatest contributions.

The EETT legislation recognizes the importance of professional development by requiring districts to spend at least a quarter of their EETT funds for this purpose.<sup>19</sup> When asked about which supports for educational technology the district provided with EETT funds, districts were most likely to report using funds to pay for professional development for teachers to assist them with integrating technology into math or reading (61 percent of districts receiving formula funds and 46 percent of districts receiving competitive funds) or to pay for professional development for teachers to assist them with integrating technology into other subject areas (53 percent of districts receiving formula funds and 49 percent of districts receiving competitive funds). During site visits to schools and districts in 2004–05, districts that received EETT funds consistently reported that EETT funding provided opportunities for professional development that focused on technology integration that might not have been possible without EETT funds. Case study districts often stated that these professional development opportunities were the greatest contribution of the EETT program.

## **Poverty-Related Differences in Technology-Based Professional Development Needs**

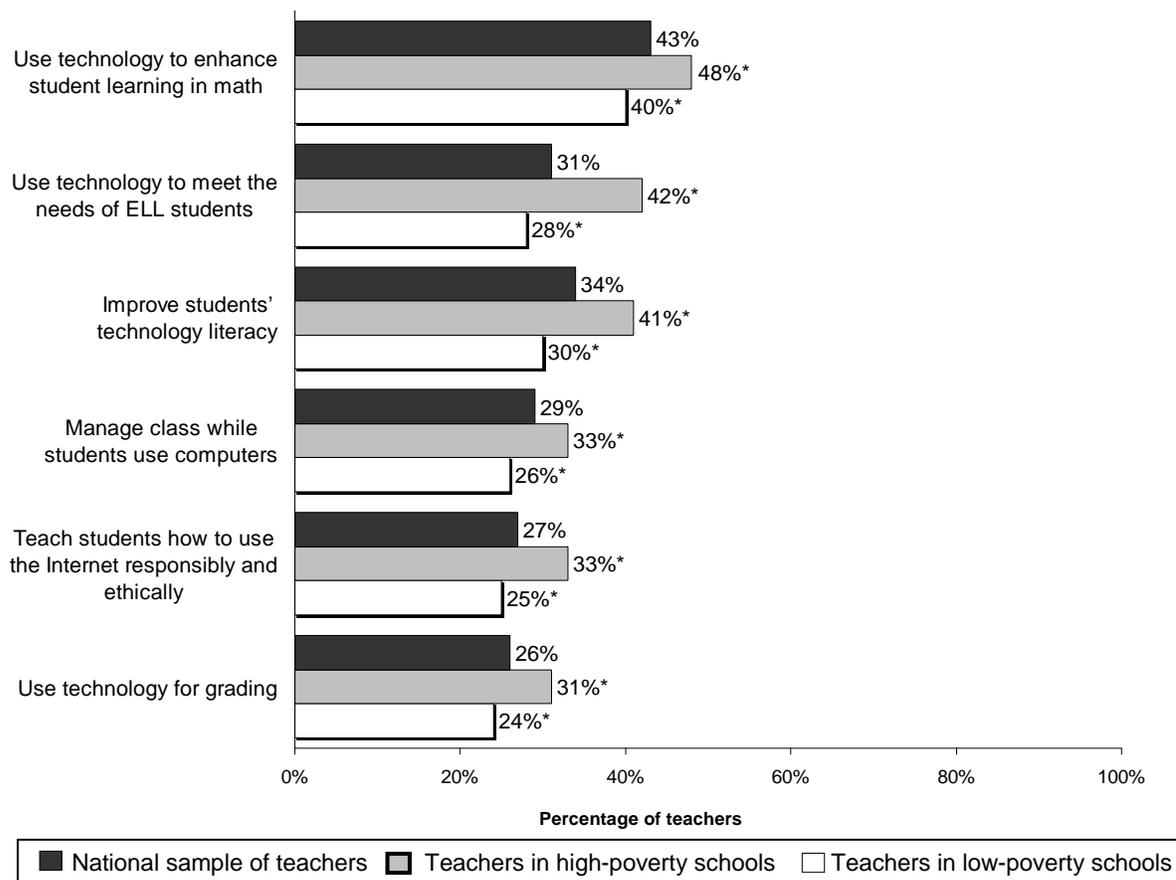
Teachers in high-poverty schools were more likely than teachers in low-poverty schools to report a need for additional training on the use of technology to meet the needs of English language learners (ELL students) and on ways to improve students' technology literacy.

In addition to examining perceived needs for additional technology-related professional development for teachers nationally, the study compared the perceived needs of teachers in high- and low-poverty schools. For the two most commonly cited professional development needs (i.e., using technology to support new teaching methods and to enhance student reading), there was no difference in teacher responses by the poverty level of the schools in which they taught. However, there were significant differences by poverty level in six other areas (see Exhibit 8). In all of these cases, teachers in high-poverty schools were more likely to feel the need for additional technology-related professional development than were teachers in low-poverty schools. The disparities between teachers in high-poverty schools and teachers in low-poverty schools were greatest with respect to (a) the use of technology to meet the needs of ELL students, an area in which 42 percent of teachers in high-poverty schools would like more training compared with 28 percent of teachers in low-poverty schools, and (b) ways to improve students' technology literacy (41 percent of teachers in high-poverty schools compared with 30 percent of teachers in low-poverty schools).

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<sup>19</sup> However, a state can waive this requirement for a specific district if that district documents that it is already providing required professional development in the integration of advanced technologies to all teachers in core academic subjects.

### Exhibit 8. Differences in Teacher-Reported Need for Technology-Related Professional Development in High- and Low-Poverty Schools



**Exhibit reads:** Nationally, 43 percent of teachers reported using technology to enhance student learning in math. Teachers in high-poverty districts were more likely to report needing additional professional development related to the use of technology to enhance student learning than teachers in low-poverty schools.

\* $p < .05$  (significant difference between teachers in high- and low-poverty schools)

Data source: NETTS 2007 Teacher Survey.

### Availability of High-Quality Teacher Professional Development

Teachers indicated that their “most useful” training experience in 2006–07 did not incorporate many research-suggested characteristics.

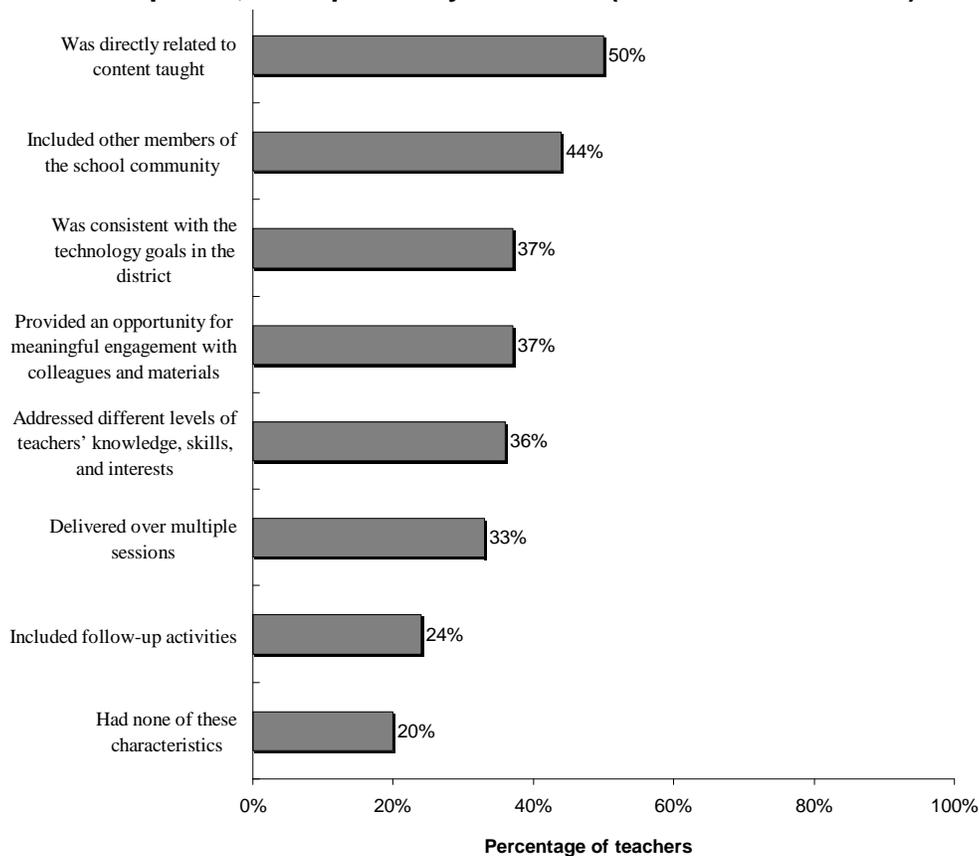
In addition to examining the topic areas of district-supported professional development, the study gathered data pertaining to the *quality* of that professional development. Based on a review of research, seven characteristics that are generally cited as elements of best practice were identified (Means et al. 2004): (a) relates to the content the teacher teaches; (b) includes other members of the school community; (c) is consistent with technology goals in the district; (d) provides an opportunity for meaningful engagement with colleagues and materials; (e) addresses different levels of teachers’ knowledge, skills, and interests; (f) delivered over multiple sessions; and (g) includes follow up activities.

Research on the effectiveness of teacher professional development suggests that technology-related training is most effective when it relates directly to the content that faculty teach, engages participants at their current knowledge and skill levels, is delivered over multiple sessions rather than in a single workshop, and offers follow-up activities (Gollub et al. 2002). Literature on professional development practices in general also suggests that teachers benefit more from professional development when they attend with other teachers from their schools. When teachers complete professional development together, they are more likely to support one another's work and reinforce their own professional development goals (McLaughlin and Talbert 1993). Additionally, professional development seems to be more effective when it aligns well with district technology goals and teachers' professional goals (Smith, Clark and Blomeyer 2005; Sweet et al. 2004). Finally, technology-related professional development that gives teachers active learning opportunities, including opportunities to meaningfully engage with colleagues and curricular materials, helps them more successfully develop their professional practice (Bransford, Brown and Cocking 2000).

Teacher and district survey responses suggest that what teachers considered the most useful technology-related professional development they received in 2006–07 did not incorporate many research-suggested characteristics. For example, although research suggests that professional development is most effective when delivered over multiple sessions, district-provided professional development on technology usually takes the form of conferences or instructor-led workshops, with 73 percent of districts reporting use of these formats for their technology-related professional development. Nevertheless, when reflecting on the most useful technology-related teacher professional development activity in which they had participated during summer 2006 or school year 2006–07, 80 percent of teachers indicated that this professional development experience had at least one of the research-suggested characteristics (see Exhibit 9). Although there is no research-based guidance that a certain number of these characteristics must be present, it stands to reason that professional development that has more of these features is likely to be better than those embodying few or none of the characteristics. Slightly fewer than one-third of teachers (32 percent) indicated that this professional development experience had four or more of the research-suggested characteristics. One in five teachers reported that their “most useful” training lacked all of the research-suggested features.

When describing their most useful technology-related professional development activity, the most commonly reported research-suggested professional development practice reported by teachers was that the training directly related to the content that participating teachers taught (50 percent). Forty-four percent of teachers reported that their most useful technology-related professional development included other participants from their schools. Other best practices in professional development characterized about one-third or fewer of the most useful technology-related professional development experiences described by teachers. There were no statistically significant differences between the responses of teachers in high-poverty schools and those in low-poverty schools, suggesting that the technology-related professional development that is provided is of similar quality, on average, regardless of the poverty level of the students that teachers are instructing. Issues of quality and intensity may reduce the overall efficacy of the technology-related training on instructional practices.

