# Technology in Massachusetts Schools

## *2003-2004*

**April 2005**


**Massachusetts Department of Education**

**address** 350 Main Street, Malden, MA 02148
**telephone** 781-338-3000 **internet** www.doe.mass.edu

Massachusetts Department of Education
This document was prepared by the Massachusetts Department of Education
Dr. David P. Driscoll, Commissioner of Education

***This report was prepared by the Instructional Technology Group:***

Connie Louie, Director of Instructional Technology

Susan Hargrave, Instructional Technology Specialist

Carol Lach, Instructional Technology Specialist

Baiba Ozols, Instructional Technology Specialist

LeRoy Wong, Instructional Technology Specialist

Nicole Cirino, Administrative Assistant

April Graziano, Instructional Technology Consultant



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350 Main Street, Malden, Massachusetts 02148-5023 #781-338-3000

Internet address: www.doe.mass.edu

# Contents

*We see dramatic changes taking place in the educational landscape – a new excitement in the vast possibilities of the digital age for changing how we learn, how we teach, and how the various segments of our educational system fit together – a ferment for reform that is bringing changes undreamt of even five years ago and unparalleled in our nation's history.*

-- National Education Technology Plan[1]

# Introduction

The 2004 National Education Technology Plan paints a hopeful picture of technology in American schools, highlighting examples of effective use and applauding the innovation that is occurring. The plan touts the benefits of the Internet and the opportunities it offers for improving education, such as enhanced access to interactive learning resources, virtual courses, and easily accessible, up-to-date information.

Using technology is also essential for engaging students of the Millennial generation. In describing this generation, the national plan states, "Today's students are very technology-savvy, feel strongly about the positive value of technology and rely upon technology as an essential and preferred component of every aspect of their lives." According to the plan, students approach their lives differently because of technology. For example, today's teens spend more time on the Internet than they do watching television, and the Internet is their preferred means of accessing information. As a result, the plan warns, schools that do not embrace twenty-first century technology are likely to become increasingly irrelevant to students.

Schools need to harness technology, the national plan says, in order to better prepare our young people for the challenges of the global economy. This means improving teaching and learning so that every student succeeds in reading and mathematics. Integrated data systems can help schools reach this goal, by making it possible for educators to analyze students' strengths and weaknesses so that they can develop strategies to improve their learning.

The national plan includes some caveats, pointing out that the promise of technology will not be realized unless teachers are adequately trained, schools have sufficient technology infrastructures, and technical support is available to maintain those infrastructures. Massachusetts school districts have tools for addressing these issues: the *Local Technology Plan Guidelines for 2004-2005 to 2006-2007*[2] and the *Massachusetts School Technology and Readiness (STaR) Chart* developed by the state's Educational Technology Advisory Council (ETAC).[3] These tools are designed to help districts gauge their progress in providing conditions that support the effective use of technology.

[1] Complete text of the plan, released in January 2005, is available at http://www.nationaledtechplan.org/ .
[2] The guidelines are available at http://www.doe.mass.edu/edtech/tplanguide04_07.html .
[3] The Massachusetts STaR Chart is available at http://www.doe.mass.edu/boe/sac/edtech/star.html .

An analysis of the technology data submitted to the Department for the 2003-2004 school year reveals some promising trends. The percentage of teachers receiving technology professional development increased from 61% in 2003 to 71% in 2004. Districts have also made improvements in their infrastructures, with the percentage of districts that have every classroom connected to the Internet up from 72% to 79%. In addition, 60% of districts met the guideline of five or fewer students per modern computer, even though the definition of a modern computer was upgraded substantially in 2004.

Other data reveal some of the challenges districts face in their use of technology. In some districts, the number of computers varies widely from one school to the next, so students are not all receiving the same benefits. Many schools continue to lack the technical support staff to maximize their use of technology, so that on average it takes more than three days to service a computer that is down. Finally, nearly one-third of teachers use technology with their students only about once a month or less, suggesting that they need more support and training in order to be able to reap the benefits technology offers.

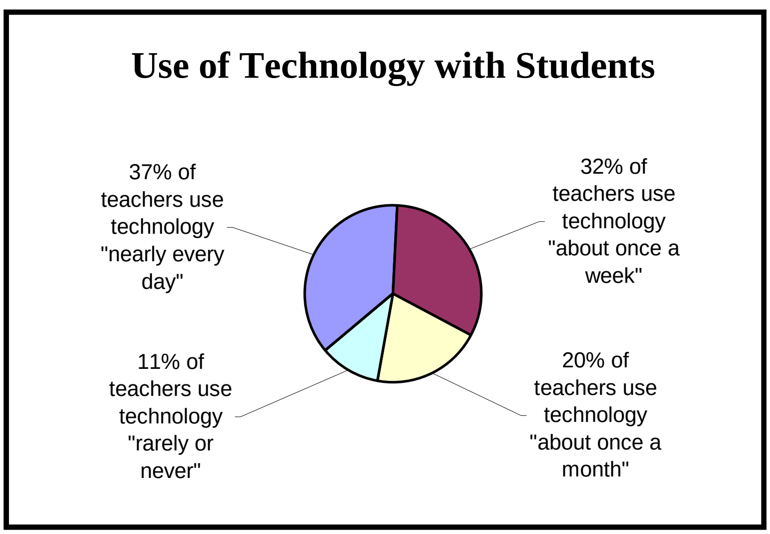
# Teaching and Learning

## *Use of Technology*

"Public schools that do not adapt to the technology needs of students risk becoming increasingly irrelevant," according to the national technology plan. This is just one of the reasons that our state guidelines recommend that at least 85% of teachers use technology each week with their students.