**Exhibit 9. Characteristics of “Most Useful” Technology-Related Professional Development, as Reported by Teachers (School Year 2006–07)**

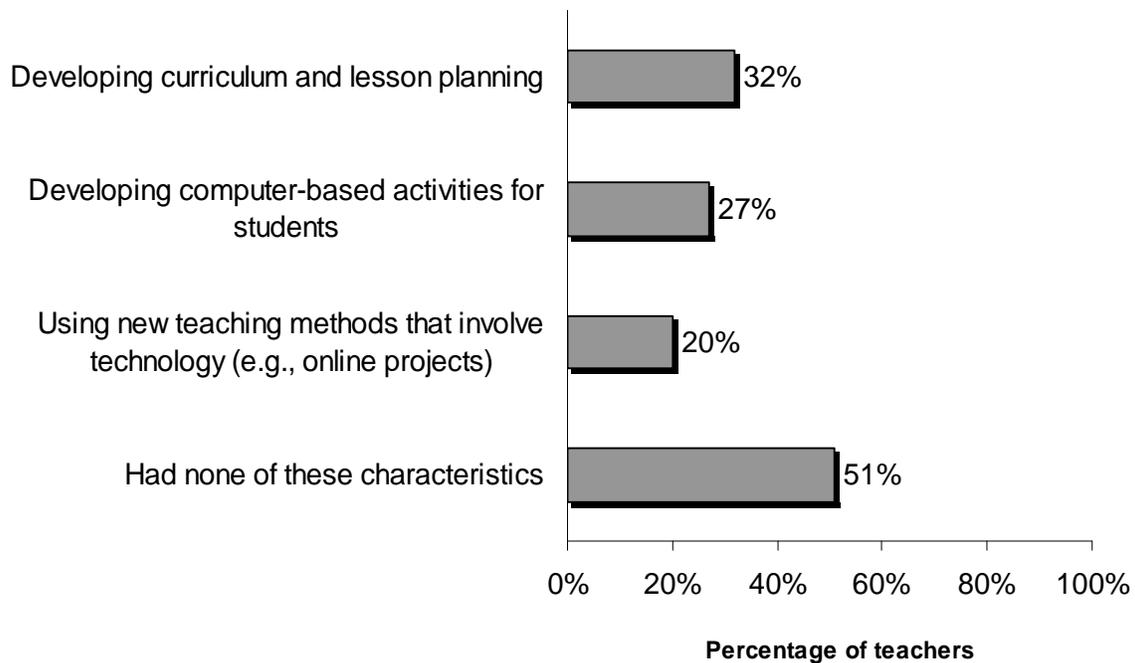


**Exhibit reads:** Fifty percent of teachers reported that their “most useful” technology-related professional development activity was related to the content they taught. Data source: NETTS 2007 Teacher Survey.

According to teachers, the technology-related professional development they received had some effect on their practices in 2006–07. Of the teachers who reported participating in professional development during summer 2006 or during school year 2006–07, more than one-third noted that their professional development had increased substantially their general knowledge of computers (37 percent) and general use of computers (42 percent), and a similar proportion (37 percent) said that their use of technology for classroom administrative tasks had increased substantially. Sixty percent of teachers reported a substantial increase in at least one of these three administrative areas. These teacher reports are consistent with the district-reported focus of professional development on administrative skills noted above. Fewer teachers reported that professional development had affected their *instructional practices*. A third or fewer of teachers reported that the training they had received had helped them to use technology as an instructional tool in ways such as developing curriculum and lesson planning (32 percent), developing computer-based activities for students (27 percent), or using new teaching methods

that involve technology, for example, online projects (20 percent) (see Exhibit 10).<sup>20</sup> Forty-nine percent of teachers indicated a substantial increase in one of these three instructional practices. The lower proportion of teachers reporting an effect of technology-related professional development on their instructional practices (compared with the more administrative types of tasks described above), coupled with the limited frequency of research-suggested characteristics of professional development activities, suggest a need for continued focus on the quality and relevance of technology-related professional development if the goal is to be realized of technology-supported increases in student academic achievement that is at the heart of the EETT program.

**Exhibit 10. Instructional Practices That “Increased Substantially” As a Result of Technology-Related Professional Development, as Reported by Teachers (School Year 2006–07)**



**Exhibit reads:** About one-third of teachers reported that their use of technology to develop curriculum and plan lessons had increased substantially as a result of their technology-related professional development.

Data source: NETTS 2007 Teacher Survey.

<sup>20</sup> Forty percent of teachers did not report a substantial increase in any of the three administrative practices compared with 51 percent of teachers who did not report a substantial increase in any of these three instructional practices.

## Technology Standards for Teachers

Only 27 states reported having minimum technology standards in place for teachers in 2006–07.

Having examined data relevant to the *GPRA* objective of providing professional development on the effective integration of technology for school staff members, this chapter turns now to the related *GPRA* measure—the proportion of teachers meeting their state’s technology standards. Technology standards identify the knowledge and skills that teachers need to be able to use technology effectively for instruction, and a well-aligned system includes supports and opportunities for professional development around topics covered in the standards. Over time, one would expect increasing numbers of teachers to meet technology standards through participation in technology-related professional development and related changes in teacher practice. Only 27 states (52 percent) had minimum technology competency standards for teachers in 2006–07. (Exhibit 15 at the end of this section provides a state-by-state summary of teacher technology standards and related assessment practices.)

## Topics Covered by Teacher Standards

Across states and districts, standards tend to include topics recommended by the International Society for Technology in Education (ISTE).

Among those states that had technology standards for teachers, there was a fairly large degree of similarity in the areas covered by the standards (see Exhibit 11). Most state standards covered topics related to the use of computers for: basic operations and concepts; planning and designing learning environments and experiences; teaching, learning and the curriculum; assessment and evaluation; productivity and professional practice; and social, ethical and human issues related to technology. This consistency in standards across states probably results from the fact that many states modeled their standards on the professional standards developed by ISTE, a nonprofit membership society.<sup>21</sup> More than three-quarters of the states with teacher standards reported that their standards adhere to the key topics established by ISTE.

Many states also had technology-related requirements to ensure that teachers had an opportunity to acquire technology skills. Twenty states reported preservice teacher requirements, including technology-related coursework or other professional development to help teachers use technology for instruction. Another two states planned to have a preservice requirement in place by the end of 2007–08. Fifteen states reported having certification requirements for teachers in place by 2006–07, and another five planned to have certification requirements in place by the end of 2007–08. Districts also develop technology standards. Although a lower proportion of districts than of states reported having technology standards for teachers in 2006–07 (35 percent compared with 52 percent of states), among those districts that had technology standards, a higher proportion reported addressing each of the topics outlined by ISTE.

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<sup>21</sup> ISTE is in the process of revising its teacher standards, with an expected release date of 2009.

**Exhibit 11. Components of Teacher Standards for Educational Technology  
(School Year 2006–07)**

Topic	ISTE-Recommended Teacher Standards  Teachers ...	Percentage of States Reporting Standards (No. of States)	Percentage of All Districts Reporting Standards <sup>a</sup>
<b>Basic operations and concepts</b>	<ul style="list-style-type: none"> <li>• demonstrate introductory knowledge, skills, and understanding of concepts related to technology.</li> <li>• demonstrate continual growth in technology knowledge and skills to stay abreast of current and emerging technologies.</li> </ul>	89% (24)	95%
<b>Planning and designing learning environments and experiences</b>	<ul style="list-style-type: none"> <li>• design developmentally appropriate learning opportunities that apply technology-enhanced instructional strategies to support the diverse needs of learners.</li> <li>• apply current research on teaching and learning with technology when planning learning environments and experiences.</li> <li>• identify and locate technology resources and evaluate them for accuracy and suitability.</li> <li>• plan for the management of technology resources within the context of learning activities.</li> <li>• plan strategies to manage student learning in a technology-enhanced environment.</li> </ul>	78% (21)	88%
<b>Teaching, learning and the curriculum</b>	<ul style="list-style-type: none"> <li>• facilitate technology-enhanced experiences that address content standards and student technology standards.</li> <li>• use technology to support learner-centered strategies that address the diverse needs of students.</li> <li>• apply technology to develop students' higher-order skills and creativity.</li> <li>• manage student learning activities in a technology-enhanced environment.</li> </ul>	89% (24)	90%
<b>Assessment and evaluation</b>	<ul style="list-style-type: none"> <li>• apply technology in assessing student learning of subject matter using a variety of assessment techniques.</li> <li>• use technology resources to collect and analyze data, interpret results, and communicate findings to improve instructional practice and maximize student learning.</li> <li>• apply multiple methods of evaluation to determine students' appropriate use of technology resources for learning, communication and productivity.</li> </ul>	78% (21)	85%
<b>Productivity and professional practice</b>	<ul style="list-style-type: none"> <li>• use technology resources to engage in ongoing professional development and lifelong learning.</li> <li>• continually evaluate and reflect on professional practice to make informed decisions regarding the use of technology in support of student learning.</li> <li>• apply technology to increase productivity.</li> <li>• use technology to communicate and collaborate with peers, parents and the larger community to nurture student learning.</li> </ul>	81% (22)	90%
<b>Social, ethical and human issues</b>	<ul style="list-style-type: none"> <li>• model and teach legal and ethical practice related to technology use.</li> <li>• apply technology resources to enable and empower learners with diverse backgrounds, characteristics and abilities.</li> <li>• identify and use technology resources that affirm diversity.</li> <li>• promote safe and healthy use of technology resources.</li> <li>• facilitate equitable access to technology resources for all students.</li> </ul>	78% (21)	88%
<b>Other<sup>b</sup></b>		30% (8)	6%

**Exhibit reads:** Basic operations and concepts was the most frequently cited topic among states and districts that had teacher technology standards.

<sup>a</sup> Percentages of districts are based on the 35 percent of districts that reported having teacher standards.

<sup>b</sup> The majority of states that selected "Other" indicated that standards were related to teachers' ability to use technology to improve instruction. One state placed special emphasis on teachers' ability to evaluate and implement assistive technologies. Another state followed ISTE standards but indicated "Other" because these had not been officially adopted by the State Board of Education.

Data source: NETTS 2007 State Survey and NETTS 2007 District Survey.

## Measuring Teachers' Attainment of Technology Standards

One-quarter of states reported aggregating statewide data regarding the percentage of teachers meeting state proficiency standards.

In terms of teachers' attainment of state technology standards, 11 states provided the percentage of teachers who met technology skill standards in 2005–06, the most recent year for which data were available at the time of the NETTS State Survey (see Exhibit 12). However, it is important to remember that, in some cases, not all teachers are required to participate in technology-related assessments. In addition, Connecticut reported a percentage based on a survey conducted by the Connecticut superintendents' organization. The variety of practices across states suggests that great caution is required in trying to aggregate percentages of teachers meeting technology standards across states. Reported percentages of teachers meeting technology skill standards ranged widely from eight percent of teachers who participated in professional development paid for with EETT funds in California to 100 percent of all teachers in Georgia and Virginia.<sup>22</sup> For the 11 states reporting data, the average percentage of teachers meeting standards was 61 percent.

As one might suspect from such a wide range of percentages across the states, the ways in which states assess teachers' skills vary greatly. Even among the two states reporting that 100 percent of teachers met state standards for technology competency, there is little consistency in assessment practices. Virginia allows local districts to develop the assessment, and results are reported to the state. Georgia requires all teachers to pass the *Computer Skills Competency Assessment*, which is available online as part of the teacher certification process. Exhibit 15 at the end of this chapter provides a state-by-state summary of how states are assessing teachers' technology competency.

As suggested above, some states leave the assessment of teachers' technology proficiency largely up to districts. For example, in Virginia and Connecticut, competencies are determined by each district. In Texas, schools are responsible for assessing teachers' proficiency and documenting progress on the Texas Teacher School Technology and Readiness Chart. All teachers are asked to document progress in meeting state standards.

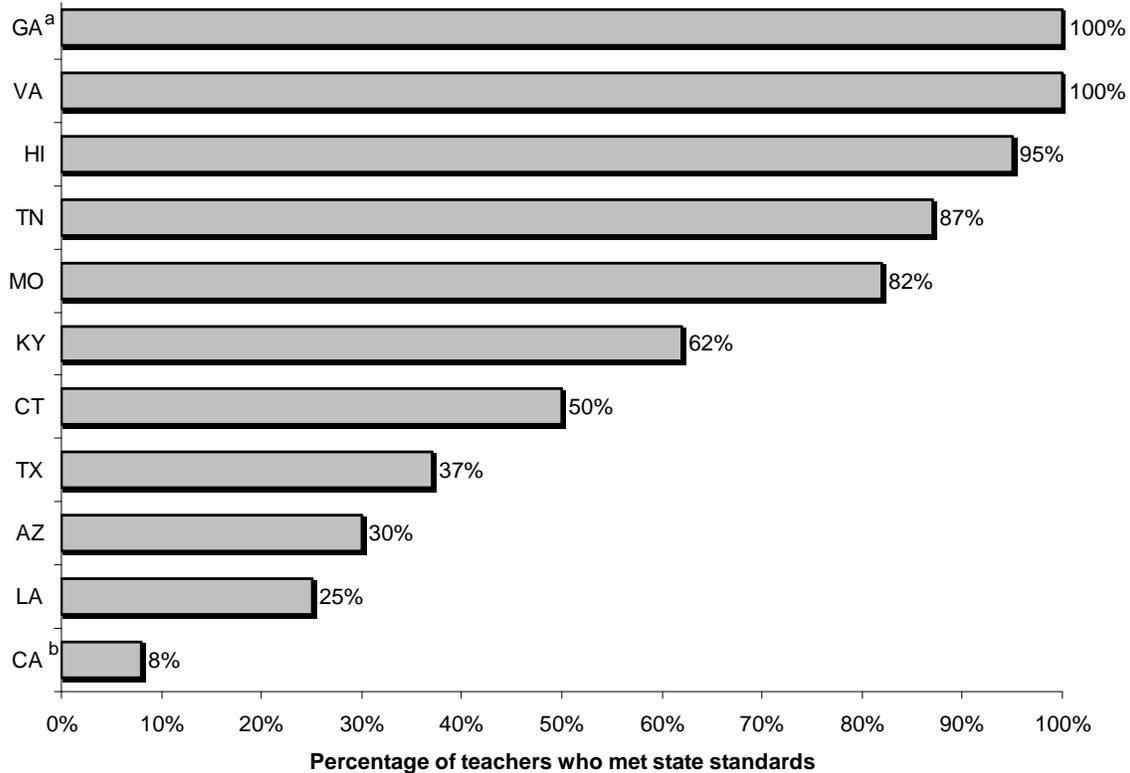
A few states reported that they regarded the training and assessment of teachers' technology skills as the responsibility of preservice or other teacher training programs. Under this expectation, it will be many years before all of a state's teachers go through a preservice program that includes technology preparation. In 2007, 51 percent of teachers reported that there was no requirement for teachers to demonstrate proficiency in using educational technology during their preservice training, and 37 percent of teachers reported receiving no introductory training course about computers and the Internet in their preservice training. Nearly half of teachers reported receiving no preservice training regarding ways to promote student technology literacy (48 percent), a significant goal of the EETT program, and 46 percent of teachers reported that they did not receive instruction regarding the uses of technology for student assessment in their preservice training. Not surprisingly, this lack of preservice training is

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<sup>22</sup> The California percentage is based on an average of the three proficiency types for which California reported: computer knowledge and skills (17 percent); using technology in the classroom (5 percent); and using technology to support student learning (3 percent).

particularly evident for teachers who have been teaching 15 or more years (48 percent of respondents). Whereas only 6 percent of new teachers reported that they did not receive preservice training on educational technology, 56 percent of teachers with 15 or more years of experience did not receive any preservice training regarding technology.

**Exhibit 12. State-Reported Data Regarding the Percentage of Teachers Meeting Technology Skill Standards (School Year 2005–06)**



**Exhibit reads:** Georgia and Virginia reported that 100 percent of their teachers met technology skill standards in school year 2005–06.

<sup>a</sup> Data for Georgia are as of June 2007.

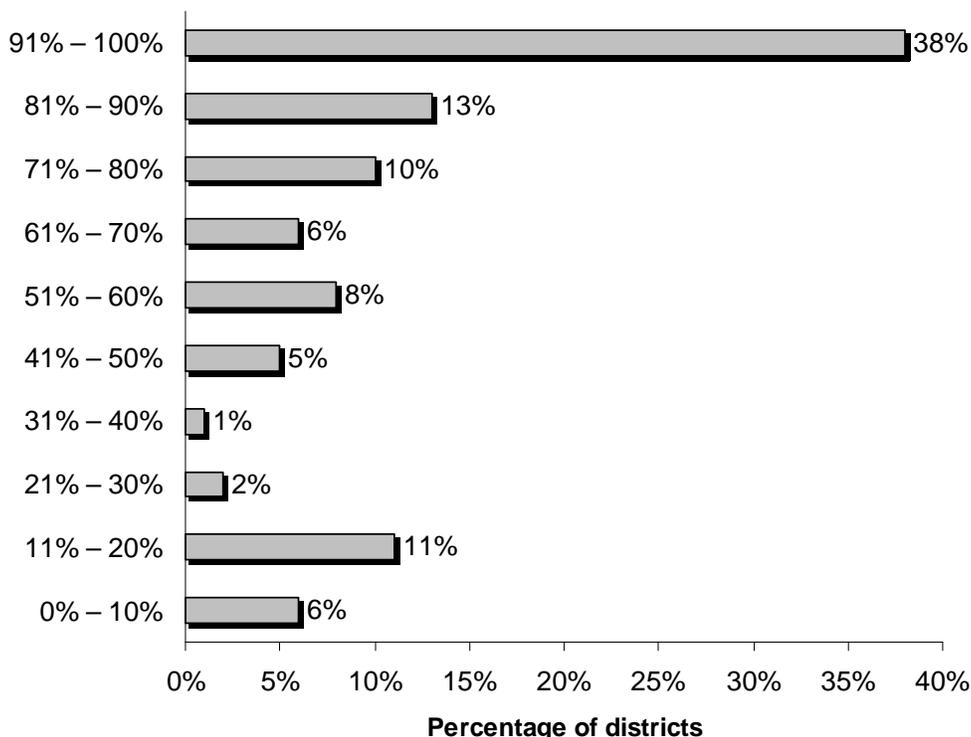
<sup>b</sup> California reported that all teachers who participated in professional development paid for with EETT formula and competitive funds must complete the state’s online EdTechProfile technology assessment profile every 12 to 18 months to self-assess their basic technology skills and integration skills. California reported the following proficiencies: computer knowledge and skills (17 percent), using technology in the classroom (5 percent), and using technology to support student learning (3 percent). The average of these three measures is reported in the exhibit.

Data source: NETTS 2007 State Survey.

As stated above, districts also reported having technology standards for teachers in 2006–07. Of the 35 percent of districts that reported having technology standards for teachers in 2006–07, 69 percent reported that they assessed (or planned to assess) whether teachers met technology standards. Some districts require teachers and administrators to demonstrate proficiency either by an assessment or through a collection of digital artifacts such as electronic lesson plans or student assignments. Other districts address teachers’ technological competency through administrator evaluations. Twenty-one percent of districts reported the percentage of teachers who met district proficiency standards. Those districts reported, on average, that 71 percent of their teachers met technology standards in 2005–06, the most recent year for which data were available at the time of the survey. District-reported percentages ranged from 0 percent to 100

percent. If multiple-item, reliable assessment of teachers were used, the data would be expected to be normally distributed (i.e. follow the pattern of a normal curve). However, the distribution of district-reported teacher proficiency rates did not follow this pattern (see Exhibit 13), which suggests caution in interpreting the data. The most common district-reported percentage of technology-proficient teachers was from 91 percent to 100 percent.

**Exhibit 13. District-Reported Percentages of Teachers Who Met District Technology Standards (School Year 2005–06)<sup>a</sup>**



**Exhibit reads:** Nearly two out of every five districts (38 percent) reported that between 91 and 100 percent of its teachers met district technology standards for teachers

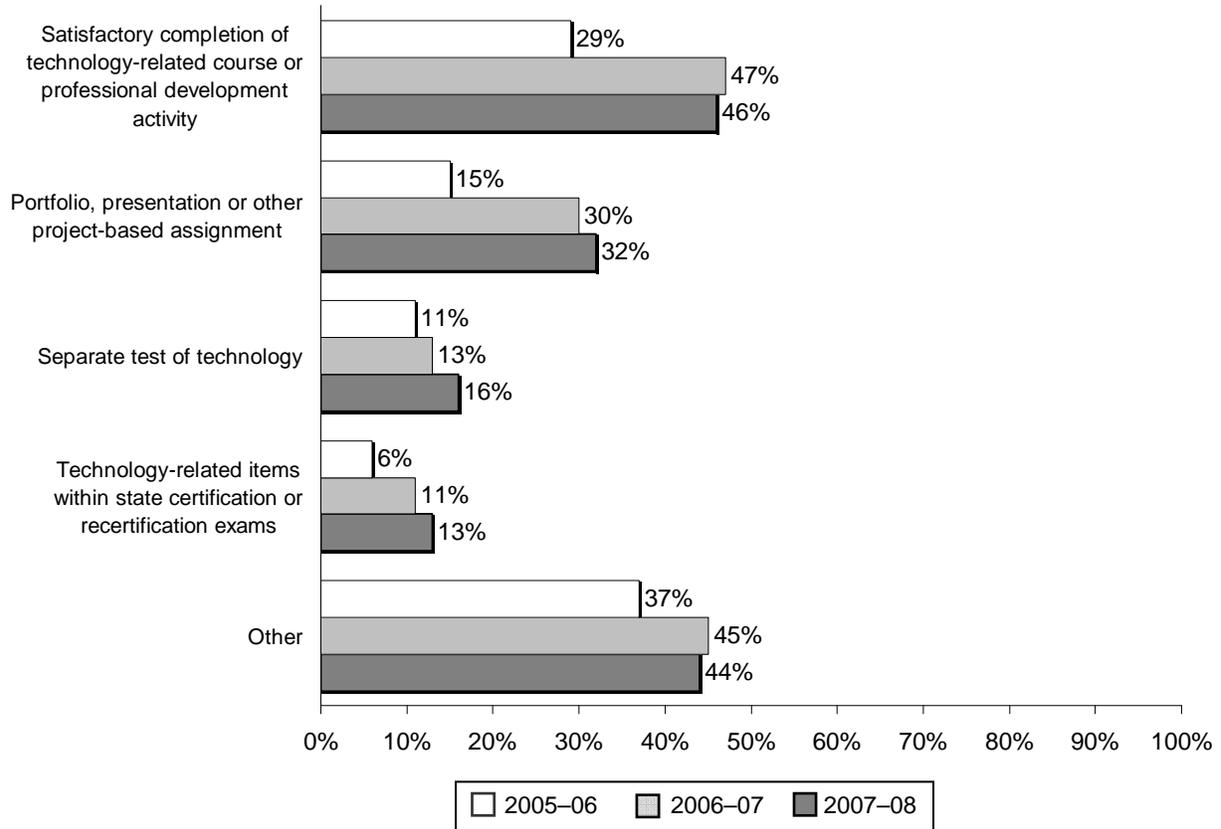
<sup>a</sup> Twenty-one percent of districts reported the percentage of teachers who met district technology standards.

Data source: NETTS 2007 District Survey.

Like states, districts vary in their choices concerning which teachers to assess and when to assess them. Just more than one-third of the districts that reported assessing whether teachers were meeting technology standards indicated that they assessed all teachers every year. Others assessed teachers when teachers sought certification or recertification (12 percent) or assessed teachers only at particular grade levels (14 percent) or for particular subjects (13 percent). Methods of assessment also vary (see Exhibit 14). Satisfactory completion of a technology-related course or professional development activity was the most common type of “assessment,” with 46 percent of districts expecting to have this requirement in 2007–08, up from the 29 percent that reported having this requirement in 2005–06. However, districts appear to be moving toward a more project-based approach of assessing teachers’ knowledge and skills. The number of districts expecting to require portfolios, presentations or other project-based assignments as evidence of teacher competency was expected to double in just one year. In 2007–08, 32 percent reported expecting to use this form of assessment, compared with the 15

percent of districts using this form of assessment in 2006–07. Only 12 percent of districts reported using a separate test of technology skills in 2005–06; 16 percent expect to use such a test in 2007–08.

**Exhibit 14. District-Based Methods for Assessing Teacher Technology Competency<sup>a</sup>**



**Exhibit reads:** Across the three years about which districts were asked to report assessment methods, satisfactory completion of a technology-related course or professional development activity was most commonly reported (29percent, 47 percent and 46 percent, respectively).

<sup>a</sup> Percentage of districts is based on the 69 percent of districts that reported assessing or planning to assess teacher teaching competency.

Data source: NETTS 2007 District Survey.

## Summary

In summary, most districts reported offering a variety of technology-related professional development opportunities for teachers, and teacher reports about participation were generally consistent with district reports about availability. Teacher-identified needs for additional training include the use of technology to support new pedagogies and student learning in the content areas. Teachers in high-poverty schools were more likely than those in low-poverty schools to report a need for more technology-related professional development, especially in the use of technology to meet the needs of English language learners and to improve students' technology literacy.

Eighty percent of teachers reported that their most useful technology-related professional development activity included at least one research-suggested practice. At the same time, 20 percent of teachers reported that their most useful technology-related professional development activity in 2006–07 did not include any of the seven research-suggested practices. In terms of the effects of their professional development experiences, 60 percent of teachers reported an influence of professional development on either their general computer proficiency or their use of technology for administrative purposes, and a smaller percentage (49 percent) reported an influence on their instructional practices. It is good news that about 50 percent of teachers report a substantial increase on one of three items related to instructional practice, but it should be noted that only 8 percent noted a substantial increase in all three practices. This finding suggests that there is still a need for technology-related teacher professional development that focuses on instructional practices.

With respect to teachers' technology proficiency, states were generally not collecting data regarding the *GPRA* measure of the percentage of teachers meeting state technology standards. Of the 11 states that reported data, the definitions and measurement of teachers' technology competency varied greatly, making it difficult to interpret aggregated data.