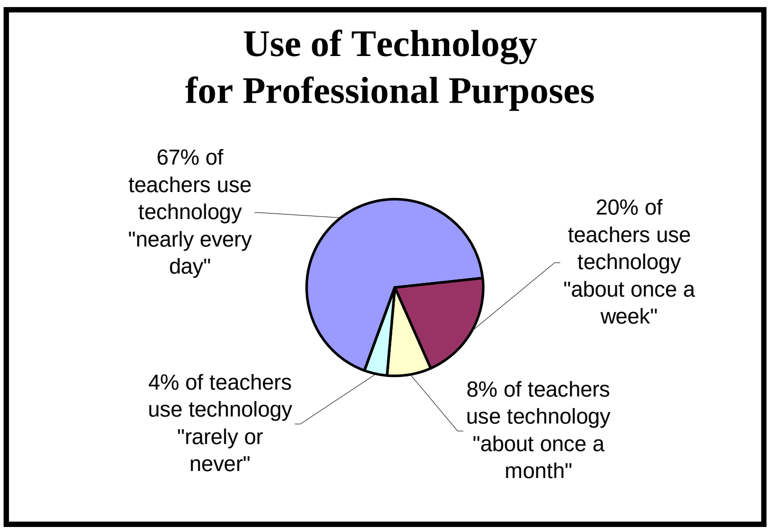
According to the data submitted by districts, the percentage of teachers using technology with their students "about once a week" or more appears to have decreased slightly, from 73% to 69%. The percentage of teachers using technology on a daily basis with students also appears to have decreased, from 43% to 37%. However, the apparent decrease in technology use may be the result of more accurate reporting. In 2003, 51% of districts relied on informal observation alone to gauge classroom technology use, while in 2004, just 36% of districts did so. Moreover, while in 2003, just 38% of districts used teacher surveys to gather data; in 2004, 53% of districts did so.

In 2004, the Department developed a one-page teacher survey that districts could choose to use to gather data. Nearly 30% of districts reported that they used the survey. Those who used the survey reported lower levels of technology use with students, suggesting that the others may have overestimated teachers' use of technology. For example, those who used the survey reported that 29% of teachers used technology on a daily basis, while those who did not use the survey reported that 40% of teachers did so.



| Use of Technology with Students<br>*Statewide Averages Based on Districts' Estimates and Surveys* | |
|---|---|
| **Frequency** | **Percent of teachers** |
| Used technology nearly every day | 37 |
| Used technology about once a week | 32 |
| Used technology about once a month | 20 |
| Used technology rarely or never | 11 |

The state guidelines also recommend that at least 85% of teachers use technology outside the classroom every day for professional purposes such as lesson planning, administrative tasks, communications, and collaboration. District data for 2004 show that 67% of teachers used technology professionally every day, while 20% did so about once a week. Interestingly, there was very little discrepancy in the data from districts that used the teacher survey and the data from those that didn't.



| Use of Technology for Professional Purposes<br>*Statewide Averages Based on Districts' Estimates and Surveys* | |
|---|---|
| **Frequency** | **Percent of teachers** |
| Used technology nearly every day | 67 |
| Used technology about once a week | 20 |
| Used technology about once a month | 8 |
| Used technology rarely or never | 4 |

## *Technology Proficiency*

### Student Technology Literacy

One of the goals of No Child Left Behind's Enhancing Education Through Technology Act is that all students become technologically literate by the end of eighth grade. The *Massachusetts Recommended PreK-12 Instructional Technology Standards* [4] define what students should know and be able to do in order to be considered technologically literate. These standards comprise three broad categories. Standard 1 includes proficiency in basic productivity tools as well as a conceptual understanding of technology systems. Standard 2 relates to understanding of ethics and safety issues in using electronic media. Standard 3 asks students to apply a wide range of technology tools to their learning of the curriculum.

Districts have devised a variety of methods for determining students' levels of technology literacy. In Walpole, for example, each student gets a Technology Competency Checklist[5] listing all of the skills from the state's instructional technology standards for their level (K-4 or 5-8). Teachers are encouraged to incorporate technology into their lessons and then check off the skills as students learn them. In Duxbury, where technology competency is a requirement for high school graduation, the technology center maintains a portfolio system to demonstrate students' mastery of the criterion.[6] As students enter an item into their portfolio folder, it is documented on a tracking sheet and signed off by the supervising teacher.

[4] The *Massachusetts Recommended PreK-12 Instructional Technology Standards* are available at http://www.doe.mass.edu/edtech/standards/itstand.pdf .
[5] Information about Walpole's Technology Competencies Program is available at http://www.walpole.ma.us/District_Home_page/district_technology/technology_competencies.htm .
[6] Information on Duxbury's technology graduation requirement is available at http://www.duxbury.k12.ma.us/technology/techgradreq.html .

The Department began collecting data from districts on the percentage of students who are proficient in these standards in 2004. Approximately half of the districted reported that they surveyed either teachers or students to determine students' level of technological literacy. Approximately one-sixth of the districts developed their own assessments. The rest of the districts used other methods such as informal interviews with staff or observations in their computer labs. While less than half of all districts actually provided the percentage of technologically literate students, the average for those districts was 61%.

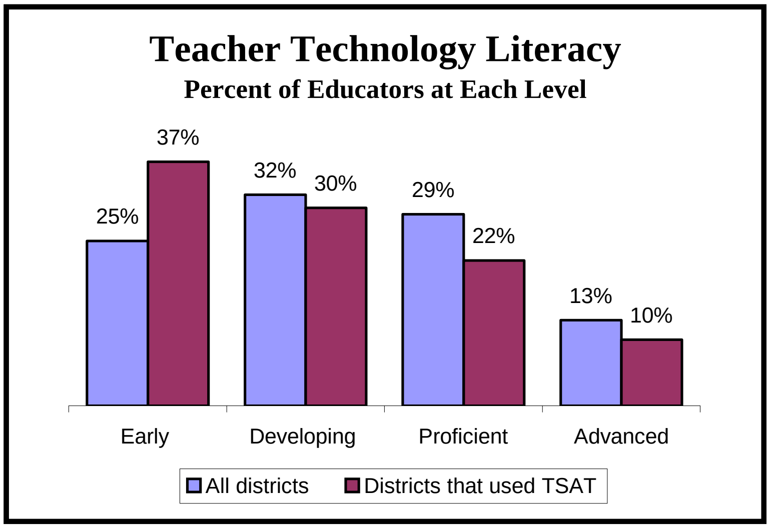
## Teacher Technology Literacy

In order to use technology for teaching and help students become technologically literate, teachers need to be knowledgeable about using technology. To help teachers determine their own levels of technology proficiency and determine their need for professional development, the Department released the online Technology Self-Assessment Tool (TSAT)[7] in 2004. In order to report on teachers' levels of technology literacy, districts were asked to use either the new TSAT application or their own methods, which needed to be aligned to the TSAT. Slightly more than a quarter of districts used the TSAT, while about the same number used locally developed survey tools. Most of the rest of the districts used other methods, such as informal observation at technology professional development workshops.