**Exhibit 15. 2005–06 Teacher Technology Standards and Assessments, by State**

State	Technology Competency Standards for Teachers	When Does State Assess Teachers' Technology Competency?				How Are Assessments Conducted?				Percentage of Teachers Who Meet Technology Skill Standards
		Every Year	During Cert. Process	During Recert. Process	Other	Decided Locally and Reported to State	Decided Locally and Not Reported to State	Statewide Test or Requirement	Other	
Alabama	X									
Alaska										
Arizona	X				X			X		30% <sup>a</sup>
Arkansas	X									
California	X		X		X		X	X	X	<sup>b</sup>
Colorado	X									
Connecticut	X				X		X			50%
Delaware										
District of Columbia										
Florida	X		X		X			X		
Georgia	X		X	X				X		100%
Hawaii	X		X	X				X	X	95%
Idaho										
Illinois	X		X	X	X			X	X	
Indiana	X				X		X			
Iowa	X									
Kansas										
Kentucky	X	X	X	X	X		X			62%
Louisiana	X		X		X	X		X	X	25% <sup>c</sup>
Maine										
Maryland	X									
Massachusetts										
Michigan	X									
Minnesota										
Mississippi	X									
Missouri	X				X			X		82%
Montana										
Nebraska	X				X		X		X	
Nevada										
New Hampshire										
New Jersey										
New Mexico					X					
New York										
North Carolina	X									

*(continued on next page)*

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State	Technology Competency Standards for Teachers	When Does State Assess Teachers' Technology Competency?				How Are Assessments Conducted?				Percentage of Teachers Who Meet Technology Skill Standards
		Every Year	During Cert. Process	During Recert. Process	Other	Decided Locally and Reported to State	Decided Locally and Not Reported to State	Statewide Test or Requirement	Other	
North Dakota										
Ohio										
Oklahoma	X				X			X	X	
Oregon										
Pennsylvania										
Puerto Rico										
Rhode Island										
South Carolina	X		X	X		X				
South Dakota										
Tennessee	X		X				X	X		87%
Texas	X		X		X	X				37%
Utah										
Vermont										
Virginia	X			X		X				100%
Washington										
West Virginia	X				X		X			
Wisconsin	X		X		X		X		X	
Wyoming										
<b>Total</b>	<b>27</b>	<b>1</b>	<b>11</b>	<b>6</b>	<b>15</b>	<b>4</b>	<b>8</b>	<b>10</b>	<b>7</b>	

**Exhibit reads:** Alabama had teacher technology standards in place in 2006–07 but did not assess teacher technology competency.

<sup>a</sup> Test required only for teachers in districts receiving EETT competitive grants.

<sup>b</sup> All teachers who participated in professional development paid for with EETT formula and competitive funds are required to complete the state's online technology assessment every 12 to 18 months to self-assess basic technology and integration skills. Reported proficiency percentages for teachers: computer knowledge and skills (17 percent), using technology in the classroom (5 percent), using technology to support student learning (3 percent).

<sup>c</sup> Public schools only.

Data source: 2007 NETTS State Survey.

## 4. Integration of Technology Into Instruction

The primary goal of the EETT program is “to improve student academic achievement through the use of technology in elementary and secondary schools.”<sup>23</sup> This focus on technology in support of teaching and learning is at the heart of the concept of “technology integration,” a term commonly used in the education community. Technology integration includes both teacher and student uses of technologies for teaching and learning, and it can include many types of use across grade levels and subjects. Exhibit 16 describes the multiple ways that technology integration can occur in one high school.

### Exhibit 16. Integrating Technology in High School

City Tech High School<sup>a</sup> is a 350-student pilot school in a large, urban district in Massachusetts. City Tech High School’s teachers and administrators value technology for the immediate job skills it gives their students, but they also appreciate it as a means of improving the way they teach their subject matter: “It’s not just technology, but using different tools to help students learn.”

At City Tech High School, all student work is completed on the computer. In science, students regularly use databases, create Web sites, enter lab data into spreadsheets, write journal entries with word processors, create animations, and conduct research on the Internet. One teacher has students film their labs and then develop Web tutorials about concepts covered in class. Another teacher assigns student work on Web-based simulations that mimic or expand on activities they have done in the lab. The only time students do not use the computers, one science teacher said, is when they are doing labs involving liquids. Teachers at City Tech feel that if students can demonstrate how something works in an animation, they have learned the concepts (as well as technology skills).

In math, students use Geometer’s Sketchpad and animations most frequently. A math teacher in the school described a project in which students created animations that showed the steps involved in working with polynomials. The project required students both to do process analysis and to become comfortable with the steps of polynomial analysis. Another math teacher described a project on applying the math concepts of slopes and equations of lines to real-world contexts. Students did online research to collect data on cell phone plans, which they then entered into a spreadsheet. Using spreadsheets allowed students to perform more complex mathematical computations than they could have done by hand.

Technology also facilitates interdisciplinary learning at City Tech. The principal described a ninth-grade project on *A Raisin in the Sun*, in which students used publishing software to create newsletters on the time period and culture in social studies, drawing tools for character plotting and mapping in language arts, technology and nontechnology tools to build houses like the one in the book and learn about thermoconvection in physics, and spreadsheets to analyze population data from the time period in math.

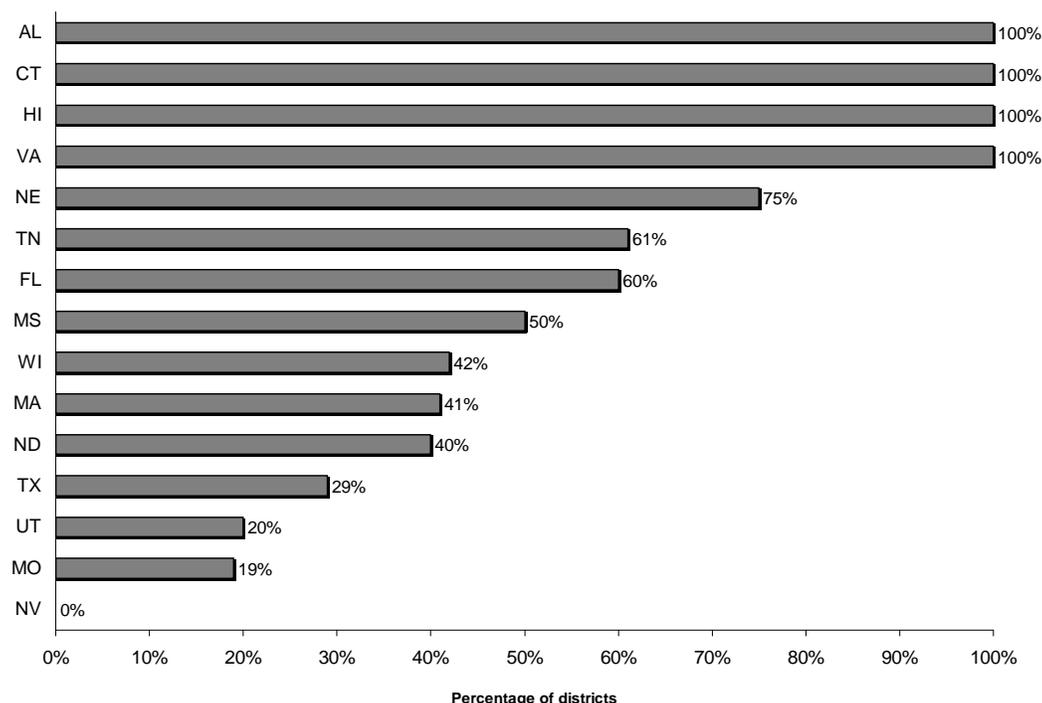
<sup>a</sup> The name of the school has been changed to protect the confidentiality of the school.  
Data source: NETTS Case Studies.

Because the EETT legislation does not mandate either a particular approach to technology integration (also called “curriculum integration”) or a specific definition or measure of this construct, states rely on state or district definitions of technology integration. Given that technology integration is one of the central EETT program goals identified in NCLB, the program uses the percentage of districts receiving EETT funds that have “effectively and fully integrated technology, as identified by states” as a *GPRA* measure of its progress. Only 15 states reported the percentage of their districts that are meeting the state’s definition of full integration

<sup>23</sup> *No Child Left Behind Act of 2001*, Public Law 107-110, Title II, Part D, Section 2402(b)(1).

(see Exhibit 17). For 2005–06, 26 states indicated that their state had not adopted a statewide definition of technology integration, did not collect data related to the percentage of districts meeting the definition or did not provide an explanation for not reporting data and responded only that the data were “not available.”

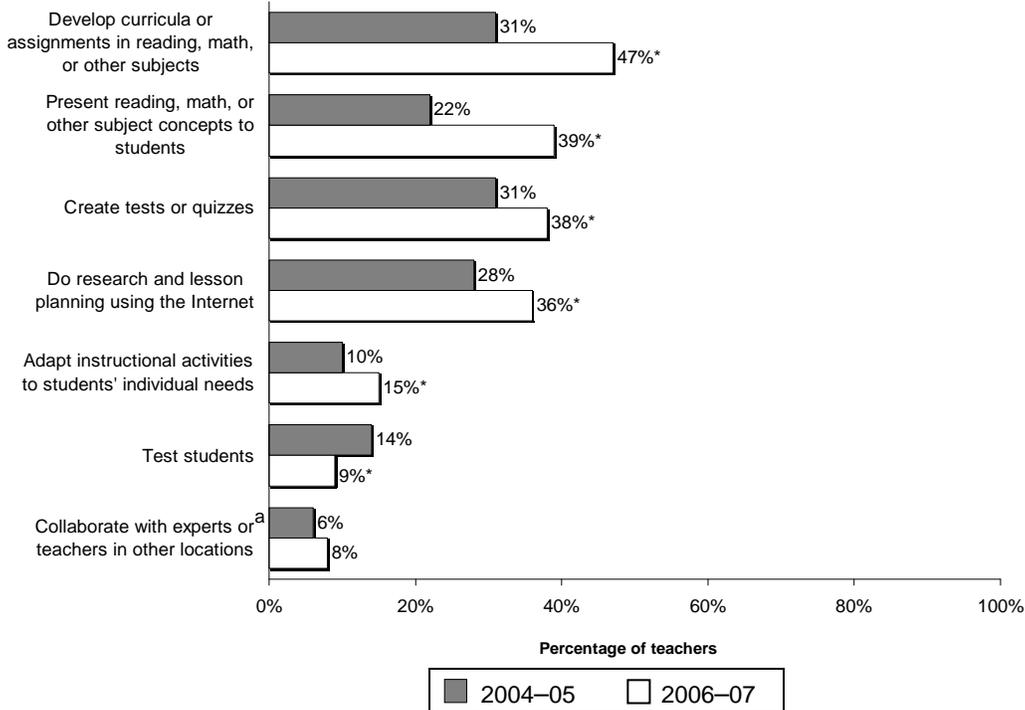
**Exhibit 17. State-Reported Data Regarding the Percentage of Districts Fully Integrating Technology (School Year 2005–06)**



**Exhibit reads:** Four states reported that 100 percent of their districts met state definitions of “fully integrating technology” in school year 2005–06.  
Data source: NETTS 2007 State Survey.

At the national level, tracking progress in technology integration is not dependent solely on the data provided by states. Another way to develop a national picture of the curricular integration of technology in elementary and secondary schools is to look at the frequency with which teachers report using technology for instruction. Teachers’ survey responses suggest that teachers were increasingly likely to use computers and the Internet on a weekly basis from 2004–05 to 2006–07 (see Exhibit 18). In 2004–05, fewer than a third of teachers reported doing any one of a variety of activities related to teaching. During school and district site visits in 2004–05, districts acknowledged relatively low levels of technology integration. The barrier to technology integration cited most often by these districts was teacher time; teachers had limited time to learn and practice technology-related skills. However, by 2006–07, there were significant increases in the proportions of teachers who reported using technology in developing curricula or assignments; presenting reading, mathematics or other subject concepts to students; research and lesson planning; and creating tests or quizzes. The only item for which there was a statistically significant difference between teachers in high- and low-poverty schools was “adapt instructional activities to students’ individual needs,” with 7 percent of teachers in high-poverty schools and 11 percent of teachers in low-poverty schools reporting that they conducted this activity at least weekly, both rather low numbers.

**Exhibit 18. Teachers' Use of Technology in Instruction on a Weekly Basis (School Years 2004–05 and 2006–07)**



**Exhibit reads:** Forty-seven percent of teachers reported using technology to develop curricula or assignments in reading, math or other subjects in 2006–07, compared with 31 percent of teachers in 2004–05.

\*  $p < .05$  (significant difference from 2004–05).

<sup>a</sup> The apparent decline in teachers' use of technology to test students may be an artifact of the surveys used in 2004–05. In 2004–05, teachers were asked how often they used technology "to test students." However, teachers were asked how often they used technology "to administer assessments online" in 2006–07. The decline may simply represent the difference between "online assessments" and other computer-based assessments.

Data source: NETTS 2005 and 2007 Teacher Surveys.

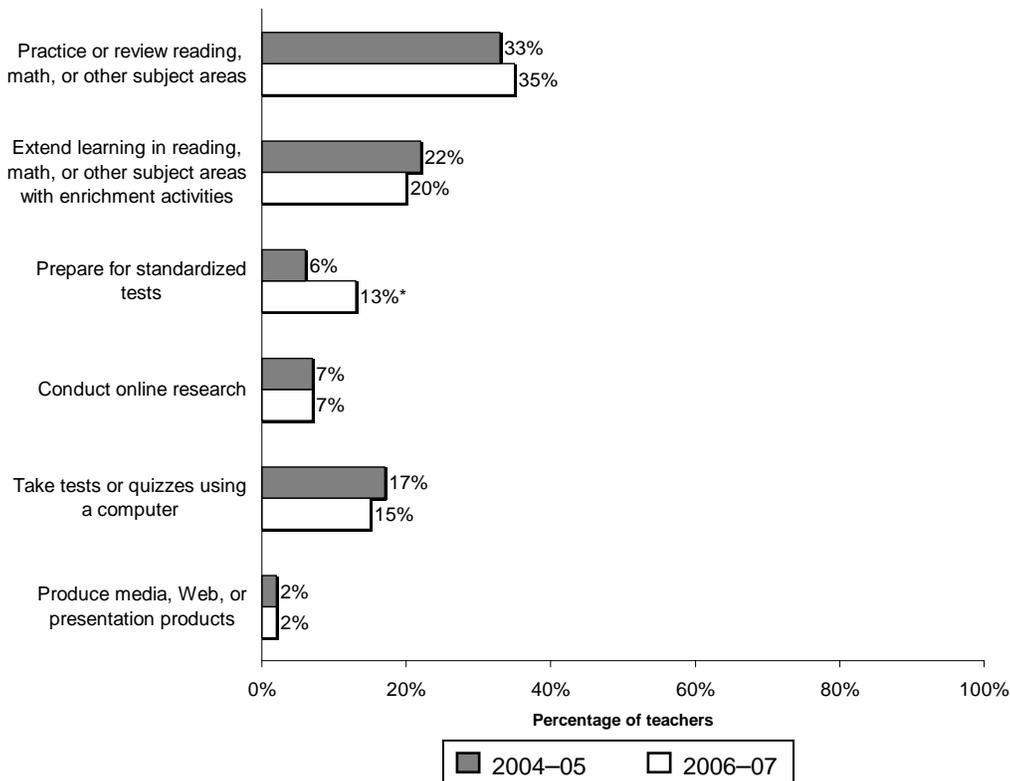
**Integrating Technology Into Instruction**

Teacher reports regarding students' technology use for instructional purposes showed little change between 2004–05 and 2006–07.

Another perspective on technology integration is provided by teacher reports of how and how often they have students use technology in their classes. In contrast to the reports for teachers' use of technology, the reports for students' technology use showed little change between 2004–05 and 2006–07 (see Exhibit 19). The major exception to this pattern of stability over time is the increase in the use of technology to prepare for standardized tests, which may include released items from state or other standardized tests or more general practice on topics known to be covered on standardized tests. The proportion of teachers whose students used

technology weekly or more often for this purpose rose from 6 percent to 13 percent from 2004–05 to 2006–07.<sup>24</sup>

**Exhibit 19. Students’ Use of Technology for Learning on a Weekly Basis, as Reported by Teachers (School Years 2004–05 and 2006–07)**



**Exhibit reads:** Teachers reported that about a third of their students used technology to practice or review reading, math or other subject areas in both 2004–05 and 2006–07.

\*  $p < .05$  (significant difference from 2004–05)

Data sources: NETTS 2005 and 2007 Teacher Surveys.

## Summary

Teacher responses to NETTS surveys suggest that there was a statistically significant increase from 2004–05 to 2006–07 in the number of teachers reporting several types of technology use to support their own work on a weekly basis. However, teacher reports did not reflect any increase in the frequency of student technology use for learning.

<sup>24</sup> The seeming inconsistency occurs between (a) teacher reports of teacher practice (Exhibit 18), which indicate a decrease in the number of teachers reporting using technology to test students on weekly basis, and (b) teacher reports of student use of technology (Exhibit 19) for which similar percentages of teachers reported that their students took tests or quizzes using a computer. This inconsistency is likely an artifact of the wording of the specific items used to solicit data from teachers. In 2006–07, teachers were asked how often they “administered online assessments” whereas the corresponding question in 2004–05 regarding student use of technology did not specify that tests or quizzes were online.

## 5. Student Technology Literacy

The EETT legislation calls for all students to be technologically literate by the eighth grade. The legislation does not formally define “technology literacy,” however. One possible definition for this concept is provided by the National Academy of Sciences (NAS) Committee on Assessing Technology Literacy (National Research Council, 2006), which recently defined technological literacy as an understanding of technology at a level that enables effective functioning in a modern technological society. The same NAS report described the knowledge, capabilities as well as critical-thinking and decision-making skills that are components of technology literacy. Among the dimensions of technology literacy that the committee described are the capabilities to use technology to carry out a design process, solve a problem, and engage in critical thinking and decision making (National Research Council 2006). Educational technologies can play a central role in helping students acquire these skills, also known as 21st century learning skills (Bransford, Brown and Cocking 2000; Bransford and Donovan 2005; Roschelle et al. 2000; Stewart, Cartier and Passmore 2005).

Districts reported focusing on student technology literacy, but relatively few reported using EETT funds to do so. Despite the prominence of student technology literacy in the EETT legislation, it was not reported to be a major focus for the use of EETT funds at the local level in 2006–07. Although many districts reported supporting activities to promote student technology literacy, districts appear to have other sources of funding, in addition to EETT funds, to pay for these activities. Seventy-one percent of districts receiving EETT formula funds reported paying for activities to support student technology literacy in 2006–07, but only 14 percent of these districts (10 percent of districts receiving formula funds overall) reported using EETT formula funds for this purpose. Similarly, 90 percent of districts with EETT competitive funds reported paying for activities to improve student technology literacy in 2006–07, but only 28 percent of these districts (25 percent of all districts receiving competitive funds) reported using competitive funds for this purpose.

### State and District Student Technology Standards

More than 80 percent of states had student standards for technology use in 2006–07.

As with the teacher standards described earlier, student technology standards can be important tools for articulating needed knowledge and skills. These standards can help focus curricular activities and assessments to ensure a strong alignment between them. In 2006–07, 45 states had either stand-alone technology standards for students or technology standards that were integrated into other student academic standards.<sup>25</sup>

In addition to having standards, some states tie student experiences with technology to graduation requirements. For example, as of 2005–06, all eighth-grade students in North Carolina are required to meet a computer skills graduation requirement that is based on an online test of computer skills (Public Schools of North Carolina n.d.). Michigan, Nevada, Texas and

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<sup>25</sup> Eleven states had both kinds of standards. Three states indicated that they were in the process of developing student technology standards. Forty-two states had standards in 2003–04.

Utah require students to pass a technology-related course before graduation. Michigan requires students to earn credit for courses that include an “online experience.” Texas requires all students to take at least one course about “technology applications” before graduating, in addition to encouraging teachers to incorporate “digital technology literacy and integration” throughout the K–12 curriculum.

Student technology standards are also very common among districts. Eighty percent of districts across the country reported having technology literacy standards for students in 2006–07. Of these, two-thirds had standards embedded within general curriculum standards, and one-third had separate standards.

What are the knowledge and skills typically covered by state and district technology standards for students? The majority of states and districts covered topics recommended by ISTE (see Exhibit 20).<sup>26</sup> Forty-three of the 45 states with student technology standards included standards for student use of technology-based communication and research tools as well as the use of technology for problem solving and decision making (only Iowa and Wyoming did not). The same 43 states included standards for basic technology systems operations and concepts. Most states (39) had standards that address social, ethical and human issues related to technology. District technology standards for students were similar to state standards, but district technology standards were less likely to include technology communication tools (68 percent compared with 96 percent of states with student standards).

### **Assessment of Student Technology Literacy**

Only six states reported conducting statewide assessments of student technology literacy in 2005–06.

The number of states conducting statewide assessments of students’ technology literacy rose from two in 2002–03 to six in 2005–06. Twenty-five states said that they rely on districts to assess student technology literacy and provide data to the state. Exhibit 23 at the end of this chapter provides a state-by-state presentation of state practices related to student technology standards and assessments.

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<sup>26</sup> ISTE released revised student technology standards in 2007, after the NETTS surveys had been administered. The tables and text included in this document reflect the previous version of the standards, first released in 1998.

**Exhibit 20. Prevalence of ISTE-Recommended Topics for  
Student Technology Literacy Standards**

Topic	ISTE-Recommended Standards Students ...	Percentage of All States Reporting Standards <sup>a</sup> (No. of States)	Percentage of All Districts Reporting Standard <sup>a</sup>
<b>Basic operations and concepts</b>	<ul style="list-style-type: none"> <li>• demonstrate a sound understanding of the nature and operation of technology systems.</li> <li>• are proficient in the use of technology.</li> </ul>	98% (43)	85%
<b>Social, ethical and human issues</b>	<ul style="list-style-type: none"> <li>• understand the ethical, cultural and societal issues related to technology.</li> <li>• practice responsible use of technology systems, information and software.</li> </ul>	91% (40)	82%
<b>Technology productivity tools</b>	<ul style="list-style-type: none"> <li>• use technology tools to enhance learning, increase productivity and promote creativity.</li> <li>• use technology to support learner-centered strategies that address the diverse needs of students.</li> <li>• use productivity tools to collaborate in constructing technology-enhanced models, prepare publications and produce other creative works.</li> </ul>	100% (44)	87%
<b>Technology communications tools</b>	<ul style="list-style-type: none"> <li>• use telecommunications to collaborate, publish and interact with peers, experts and other audiences.</li> <li>• use a variety of media and formats to communicate information and ideas effectively to multiple audiences.</li> </ul>	100% (44)	68%
<b>Technology research tools</b>	<ul style="list-style-type: none"> <li>• use technology to locate, evaluate and collect information from a variety of sources.</li> <li>• evaluate and select new information resources and technological innovations based on the appropriateness for specific tasks.</li> </ul>	100% (44)	89%
<b>Technology problem-solving and decision-making tools</b>	<ul style="list-style-type: none"> <li>• use technology resources for solving problems and making informed decisions.</li> <li>• use technology in the development of strategies for solving problems in the real world.</li> </ul>	100% (44)	78%
<b>Other</b> (please specify)		27% (12) <sup>b</sup>	4%

**Exhibit reads:** Ninety-eight percent of states with student standards for technology literacy and 85 percent of districts included student standards regarding basic operations and concepts of computer use.

<sup>a</sup> Percentages are based on the states (44) and districts (80 percent) that reported having student technology literacy standards.

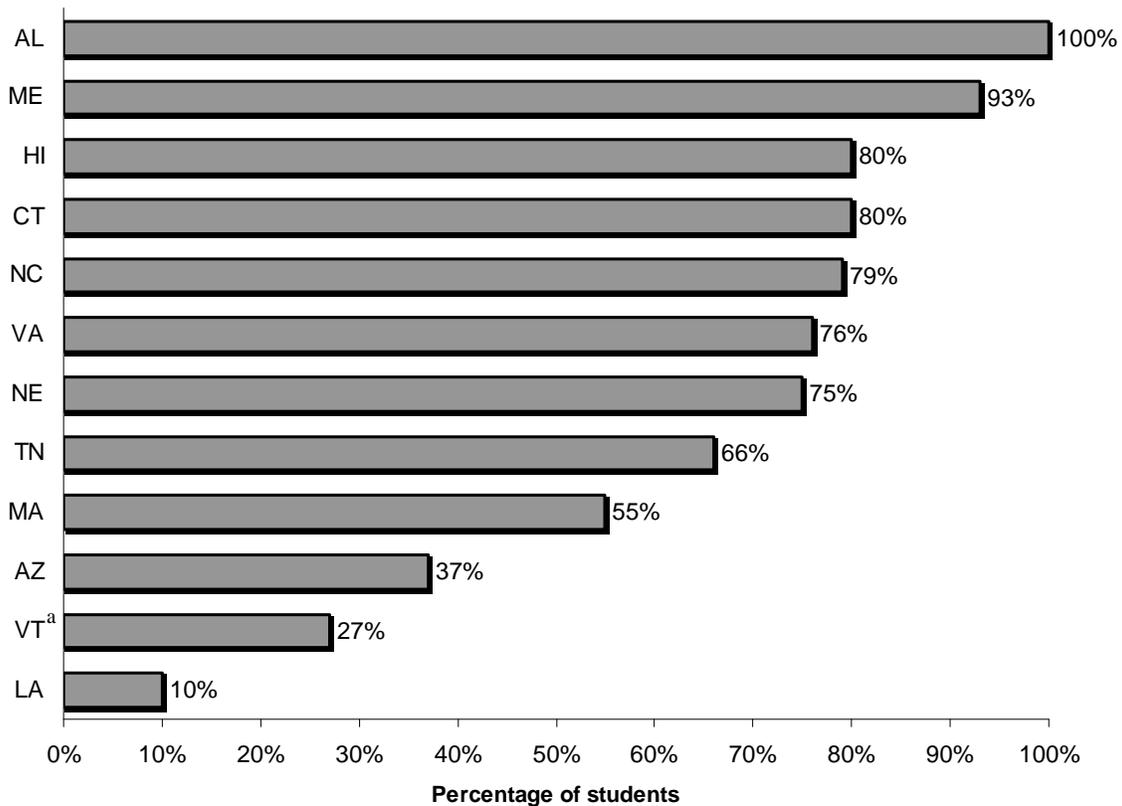
<sup>b</sup> Most of the states who indicated “Other” did not provide additional information. Examples of “Other” information provided by states includes (a) students use technology to acquire and refine 21st -century skills; (b) students create new knowledge and understanding through the use of technology; (c) students use technology to facilitate both collaboration and independent learning.