The TSAT has four levels, each of which lists an average of 25 skills. To take the TSAT, teachers begin at the lowest level (Early Technology), checking off the skills they know and progressing to the next level once they have mastered the skills at each level. For reporting purposes, a teacher's level is defined as the level where the teacher needs to stop and learn those skills. In order to preserve the privacy of individual users, the TSAT reports only aggregated data from the TSAT.

As the graph and table below show, teachers are almost evenly distributed across the TSAT's first three levels, with a smaller percentage at the Advanced level. However, in those districts that used the TSAT, there were more teachers at the Early Technology level, suggesting that districts may not have defined the levels in the same way the TSAT defined them.

[7] Information about the TSAT is available at http://www.doe.mass.edu/edtech/standards/sa_tool.html .




| Teacher Technology Literacy<br>*Percent of Educators at Each Level* | | |
|---|---|---|
| **Level** | **All districts** | **Districts that used TSAT** |
| Early technology | 25% | 37% |
| Developing technology | 32% | 30% |
| Proficient | 29% | 22% |
| Advanced | 13% | 10% |

According to the state's technology guidelines, 60% of teachers should be working on the Proficient or Advanced level by the year 2006-2007. The online TSAT, available through Virtual Education Space (VES),[8] automatically aggregates teacher data. Since the TSAT will list specific skills that teachers need to learn in order to become proficient in technology, districts can use it in planning their professional development activities.

## *Curriculum Integration Support*

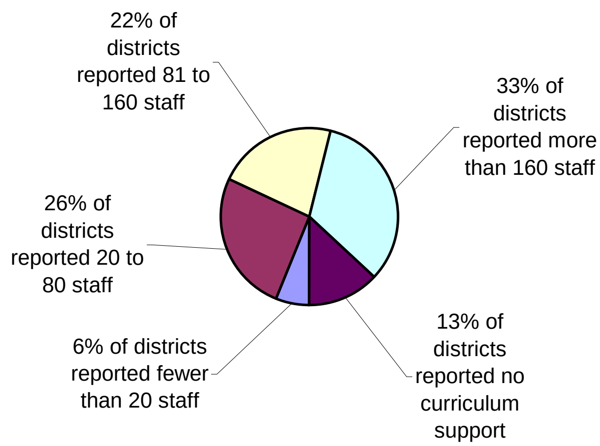
The people usually responsible for curriculum integration support are instructional technology specialists, media specialists, and library teachers. The support they provide typically includes researching, locating and evaluating curriculum resources, identifying effective practices that incorporate technology, and providing professional development.

[8] For more information about VES, see page 10.

In addition, these people may take the responsibility for ensuring that teachers and students meet the instructional technology standards. To carry out all of these functions, the curriculum integration person's activities may include consulting with teachers, modeling effective teaching with technology, collaborating with teachers to develop appropriate, technology-rich lessons, and providing workshops on technology integration.

To help teachers integrate technology into their teaching, the STaR Chart[9] recommends that schools have at least one full-time-equivalent person to support up to 80 teachers. Currently between one-quarter and one-third of districts meet this recommendation for curriculum integration support. According to district reports, nearly half of the districts either had no support or had a full-time-equivalent person supporting more than 160 teachers. However, curriculum integration staff often have multiple responsibilities, so it can be difficult for districts to accurately determine the portion of time that is devoted specifically to curriculum integration support.

**Instructional Staff per 1.0 FTE Curriculum Integration Person**




[9] The Massachusetts STaR (School Technology and Readiness) Chart is available at http://www.doe.mass.edu/boe/sac/edtech/star.html .

| Curriculum Integration Support<br>*Instructional Staff Supported by 1.0 FTE Curriculum Integration Person* | |
|---|---|
| **Number of instructional staff** | **Percent of districts** |
| Fewer than 20 instructional staff | 6% |
| 20 to 80 instructional staff | 26% |
| 81 to 160 instructional staff | 22% |
| More than 160 instructional staff | 33% |
| No support | 13% |

## Data-driven Decision Making

Technology can play a crucial role in collecting, managing, and analyzing data, which can then be used to make decisions about instructional practices that will better meet students' needs. For this reason, the national technology plan recommends that districts "establish a plan to integrate data systems so that administrators and educators have the information they need to increase efficiency and improve student learning."

Many districts in Massachusetts are using data to improve teaching and learning. In western Massachusetts, seven districts have partnered to develop a regional data warehouse. The primary goal of this project is to provide educators with timely and accurate student data to support school improvement efforts. Teachers will be able to analyze the data to focus their efforts and address specific concepts that students are struggling with; administrators will be able to analyze the data to determine programs and instructional materials that are successfully impacting learning in each grade and subject area.

A powerful data-analysis tool that is available to all Massachusetts school districts is the downloadable program TestWiz.[10] TestWiz can be used to analyze student test data, including results from the MCAS and LAS (Language Assessment Scale), allowing administrators and teachers to determine which specific learning standards students are mastering and which ones require better teaching strategies. Because TestWiz can track this data over time, it allows educators to identify which teaching strategies are working best. According to data from TestWiz, nearly 90% of all districts have downloaded the application, and more than half of all districts have attended at least one TestWiz training session.

[10] For more information on TestWiz, go to http://www.doe.mass.edu/mcas/2002/news/tstwiz_qa.html .

A new tool that may enhance the usefulness of tools like TestWiz is the recently released NCS Mentor.[11] Designed to provide a bridge between the MCAS and classroom instruction, this web-based tool can help educators better understand the curriculum frameworks and MCAS performance level expectations, which they can then integrate into their instruction. When using the tool, educators view actual student responses to MCAS open-response questions in mathematics and English language arts, as well as to composition writing prompts. NCS Mentor includes scoring rubrics, scoring guidelines, and examples, with detailed annotations, of student responses at each score point. After learning the criteria for scoring the sample student responses, educators can practice scoring responses themselves to see if they can match the actual scores. As of April 2005, 200 educators from 20 school districts have received training on the use of the NCS Mentor.