Data source: NETTS 2007 State Survey and NETTS District Survey.

As mentioned earlier, the EETT legislation calls for all students to be technologically literate by the eighth grade, and the corresponding *GPRA* program measure assesses the percentage of students who meet state technology standards by the end of the eighth grade. However, it is difficult to determine national progress toward the EETT goal of making all students technologically literate because few states actually assess students' technology literacy. Six states (Arizona, Hawaii, Louisiana, Maine, North Carolina and Pennsylvania) reported conducting statewide student literacy assessments in 2005–06, up from just two states in 2002–03 (U.S. Department of Education 2007b). These six states all reported collecting data at the eighth-grade level. Another four states (Georgia, Kansas, New Hampshire and Wisconsin) indicated that they planned to conduct assessments of students' technology literacy for the first time in 2006–07. Other states relied on district assessments to estimate the number of students meeting student technology literacy standards.

In 2007, just 12 states reported the percentage of students meeting technology literacy standards in 2005–06, the most recent year for which data were available at the time of the survey (see Exhibit 21). Aggregating data across these 12 states is problematic because of different test contents, student samples, and administration schedules. For example, Maine reported that 93 percent of its students met standards; however, districts in Maine are not required to assess student technology literacy, and those districts that do choose to assess literacy and report findings to the state may develop their own method of evaluation. Arizona does not test all students but administers tests to a sample of approximately 25,000 students statewide. All districts that receive EETT competitive funds in Arizona are required to test a sample of students at the fifth and eighth or ninth grades, and Arizona recommends that EETT formula grantees that receive more than \$30,000 also assess students. Arizona reported that 37 percent of its eighth- and ninth-graders met proficiency standards in year 2005–06. In Alabama, where 100 percent of students were reported to have met technology literacy standards, the state requires the completion of a course, and assessment methods are developed or decided on locally.

**Exhibit 21. State-Reported Data Regarding the Percentage of Students Meeting Technology Literacy Standards (School Year 2005–06)**



**Exhibit reads:** Alabama reported that 100 percent of its students met technology literacy standards in school year 2005–06.

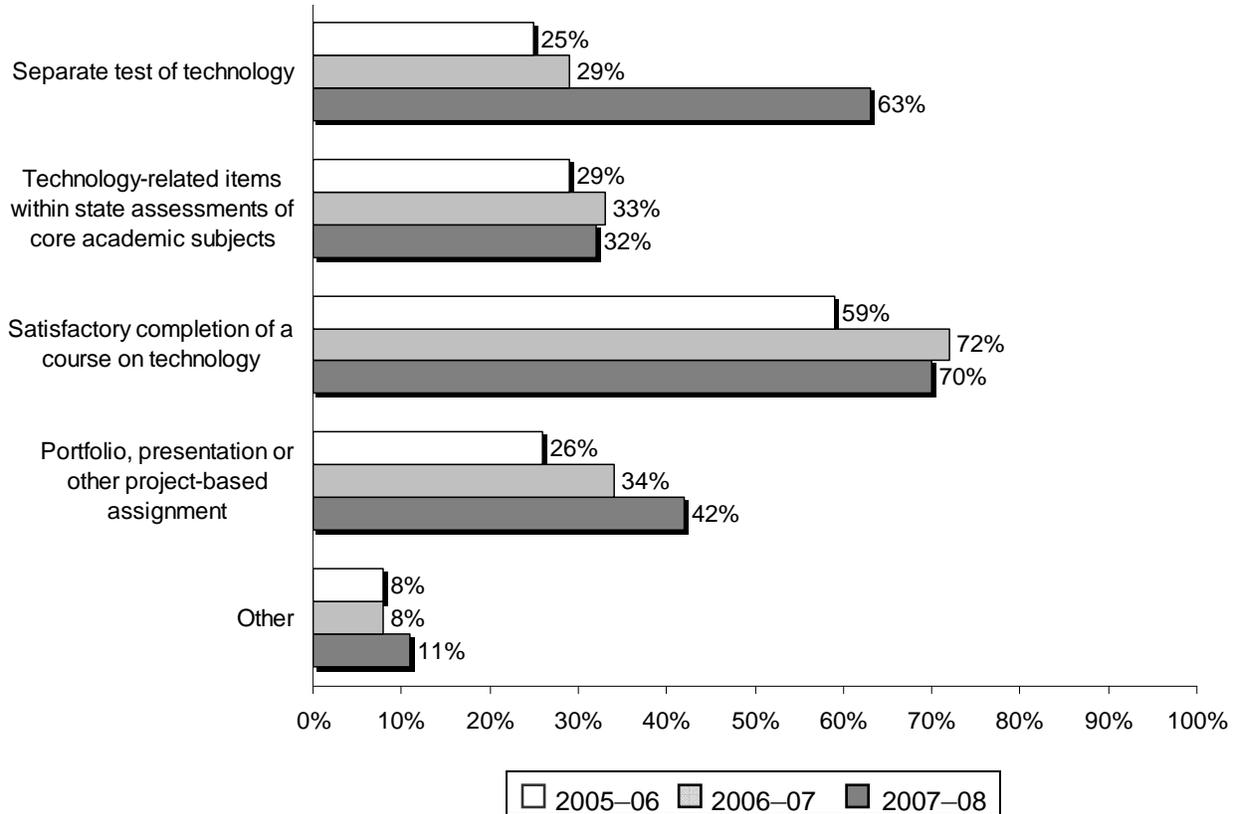
<sup>a</sup> Percentage is for eighth- and ninth-graders.

Data source: NETTS 2007 State Survey.

In 2007, 89 percent of districts reported that they either assessed or planned to assess students’ technology literacy. Fifty-five percent of districts reported that they assessed student technology literacy of eighth-graders in 2005–06. Districts reported using multiple methods to assess students’ technology literacy (see Exhibit 22). The most common strategy reported across three years was to require satisfactory completion of a course on technology; only 25 percent of districts reported using an actual test of student technology proficiency in 2005–06.

Only one-third of districts reported the percentage of students meeting technology literacy standards in the eighth grade. The proportion of technologically literate eighth-graders reported by individual districts varied from 0 percent to 100 percent. Across districts assessing student technology literacy in some way, the average proportion of eighth-grade students reported to have met the district’s technology literacy standards by the end of the 2005–06 school year was 88 percent. Districts appear to be moving toward the use of an actual assessment of students’ technology literacy rather than sole reliance on course completion. In 2007, 63 percent of districts also reported that they expected to be using a student technology literacy test in 2007–08.

## Exhibit 22. District-Based Methods for Assessing Students' Technology Literacy



**Exhibit reads:** Districts report an increasing reliance on a separate test to assess student technology skills, with 25 percent of districts reporting this activity in 2005-06 and 63 percent reporting this activity in 2007-08.

Data source: NETTS 2007 District Survey.

### Summary

Too few states have consistent, reliable data on the percentage of their students meeting state technology literacy standards by eighth grade to support a judgment concerning attainment of this *GPRA* measure. States and districts appear to be moving toward more substantive measures of students' technology literacy, as evidenced by the increase over the last two years in the proportion of states and districts either assessing or planning to assess students' technology skills. Trends suggest that states and districts are increasingly focused on student technology literacy, evidenced by the increase in states and districts that have put in place technology requirements for students and have begun to assess progress toward standards. However, considerable effort is still needed to develop valid, reliable measures of student technology literacy.

**Exhibit 23. Student Technology Literacy, by State in 2006–07**

State	State Has Student Technology Standards	Level of Assessment			Method of Assessment				
		State Assesses Directly	State Relies on District-Provided Data	Specific Grade-Level Assessments	State Paper and Pencil Test	State Computerized Test	Course Completion	Developed Locally, Reported to State	Developed Locally, Not Reported to State
Alabama	X		X				X		X
Alaska	X		X						X
Arizona	X	X		5, 8, 9		X			
Arkansas	X								
California	X		X						
Colorado									
Connecticut	X		X					X	
Delaware									
District of Columbia									
Florida	X								
Georgia	X		X					X	
Hawaii	X	X		8					
Idaho	X								
Illinois	X		X		X	X	X	X	
Indiana	X		X					X	
Iowa	X		X					X	
Kansas	X		X					X	
Kentucky	X								
Louisiana	X	X		8		X	X	X	
Maine	X	X		7, 8				X	
Maryland	X								
Massachusetts	X		X					X	
Michigan	X		X					X	
Minnesota	X		X						
Mississippi									
Missouri	X								
Montana	X			8					
Nebraska									

*(continued on next page)*

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State	State Has Student Technology Standards	Level of Assessment			Method of Assessment				
		State Assesses Directly	State Relies on District-Provided Data	Specific Grade-Level Assessments	State Paper and Pencil Test	State Computerized Test	Course Completion	Developed Locally, Reported to State	Developed Locally, Not Reported to State
Nevada	X								
New Hampshire	X		X	8				X	
New Jersey	X		X					X	
New Mexico	X								
New York									
North Carolina	X	X		8, 9-12					
North Dakota	X		X				X		X
Ohio	X								
Oklahoma	X								
Oregon	X								
Pennsylvania	X	X		4, 8, 11	X				
Puerto Rico									
Rhode Island	X		X						
South Carolina	X		X						X
South Dakota	X								
Tennessee	X		X					X	
Texas	X		X					X	
Utah	X		X	5, 7, 12					
Vermont	X		X						
Virginia	X		X					X	
Washington	X		X					X	
West Virginia	X								
Wisconsin	X		X					X	
Wyoming	X		X					X	
<b>Total</b>	<b>45</b>	<b>6</b>	<b>25</b>		<b>2</b>	<b>3</b>	<b>4</b>	<b>18</b>	<b>4</b>

**Exhibit reads:** Forty-five states report having student technology standards in 2006–07, with 31 either conducting state-level assessments or relying on district-reported data.

Data source: NETTS 2007 State Survey and NETTS 2007 District Survey.

## 6. Summary and Conclusions

The data presented in this report address the *GPRA* objectives and measures used to monitor EETT program performance at the national level. These indicators address two precursors to technology use—technology access and technology-related teacher professional development—and two outcomes of technology use—the integration of technology into teaching and learning and student technology literacy.

One objective of the EETT program is to support high-poverty, high-need schools in their acquisition of technology so that students and teachers in these schools can have access to educational technology equivalent to that of students and teachers in other schools. Technology access within instructional classrooms has continued to progress, and there are few differences between high- and low-poverty schools. With the exception of the availability of laptop computers, comparisons of the reports of teachers in high- and low-poverty schools suggest that equivalent access has been achieved. High-poverty schools have seen particular gains in classroom high-speed Internet access for student use over the last several years.

The teacher professional development in technology set forth as a second *GPRA* objective for EETT is being fulfilled to some degree. States and districts are offering technology-related professional development, and EETT funds are being used for this purpose. However, the “most useful” professional development identified by teachers did not incorporate any of the research-suggested practices for one in five teachers in 2006–07. In addition, teacher reports on surveys suggest that the professional development that has been provided has had limited effect on instructional practices.

The *GPRA* measure related to the technology-related professional development objective—“the percentage of teachers who meet their state technology standards”—cannot be evaluated because only a quarter of the states measure teachers’ technology skills directly or ask districts to do so and report the data to the state. On the most recent NETTS State Survey, only about one-fifth of states provided teacher technology proficiency data, and the response from two of these 11 states indicated that *every* teacher in the state reached technology proficiency.