## *Use of the VES Web Portal*

Use of the state's education portal, Virtual Education Space (VES), continues to grow, with 55,877 user accounts as of March 2005, nearly double what it was in 2004. Student accounts, which have increased more than fourfold over the past year, make up 40% of the total. Popular tools include the discussion forums, the virtual hard drive (for anytime, anywhere access to files), and the sharable calendar. Educators are also making use of CLASP Online, which enables curriculum administrators to manage district curriculum guidelines, and the TSAT (Technology Self-Assessment Tool), which allows educators to assess their technology proficiency.[12]

Debuting in 2005 is VES's Data Collection Assessment & Survey Tool, or DCAST. This tool allows educators to create online data collection forms so that, for example, a teacher can create an online quiz or survey for students to take. The tool allows educators to select from eleven different question types, including formats such as multiple choice, short answer, matching, and ranking. Educators can then view the results either as a PDF file, showing the complete work of each student, or as a spreadsheet with aggregated answers.

## *E-Learning*

The national technology plan describes the recent explosive growth in online instruction and recommends that every student have access to it. In Massachusetts, the use of distance learning courses continues to increase, with 25% of districts reporting that their students took such courses in 2003-2004. Still, only a small minority of students statewide is impacted, with just under one-half of one percent taking part in distance learning. Online professional development, which is discussed in the professional development section of this report, is more prevalent, with 69% of districts reporting some use of it.

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[11] NCS Mentor can be accessed at http://www.doe.mass.edu/mcas/2004/news/1119mentor.html .
[12] For more information about VES and the tools it offers, see http://ves.doe.mass.edu/ .

The most common format, used by 90% of districts that offered distance learning courses, involved online instruction through a web-based system. Also, 11% of the districts delivered instruction through web-based videoconferencing, and 2% of districts delivered it through television or satellite broadcasts.

According to district reports, 114 educators from 52 districts are teaching distance learning courses to students. In about two-thirds of these districts, educators are teaching students in their own district. Additionally, in about two-thirds of the districts, educators are teaching students in other districts, with some educators teaching students both in and outside their districts. Fifty-one districts reported membership in Virtual High School (VHS), which allows schools to share resources in order to offer courses that they could not otherwise provide for their students.

As the table below illustrates, the most common curriculum area for distance learning courses in 2003-2004 was science, which was offered as an online course in 63 districts.

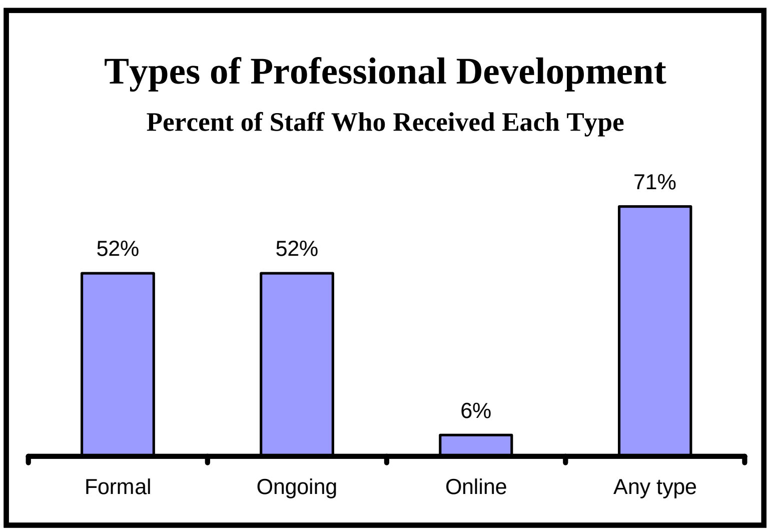
**Districts' Use of Distance Learning Courses**

| Curriculum area | Number of districts offering courses |
|---|---|
| Science and Technology/Engineering | 63 |
| Mathematics | 57 |
| English Language Arts | 53 |
| History and Social Science | 47 |
| Arts | 35 |
| Foreign Languages | 19 |
| Comprehensive Health | 12 |

## Educator Professional Development

The importance of technology professional development is prominent in the national technology plan, which states, "Teachers have more resources available through technology than ever before, but some have not received sufficient training in the use of technology to enhance learning."

Massachusetts districts are addressing the need for technology professional development, reporting, on average, that 71% of their teachers received some type of technology training in 2003-2004. Moreover, the percentage of teachers receiving technology professional development has increased by 10 percentage points since 2002-2003. Districts indicated that slightly more than half of their teachers received formal professional development such as technology workshops, summer institutes, credit courses, or study groups. In addition, slightly more than half of the teachers received ongoing professional development such as coaching, mentoring, and co-teaching. These data suggest that many teachers received both formal and informal technology professional development, which is in line with the Massachusetts State Plan for Professional Development's recommendation that professional development provide "on-the-job, informal support throughout the school year."



| **Types of Professional Development**<br>*Percent of Staff Who Received Each Type* | |
|---|---|
| **Type of professional development** | **Average percent of staff who received it** |
| Formal professional development | 52% |
| Ongoing professional development | 52% |
| Online professional development | 6% |
| Any type of professional development | 71% |

The aggregated data suggest that schools are on track to meet the state guideline of 85% of teachers receiving at least 45 hours of technology professional development by 2006-2007. In 2003-2004, Massachusetts school districts offered a total of 579,414 staff-hours[13] of formal professional development. This is 22% of the hours needed to meet the three-year goal.[14] Since this data does not include hours spent on informal professional development or online professional development, it seems likely that districts are providing the recommended level of professional development. However, because this analysis is based on aggregated data, individual districts will vary. Thus, each district needs to track the professional development its teachers are receiving and assess whether it is adequate.

## *Assessing Professional Development Needs*

The state technology guidelines recommend that districts assess the needs of their teachers, as well as the district as a whole, when planning professional development. Beginning in 2004, the Department provided the Technology Self-Assessment Tool (TSAT) to help districts in their needs assessment efforts. The TSAT is available as a printable file on the Department's web site and as an online application on Virtual Education Space (VES). The online TSAT allows administrators to access aggregated data for all of the teachers in the district or for those in a particular school. Administrators can also view TSAT data for specialized groups of teachers, such as all of the district's middle school science teachers.

In 2003-2004, 30% of districts used the TSAT to determine the professional development needs of their teachers. Most districts, including many of those who used the TSAT, used other means, such as collaborating with curriculum leaders, using a district-developed survey, observing teachers' use of technology, analyzing the questions teachers most

[13] If a district sponsors a two-hour workshop and 10 staff members attend, it is counted as 20 staff-hours.
[14] To meet the guideline, the total number of staff-hours statewide will need to reach 2,660,785 by 2006-2007.

frequently asked about technology, and looking at teacher requests for training. Some districts mentioned that they analyzed how technology professional development aligned with their district goals, with several districts using MCAS results as part of their needs assessment.

According to usage data gathered by the Department, teachers from 250 districts used the online TSAT from November of 2003 (when the TSAT first became available on the VES portal) to February 2005. Since just 105 districts reported using the TSAT in planning their professional development activities, the data suggest that some districts may have begun piloting the TSAT for future use. In fact, a number of districts reported that they planned to use the TSAT in the upcoming school year. In addition, some teachers may have used the TSAT independently to identify areas where they could improve their professional competencies.

## *Technology Toolkit*

One of the recommendations in the national technology plan is that teachers have access to examples and staff development so that they will be aware of best practices in technology use. In 2004 the Department developed a technology "toolkit" for educators, *Using Technology to Improve Student Learning*, which was distributed to school superintendents, principals, and technology directors. The toolkit, which is available on the Department's web site,[15] includes examples of technology-rich projects from Massachusetts classrooms, which were drawn from schools that received technology grants and schools that participated in Project MEET.

In addition to classroom examples, the toolkit includes numerous resources that were developed through Project MEET (Massachusetts Empowering Educators with Technology), which provided professional development to hundreds of educators throughout the state from 1998 to 2004. These professional development resources include multimedia training presentations, worksheets, rubrics, tutorials, and articles.

## *Online Professional Development*

Distance learning programs make it possible for educators to receive professional development on a schedule that is convenient to them. In addition, these programs allow educators to participate in professional development activities that might otherwise be unavailable, providing opportunities to communicate and collaborate with educators in distant locales.

The national technology plan recommends that every teacher have an opportunity to take online courses. In Massachusetts, the use of online professional development is rapidly increasing. In 2003-2004, the percentage of districts with one or more educators taking online professional development was 69%, up from 37% in 2002-2003.

[15] The technology toolkit is available at http://www.doe.mass.edu/edtech/toolkit/ .

While some districts are just beginning to investigate the use of online professional development, other districts are using it extensively. In one-quarter of all districts, at least 10% of the staff participated in online professional development. Moreover, in 7% of districts, teacher participation ranged from 20% to 100%.

The most common distance learning format used for teacher professional development involved asynchronous, text-based discussion delivered through a web-based system. However, some districts used other systems. In 16% of districts, teachers accessed professional development through web-based videoconferencing; while in 6% of districts, teachers accessed courses through television or satellite broadcasts. Most of the districts that used these other technologies also used web-delivered, text-based systems.

Massachusetts has a growing cadre of educators who are teaching professional development online, with more than 100 educators doing so in 2003-2004. Moreover, 16% of districts reported that one or more members of their staff taught online professional development workshops or credit courses for teachers and administrators. In the vast majority of these districts (76% of them), teachers taught their colleagues within the district, while in slightly over half of the districts, teachers taught educators outside their district.

# Infrastructure for Technology

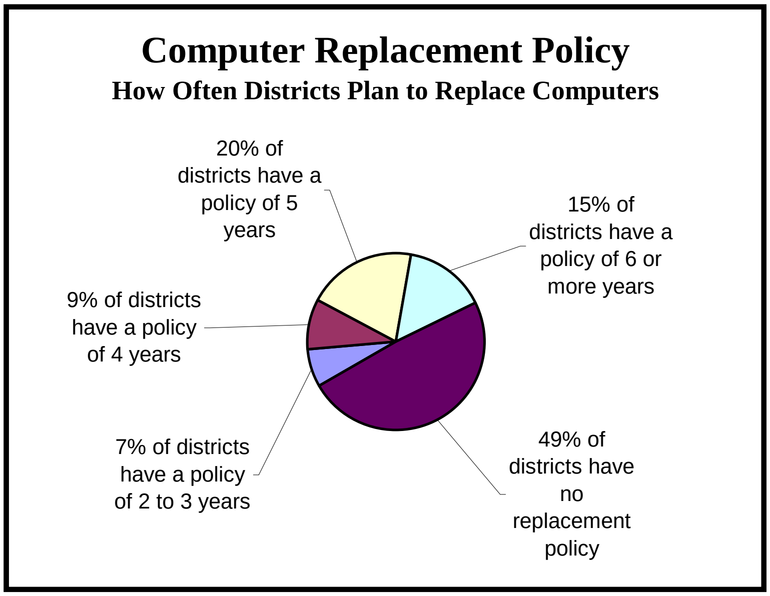
The national technology plan recommends that schools rely more on multimedia and online content, pointing out that the use of digital content offers advantages such as "cost savings, increased efficiency, improved accessibility, and enhanced learning opportunities." Another national recommendation is that all teachers and students have access to online instruction. In order to provide these resources and opportunities, the plan points out, districts need to evaluate their technology infrastructure, as well as ways to ensure its reliability and maximize educational uptime. In Massachusetts, districts can use the state's technology guidelines to assess their performance in these areas.

## *Computers*

The state guidelines recommends that districts maintain a ratio of fewer than five students per high-capacity Internet-connected computer. Acting on the advice of district technology directors and other stakeholders across the state, the Department updated the definition of a high-capacity computer in 2004.[16] While the old definition specified a minimum of 32 MB of RAM and a 225 MHz processor (133 for Macintosh computers), the new definition specifies a minimum of 128 MB RAM and a Pentium 3 or Macintosh G3 processor (or equivalent). This updated definition makes sense in light of the new national technology plan, which encourages schools to use e-learning, digital resources, and sophisticated data systems.