In terms of the EETT objective, the lack of agreed-on definitions and solid assessment strategies makes it difficult to assess the program on a national level. Additional guidance appears necessary to achieve the consistency and validity necessary to make national aggregations of data meaningful. As a result, it is difficult to determine the extent of progress with respect to the *GPRA* measures for technology integration and student technology literacy. Each of the *GPRA* measures used to determine progress along these dimensions requires clear state definitions and standards as well as a consistent measurement system within each state.

The *GPRA* measure for technology integration is “the percentage of districts receiving Educational Technology State Grants funds that have effectively and fully integrated technology.” Half of the states indicated that they either did not have a statewide definition of “fully integrated technology” or did not have a system in place to collect data on their chosen integration standard. Fifteen states reported the percentage of their districts state’s definition for full technology integration, with reported percentages ranging from 0 percent to 100 percent.

The lack of a strong assessment system is apparent also in the area of student technology literacy. In 2006–07, five states reported conducting statewide assessments of student technology literacy. Twenty-five states relied on districts to assess student technology literacy, and the most common district strategy for doing so was to require completion of a technology course. Only 25 percent of districts directly assessed students' technology skills as opposed to requiring completion of a course.

Even among those states that reported the requested technology integration and proficiency estimates, the wide range of values and large number of extreme cases (i.e., 0 percent or 100 percent proficiency) undermines confidence in the reported data. It is unlikely that districts, teachers and students really vary from state to state as greatly as the reported statistics suggest.

If one moves beyond the specific *GPRA* measures to consider the EETT program and educational uses of technology more broadly, some national trends do emerge. There are ample opportunities for teachers to participate in technology-related professional development, although there is an indication of some unmet needs in high-poverty schools in this regard. Using technology to meet the needs of English language learners and to increase students' technology literacy are two topics for which teachers in high-poverty schools were somewhat more likely than those in low-poverty schools to want more training. For all teachers, the effectiveness of their technology-related professional development was a concern. About a third of teachers reported effects of their technology-related teacher professional development on their own use of technology, and teacher-reported frequency of their own technology use rose from 2005 to 2007. Fewer teachers reported effects of professional development on their instructional practices, however, and teacher reports suggest that the extent of students' use of technology for academic purposes did not change between 2004–05 and 2006–07.

Overall, states and districts are showing some progress in developing the infrastructure necessary to support student and teacher capacity to use technology in robust ways. Computers and Internet connections are increasingly in place within classrooms, suggesting the suitability of a renewed focus on high-quality teacher professional development, how technology is used in instruction and learning, and the skills that teachers and students gain as a result.

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## **Appendix A**

### **EETT Program Administration**

Through the EETT program, the federal government provides funds to states so that states can help high-need districts and schools increase teachers' and students' access to technology, provide teachers with technology-related professional development, and support the use of technology in instruction. Federal funding for the EETT program began in federal FY 2002 at slightly more than \$700 million. By FY 2006, the year in which states were most likely to receive funds that would be used by districts in school year 2006–07 (the focus of data provided in this report), program funding had been cut to less than \$300 million. In FY 2007, federal grants to states ranged from \$1.3 million to \$35.2 million, with an average state award size of \$5.1 million. States can reserve up to 5 percent of their federal award for state administration of the EETT program, and the remainder of EETT funds is distributed to districts through formula and competitive grants.

#### **Other State Funds for Educational Technology**

EETT is the only federal program that distributes funds dedicated to educational technology to all states. In 17 states, the EETT program represents the only dedicated funding source for educational technology at the state level. Thirty-four states reported having additional dedicated funds for educational technology; these states reported receipt of almost \$30 million in 2006–07, on average, for educational technology activities.<sup>27</sup> A few states reported receiving funds from the private sector, but these amounts were typically small, ranging from \$25,000 to \$75,000. Six states reported receiving funds from foundations or other nonprofit organizations, with amounts ranging from \$25,000 to about \$1 million. States also reported receiving funds from other sources such as lottery funds, state bond funds and tobacco settlement money.

#### **Allocation of EETT Program Funds for School Year 2006–07**

In any given year, states have equal amounts of formula and competitive funds to distribute. States award formula funds to districts according to the same funding formula used by the Title I: Improving Basic Programs Operated by Local Education Agencies program, the largest elementary and secondary program in the *No Child Left Behind (NCLB)* legislation.<sup>28</sup> The formula targets districts within a state that serve the highest numbers or percentages of students living in poverty. Eligible districts also must serve at least one school in need of academic improvement, as defined in *NCLB*, or one requiring assistance with acquiring or using technology. There are no legislative guidelines for how technology need is defined, so states have developed their own criteria. The districts that qualify for formula funds make up the pool of districts that are also eligible for competitive grants. States have more discretion in awarding competitive funds than formula funds. States can tailor competitive grant programs to meet state

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<sup>27</sup> Funding amounts from state legislatures ranged from \$1 million to \$227 million, as reported by states.

<sup>28</sup> The Title I program represents a significant portion of federal funds appropriated to elementary and secondary education. The primary purpose of the program is to ensure equal educational opportunities for all children and to eliminate the achievement gap that exists between students in lower and higher socioeconomic groups by providing additional resources for disadvantaged groups.

priorities as long as they are within federal EETT program guidelines. States award competitive funds based on state priorities and needs; the strength of district and consortia proposals for competitive funds; and districts' financial, academic and technology needs.

States reported making 12,327 new EETT grants, totaling almost \$253 million in program funds, for 2006–07. In this year, states awarded approximately \$118 million in formula grants to districts, with a median grant size of \$1,617. Approximately \$135 million in competitive grants to districts or consortia were awarded for use in 2006–07, with a median grant size of \$50,000.

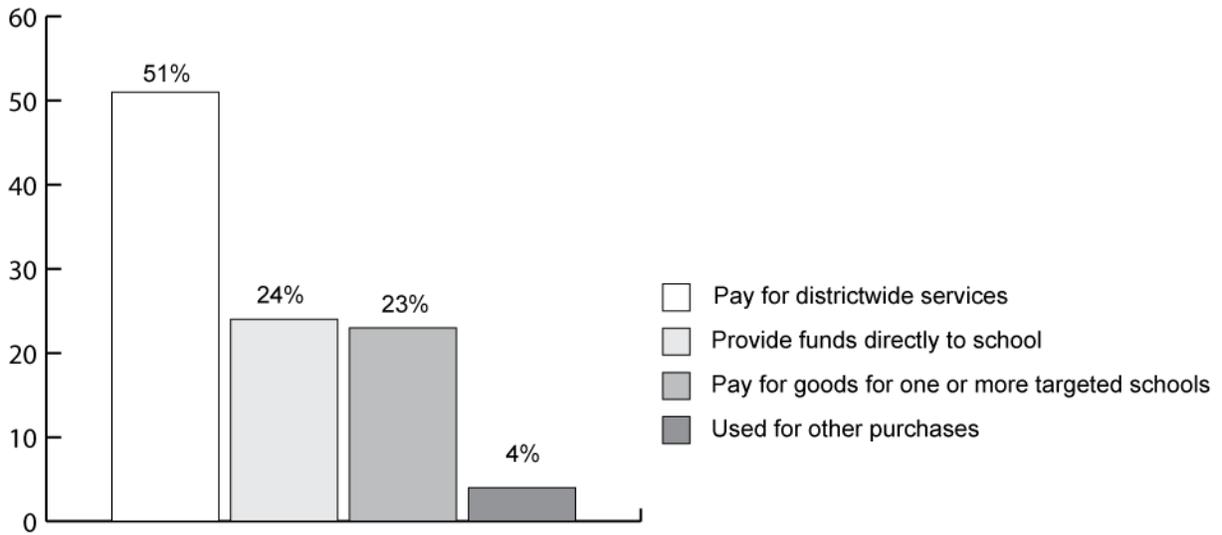
Eleven states reported that they did not award formula funds in 2006–07. Two states, Hawaii and Puerto Rico, are “unity districts,” which means that the state authority and local authority cover the same territory, and they are not required to distribute funds to individual schools. Eight of the nine remaining states indicated that they did not provide any formula awards in 2007 because of insufficient EETT funding. These states indicated that the amount of funds they could have allocated to the districts would have been too small to make an effect on technology integration at the school level. One state did not offer formula grants in 2006–07 because its award cycle spanned two years, and 2006–07 was an “off” year.

Similarly, 11 states, including Hawaii and Puerto Rico did not offer a competitive grant cycle for use by districts in 2006–07. Seven of these states hold multiyear award cycles in which grants are awarded for more than one year. Lack of sufficient funding was cited by two states, both of which distributed competitive funds to previous competitive award winners through continuation grants.

### **District Allocation of EETT Funds**

A large proportion of districts (94 percent) indicated that they were able to distinguish between technology-related purchases made with EETT funds and those made with other sources of technology funding. Similarly, 96 percent of the districts that received both formula and competitive funds reported that they could distinguish between purchases made with EETT competitive funds and those made with EETT formula funds. Among those districts that received formula funds, 51 percent of the funding was used to pay for districtwide services, 24 percent was provided directly to schools, 23 percent paid for goods and services to be used in or by one or more targeted schools, and 4 percent was used for other purchases (see Exhibit A-1).

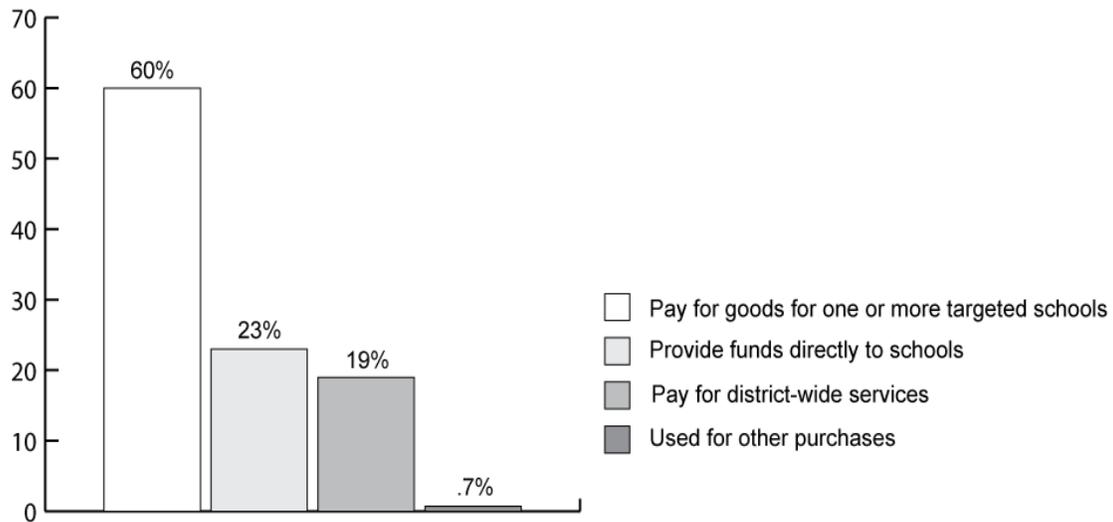
### Exhibit A-1. District Distribution of Formula Funds



Data source: NETTS 2007 District Survey.

The allocation of the competitive funds presents a different picture (see Exhibit A-2). Districts that received competitive funds, on average, used 60 percent of the funds to pay for goods and services provided exclusively to one or more targeted schools. They provided 23 percent of the EETT competitive funds directly to schools, used 19 percent to pay for districtwide services, and used less than 1 percent to pay for other purchases.

## Exhibit A-2. District Distribution of Competitive Funds



Data source: NETTS 2007 District Survey.

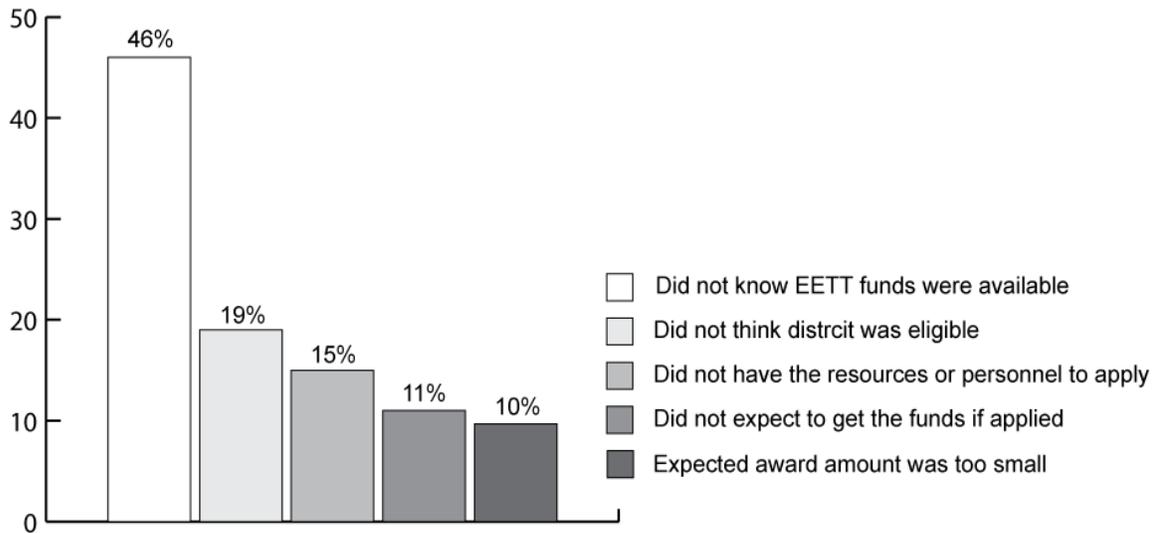
### Districts That Did Not Apply for Funds

The EETT program provides funds to districts that have above the median percentage or number of poor in a given state. Because the number of districts varies considerably from state to state, so does the number of districts eligible for EETT grants. In 2006–07, the number of districts within a state eligible for formula grants ranged from 17 to 1,182, with a mean of 294. However, the average number of districts that applied for EETT formula grants was 249. In other words, as many as 15 percent of eligible districts did not apply for formula grants for 2006–07. Among the districts that did not apply, 46 percent indicated they did not know that EETT funding was available (see Exhibit A-3).<sup>29</sup> Other reasons for not applying included that districts did not think they were eligible (19 percent) or did not have the resources or the personnel to apply (15 percent). Eleven percent of districts reported that they did not expect to get funds if they applied, and another 10 percent reported that their expected award was too small to merit the application process.

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<sup>29</sup> Respondents to this survey item are likely to include both eligible and ineligible districts.

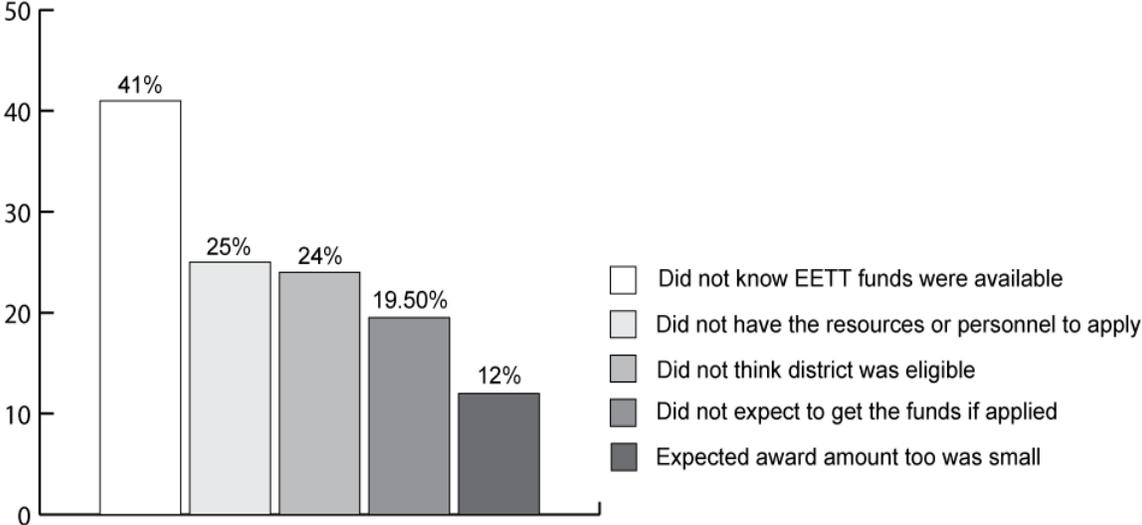
### Exhibit A-3. Districts' Reasons for Not Applying for EETT Formula Funds



Data source: NETTS 2007 District Survey.

Across states, a range of 5 to 127 districts applied for EETT competitive grants, and the average number of districts per state (37) that applied for those grants was much lower than the average number of districts eligible. This average represents just 13 percent of the districts eligible for competitive awards. Districts cited a lack of information about the availability of funds as the main reason for not applying for competitive grants (see Exhibit A-4). Among the districts that did not apply, 41 percent did not know that EETT funding was available, 25 percent lacked resources or personnel to apply, and another 24 percent did not think they were eligible to apply.

**Exhibit A-4. Districts' Reasons for Not Applying for EETT Competitive Funds**



Data source: NETTS 2007 District Survey.

## **Appendix B**

### **Data Sources and Methodology**

This appendix describes the methods that were used to examine how states allocated EETT grants to districts in FY 2006, how districts invested their EETT and other technology funds in school years 2003–04 and 2006–07, and the ways that teachers and students in high- and low-poverty schools used technology in teaching and learning in school years 2004–05 and 2006–07. Two phases of survey data collected at the state, district and teacher levels were designed to compile information about EETT funds that were spent and services that districts provided in schools during school year 2004–05. To account for the time it took for federal funds to be allocated to states, awarded to districts and distributed to schools for use in 2004–05, Phase 1 surveys collected information from different fiscal and school years. Phase 2 surveys were administered concurrently in early 2007 and collected data on EETT funds awarded and technology activities that took place in school year 2006–07. Findings from the FY 2003 state survey are reported in the first NETTS report (U.S. Department of Education 2007b).

#### **Data Collection**

##### **State Survey**

The NETTS 2007 Survey of State Educational Technology Directors was administered between the end of March 2007 and mid-August 2007. The state survey requested a substantial amount of qualitative data. Survey topics addressed EETT program eligibility and application requirements, state support for program initiatives, technology standards for teachers and students, EETT evaluation information, and reflections on the EETT program.

State educational technology directors provided data about the numbers and sizes of EETT formula and competitive awards that districts received. States supplied lists of the districts to which they made formula and competitive awards, either directly or through consortia, and the sizes of those awards from FY 2004 through FY 2007.

The survey sample consisted of 52 respondents: all 50 states, the District of Columbia and Puerto Rico. All 52 respondents completed the survey, generating a response rate of 100 percent. These respondents are referred to collectively as “states” throughout this report.

##### **District Survey**

The NETTS 2005 District Survey data collection began in spring 2005, when NETTS researchers surveyed district technology coordinators about their EETT programs and the use of EETT funds for districtwide technology activities. The district survey asked technology coordinators to report on technology spending and support in school year 2003–04. The eight-part survey collected information about the EETT application process, the use of EETT partnership or consortium funds, spending on educational technology, support provided to encourage technology integration into classroom instruction, activities associated with technology-related professional development, the use of student data management systems, and estimates of districts’ technology inventories. The final section of the survey gathered information on survey respondents’ roles and responsibilities in the district. The district survey asked districts to report on spending and technology support in school year 2003–04.

NETTS researchers administered the district survey to 1,039 technology coordinators selected from the 50 states, the District of Columbia and Puerto Rico. The survey respondents represented districts that received EETT funds, districts that did not receive EETT funds and nondistricts that were lead entities for competitive EETT awards.

The sampling frames for the survey were populated by using state-provided lists for each entity and were based on data collected from the Common Core of Data (CCD), Web searches and phone calls. The sampling strategy considered the type of educational entity (district or nondistrict), poverty status, student enrollment, and location (urban or rural status). The sampling frames included the 60 largest urban districts, 12,423 other districts that had received EETT funds and 70 nondistrict entities that had received EETT competitive awards. From this population, 1,050 entities were sampled in proportion to EETT funding if they received EETT funds and in proportion to enrollment if they did not. Sample sizes by strata were designed to meet prespecified precision thresholds established by the Department.

District technology coordinators could respond to surveys online, on paper or by phone. The response rate for the district survey was 99 percent, with 1,029 entities responding. For data analysis, respondents were weighted to reflect a nationally representative sample of districts.

Between March and June 2007, the 2007 District Survey was administered to these same 1,039 district technology coordinators. Of these districts, 980 responded to the Phase 2 survey, for a final response rate of 94.3 percent. The sampling weights were adjusted to account for differences in response rates across different types of districts. Nineteen of the 980 respondents were deemed ineligible for the study, based on their 2005 survey responses, and were assigned a weight of zero.<sup>30</sup> The final analysis sample for this study includes 961 districts. The 2007 District Survey covered the same general topic areas that the 2005 survey did.

## **Teacher Survey**

The fall 2005 NETTS Teacher Survey asked teachers about their use of technology in school year 2004–05. Teachers were asked to describe their access to technology and technical support, their participation in technology-related professional development, their use of technology for instruction, their students’ use of technology for learning, and supports for and barriers to technology use in their schools. The teacher sample was created by drawing a probability sample of 975 schools from respondents to the district survey, stratified by school type (elementary or secondary) and poverty level (high or low).<sup>31</sup> Schools were randomly sampled in proportion to the number of teachers and in inverse proportion to district size to produce a sample of schools whose selection probabilities were roughly independent of the size of their district’s enrollment. NETTS researchers obtained teacher rosters for the 975 schools. Teachers who did not teach at the same school in school years 2004–05 and 2005–06 or who did not teach in a core subject area were excluded from the sample. Targets of four teachers from each of the schools in the original probability sample (742 schools) and of 25 teachers from each

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<sup>30</sup> Technically, the sampling frame consisted of school districts with students and nondistrict entities that received EETT funding. Therefore, the sampling frame should have excluded nondistrict entities that did not receive EETT funding. However, 19 respondents to the 2007 survey reported in the 2005 survey that they did not serve any students—suggesting that they were nondistrict entities—and reported that they did not receive any EETT funding for the 2002–03 school year. Because it appears that these entities should not have been eligible for selection into the study, they were assigned a weight of zero.

<sup>31</sup> For elementary schools, the poverty threshold, measured in terms of the percentage of students who were eligible for free and reduced-price lunch (FRPL), was 29.7 percent. For middle schools and high schools, the poverty thresholds were 24.3 percent and 15.9 percent, respectively. Schools with at least these percentages of students eligible for FRPL were considered “high-poverty” for the purpose of this study.

of the high-poverty schools (233 schools) were randomly selected for the teacher sample. The final teacher sample consisted of 6,017 teachers.

NETTS researchers administered the first NETTS Teacher Survey in fall 2005. Teachers could complete their surveys online or on paper. Researchers collected completed surveys from 4,935 teachers, for an overall response rate of 82 percent. In analyzing the data, survey respondents were weighted to reflect a nationally representative sample of teachers.

Between April and June 2007, the second NETTS Teacher Survey was administered to 2,509 teachers selected randomly from the 2005 district and school samples. The 2007 survey covered the same topics as the 2005 survey. Lists of all teachers from the school sample were requested from Market Data Research, a company that maintains updated teacher rosters. Additional rosters were requested from Quality Education Data to supplement incomplete teacher lists. Lists of eligible teachers were obtained for 865 schools, and a stratified sample of 2,509 teachers was selected from these schools.

Teachers were eligible for the 2007 teacher survey sample only if they were teaching at the same school in school year 2005–06. This requirement was imposed to facilitate appropriate responses to survey questions about the availability of technology and technology use in the previous school year. Schools provided information that enabled identification of 652 ineligible teachers, leaving a final sample of 1,857 teachers. An additional 78 teachers were deemed ineligible after survey administration, based on their responses to the teacher experience questions. The final teacher sample consisted of 1,779 teachers. Completed surveys were obtained from 1,515 eligible teachers, for a response rate of 85 percent. For data analysis, respondents were weighted within each survey wave to reflect a nationally representative sample of teachers.

## **Data Analyses**

Descriptive statistics from state, district and teacher survey items that addressed technology access, technology-related teacher professional development, technology integration and student technology literacy were produced. District and teacher data from school year 2004–05 and from school year 2006–07 described relationships between district investments in educational technology activities and teachers' reports of technology access and use. Researchers noted changes over time in technology access and integration; examined comparisons of technology access, skill and use; and analyzed teacher participation in technology-related professional development in high- and low-poverty schools. Linear regression models (with standard errors adjusted for cluster sampling) were used to examine the statistical significance of differences between teachers in schools of different socioeconomic contexts. In this report, high-poverty schools are defined as schools whose FRPL rates were in the top quartile of schools nationwide, according to CCD data. Middle-poverty schools are schools whose FRPL rates were in the next greatest quartile, and low-poverty schools are schools whose FRPL rates were in the lower half of schools nationwide. Statistically significant differences between teachers in schools of different poverty levels are reported in reference to the teachers in low-poverty schools. This approach is a conservative one in the sense that it is less likely to find statistically significant differences between high- and low-poverty groups than a comparison between the highest poverty quartile and the lowest poverty quartile. In essence, the analysis compares the 25 percent highest-poverty schools with schools at or below the median for poverty.







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