As a result of the updated definition of high-capacity computers, the statewide ratio of students to high-capacity computers has risen from 4.7 in 2003 to 6.9 in 2004. In 2002-2003, 68% of districts had the recommended ratio of students to computers. In 2003-2004, with the updated definition, just 60% met it. This finding underscores the importance of having a computer replacement policy, which allows a district to plan for the expenditures needed in order to provide current technology. However, just 51% of districts have such a policy. For those districts, the average replacement cycle was 5 years.

[16] Type A and Type B computers are considered "high-capacity" computers, so the minimum specifications presented here are for Type B computers. For more information, see Appendix A.




| **Computer Replacement Policy**<br>*How Often Districts Plan to Replace Computers* | |
|---|---|
| **Policy** | **Percent of districts** |
| Replace computers after 2 to 3 years | 7% |
| Replace computers after 4 years | 9% |
| Replace computers after 5 years | 20% |
| Replace computers after 6 or more years | 15% |
| No policy | 49% |

In most districts, the majority of computers are classified as high-capacity (Type A or B); however, 81% of districts continue to also use older computers (Type C computers). When used strategically, these older computers can be very useful in increasing student and teacher access to technology. When these computers are included, the statewide ratio of students to computers is 3.7.

Although older machines may not be practical for working with high-end multimedia applications or the latest instructional software, it often makes sense to continue using them for specific tasks. For example, older machines may work well for tasks such as web browsing and word processing. In addition, there are many software packages that have stood the test of time and that work well on older computers. On the down side, maintaining machines with many different operating systems may not be cost-effective. Districts need to weight the cost of new machines against the costs involved with supporting older machines.

When looking at a district's student-to-computer ratio, it is important to realize that the ratio may not reflect the conditions in all of its schools. An analysis of the 2003-2004 data showed that 16% of school buildings had student-to-computer ratios anywhere from two to more than one hundred times the district average. While some of these buildings had reasons for the higher ratios--for example, the building housed only kindergarten--others appeared not to have sound reasons for this lack of equity.

## *Portable Technologies*

In 2004, the Massachusetts Legislature's Special Commission on Educational Technology published a report recommending the use of wireless laptop computers with one-to-one access for each student.[17] According to the report, research on one-to-one computing has shown that it is fundamentally more dynamic and successful than school settings where students share technology tools. Moreover, states that have implemented one-to-one projects, such as Maine, have reported that having the technology available all the time, coupled with professional development, has dramatically changed the integration of technology.

Several Massachusetts school districts have begun piloting the use of one-to-one computing, especially at the middle school level. Three of these projects, funded in part through recently awarded Enhancing Education Through Technology Grants, are taking place in Gateway Regional School District/Easthampton Public Schools, North Central Charter Essential School, and Pittsfield Public Schools/North Adams Public Schools.

Additional schools are committed to the use of laptops, with twenty-two schools (just over 1% of all schools) using only laptop computers, although not necessarily with a one-to one ratio and wireless connectivity. For most school districts, however, shared desktop computers are still the norm. On average, just one out of every ten computers in a school building is a laptop.

Portable word processing devices continue to be widely available, with at least one unit in two-thirds of all school buildings. In addition 11% of schools have 50 or more of these units, and 2% of schools have more than 100 units.

The use of handheld computers is growing slowly, with 29% of schools reporting at least one handheld in their building. In some schools, administrators use handhelds to manage data; in others they are used by students, often in combination with science probes to

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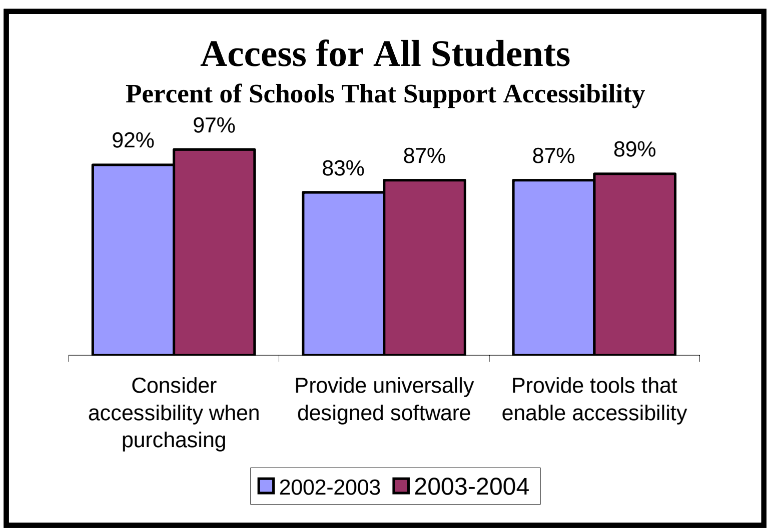
[17] The 2004 *Report Of The Special Commission On Educational Technology* is available at http://www.doe.mass.edu/edtech/toolkit/policy/commission.pdf .

measure things like temperature, light, or voltage. The use of handhelds by students appears to be limited, however, because just 5% of schools reported owning more than 10 handhelds.

## *Assistive Technologies and Universal Design*

Technology offers many ways to assist students with disabilities, including learning disabilities, as well as students whose first language is not English. For example, text-to-speech software allows students to hear text read on the computer, while interactive whiteboards allow the teacher to save what is written on the board for students who have difficulty with note taking.

Awareness of the importance of universal design and accessibility is increasing in Massachusetts. Nearly 97% of schools reported that they consider accessibility for all students when purchasing technologies. The availability of universally designed software also continues to grow. Defined as software with built-in features making it accessible to all students, universally designed software was available in 87% of school buildings in 2004, a slight increase over the 83% reported for 2003. In addition, 89% of schools have hardware, such as scanners, that can be used to digitize printed materials for students who need to use text-to-speech software.



| Access for All Students<br>*Percent of Schools That Support Accessibility* | | |
|---|---|---|
| **Means of supporting accessibility** | **2002-2003** | **2003-2004** |
| Considering accessibility when purchasing technology items | 92% | 97% |
| Providing universally designed software | 83% | 87% |
| Providing technology tools that enable accessibility | 87% | 89% |

A number of students with disabilities have been using assistive technologies to take the MCAS. Testing accommodations are generally aligned with those used by the student for instructional purposes. Guidelines for the use of assistive technologies in taking the MCAS are spelled out in the Department's publication *Requirements for the Participation of Students with Disabilities in MCAS*.[18] The most commonly used technology-based accommodations involve the use of text-to-speech software for students who have difficulty reading and the use of word processors for students who have difficulty writing. In 2004, the Department provided 175 electronic versions of MCAS tests for use with text-to-speech software, while more than 6,000 students used word processors to take the tests.

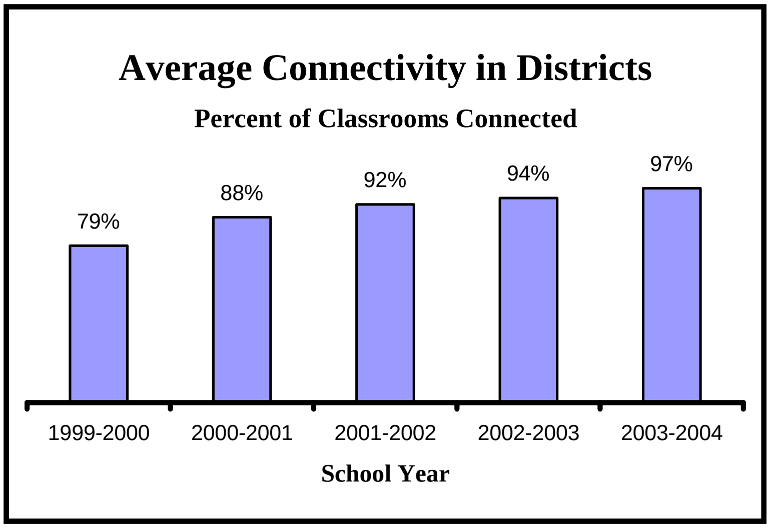
For students with significant disabilities, the Department offers the option of submitting the MCAS Alternate Assessment (MCAS-Alt),[19] which involves compiling a portfolio throughout the school year. Since 2000, schools have been permitted to submit electronic portfolios in place of paper portfolios. An electronic portfolio can include, for example, digital video or audio clips of the student completing various tasks, scanned samples of student work, and student work samples created on a computer. To assist educators in creating and organizing electronic portfolios, the Department offers downloadable software, training, and support for teachers to use the MCAS-Alt Electronic Version (EV). In 2004, electronic portfolios were submitted for 450 students.

[18] Requirements for the Participation of Students with Disabilities in MCAS is available at http://www.doe.mass.edu/mcas/alt/spedreq.pdf .

[19] Further information about the MCAS Alternate Assessment is available at http://www.doe.mass.edu/mcas/alt/ .

### *Connectivity*

Districts continue to make progress in connecting their classrooms to the Internet. In 2004, 79% of districts reported that all of their classrooms were wired, which is up from 72% the previous year. On average, districts have nearly 97% of their classrooms connected and 94% of their computers connected.




| Average Connectivity in Districts | |
|---|---|
| **School year** | **Percent of classrooms connected** |
| 1999-2000 | 79% |
| 2000-2001 | 88% |
| 2001-2002 | 92% |
| 2002-2003 | 94% |
| 2003-2004 | 97% |

The national technology plan recommends that schools provide broadband access so that educators and students can realize the full potential of the Internet for data management, online assessments, e-learning, and digital content. Nearly all Massachusetts schools are already implementing this recommendation, with only .4% of schools (7 schools) using dial-up Internet connections. The most common type of connection was T1, with 48% of schools using it, followed by cable modems, used in 23% of schools.

The use of wireless connections continues to grow. In 2004, 39% of school buildings reported at least one wireless device, and on average one in ten computers was connected to the Internet wirelessly. In addition, a significant percentage of Massachusetts schools (28%) appear to have wireless capability for all of their laptop computers.

## *Internet Safety and Ethics*

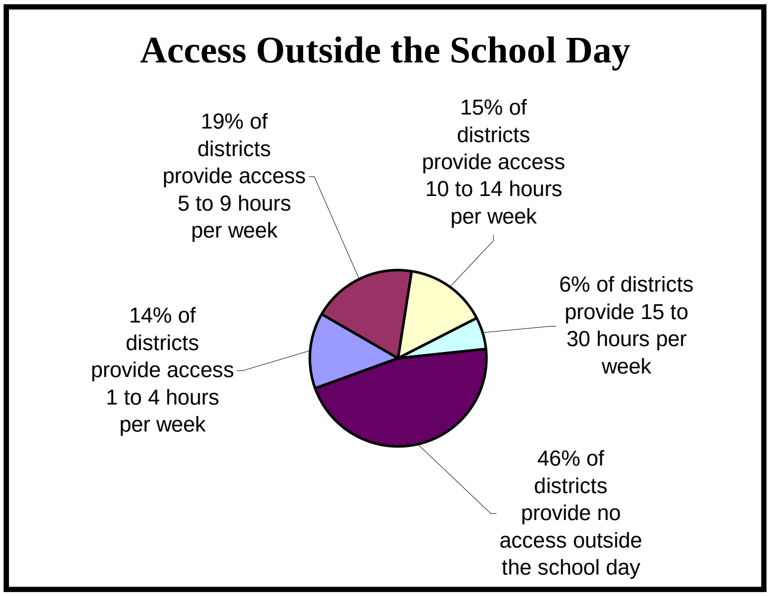
In order to be eligible for state and federal grants, schools must comply with the Children's Internet Protection Act (CIPA).[20] The law requires schools to certify that they have an Internet safety policy and that they are using filtering to block visual images that are obscene, child pornographic, or harmful to minors. In 2003, more than 98% of schools had such filters. To further protect students, 99% of schools have an Acceptable Use Policy (AUP); however, just 85% of schools included the AUP in their student handbook, and 81% posted it on their web site.

## *Access Outside the School Day*

The national technology plan recommends that all students have access to the Internet so that they can benefit from the advantages of online information and so that they can take online courses. With this increased emphasis on the Internet, it is important that students be able to go online to complete their homework so that they do not fall behind their peers. Since some students may not have Internet access at home, schools need to provide information on places that offer Internet access outside regular school hours.

The state guidelines recommend that schools provide information about places in the community where students can access the Internet before or after school. While 82% of schools provided this information, 54% of schools went a step further and allowed students to use the school's computers to access the Internet outside regular school hours. These schools offered access to student for an average of 7.4 hours per week before or after school. In addition, just over 20% of all schools offered Internet access for 10 hours or more per week. To further increase students' access to technology, 3% of schools (58 schools) allowed students to take computers home.

[20] Further information about CIPA is available at http://www.fcc.gov/cgb/consumerfacts/cipa.html .




| **Access Outside the School Day**<br>*Percent of Districts Offering Access Before and/or After School* | |
|---|---|
| **Number of hours computers can be used** | **Percent of districts offering this level of access** |
| 15 to 30 hours per week | 6% |
| 10 to 14 hours per week | 15% |
| 5 to 9 hours per week | 19% |
| 1 to 4 hours per week | 14% |
| None | 46% |

# Administration and Support Services

## *Technology Planning*

Developing a technology plan can help a school district clarify its goals and focus its efforts so that it can best leverage technology to improve student achievement. The plan should focus on both long-term and short-term goals, all of which are aligned with the district's mission, its school improvement plan, the state's education goals, and the goals of No Child Left Behind.

For each goal, there should be one or more implementation strategies to accomplish the goal. Evaluation should be an integral part of the planning process at every step along the way. As the plan is being developed, for example, the district should assess the needs of those who will use the technology. During the implementation of the plan, the district should evaluate how well it is working and how it can be improved for the future.

A state-approved technology plan is a requirement for eligibility for technology grants and E-rate discounts. To receive approval from the Department, a district needs to first develop a three- to five-year plan, which should then be posted on the district web site. Then the district must submit data to the Department annually to validate its implementation of the plan. For the school year 2003-2004, more than 92% of districts submitted data about their progress in implementing their technology plans. Most of these districts have posted their technology plans on their web sites so that the Department and others can review them.

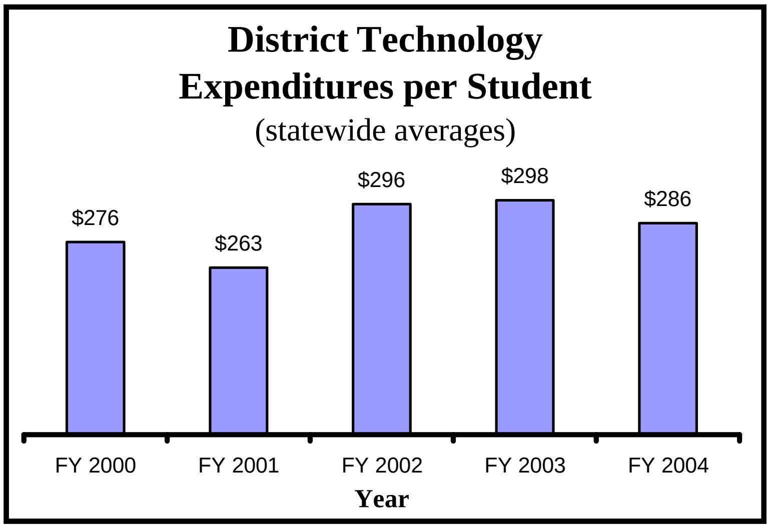
The state's technology guidelines also incorporate the requirements for the federal E-rate discount program.[21] In order for a district to be eligible for E-rate, its technology plan must meet five requirements: (1) clear goals and a realistic strategy for using telecommunication and information technology to improve education; (2) a professional development strategy to ensure that staff know how to use these new technologies; (3) an assessment of the telecommunication services, hardware, software, and other services that will be needed; (4) a sufficient budget to acquire and support the non-discounted elements of the plan; (5) an evaluation process that enables the district to monitor progress toward the specified goals.

## *Technology Budget*

A critical element of a district's technology plan is a comprehensive budget, which takes into account all of the costs associated with the use of technology. In addition to computers, the budget needs to include funds for items such as administration, maintenance, upgrades, technical support, data management, and professional development. In 2003-2004 the average per student spending on technology was $286, a 4% decrease from 2002-2003. These expenditures include monies from districts'

[21] For more information on E-rate, see http://www.fcc.gov/learnnet/ .

operational budgets, municipals bonds, and grants from federal, state, local, and private sources.




| District Technology Expenditures per Student<br>*Statewide Averages* | |
|---|---|
| FY2000 | $276 |
| FY2001 | $263 |
| FY2002 | $296 |
| FY2003 | $298 |
| FY2004 | $286 |

Providing funding for technology can be challenging, especially in times when budgets are tight. Experts recommend that a district's operational budget include a line item for technology so that it will be addressed each year when the budget is developed. One of the recommendations of the national technology plan is that districts consider the use of innovative budgeting strategies, pointing out that the focus needs to begin with the educational object and how the technology supports student learning. The plan suggests that districts restructure their budgets to realize efficiencies, cost savings, and reallocations, which could include expenditures on textbooks and instructional supplies. Another suggestion is that districts consider leasing equipment with three- to five-year refresh cycles.

The Massachusetts STaR Chart[22] recommends that districts leverage federal, state, and private resources to supplement local funding for their technology efforts. Most districts took advantage of the federal funding available for technology. Although the Department does not collect data on private funding, anecdotal reports indicate that some districts are exploring and using this option.

For the 2003-2004 school year, through No Child Left Behind's Enhancing Education Through Technology program (Title IID), a total of $6.7 million was available for entitlement grants, and an additional $6.7 million was available for competitive grants. A total of 338 districts applied for and received entitlement grants. In addition, many districts applied for competitive technology grants. The following grants were awarded: 56 Technology Enhancement Competitive Grants, 22 Model Technology Integration Grants, 26 technology-integrated Summer Content Institute Grants, and 6 Assistive Technology Summer Institute Grants. Many of these grants included partner districts, increasing the total number of districts. Additional information about grant programs is included the appendix.

Increasingly, districts are recognizing the value of the E-rate[23] discount program, with 81% of Massachusetts districts using it in 2002-2003, compared to 77% in 2002-2003. In 2003-2004 Massachusetts school districts received approximately $25 million in E-rate discounts for technology expenditures such as Internet services, telecommunications, and wiring. With discounts based on economic disadvantage and location (urban or rural), some Massachusetts districts are eligible for discounts as high as 90%. The average discount for Massachusetts districts was 60%.

## *Technical Support*

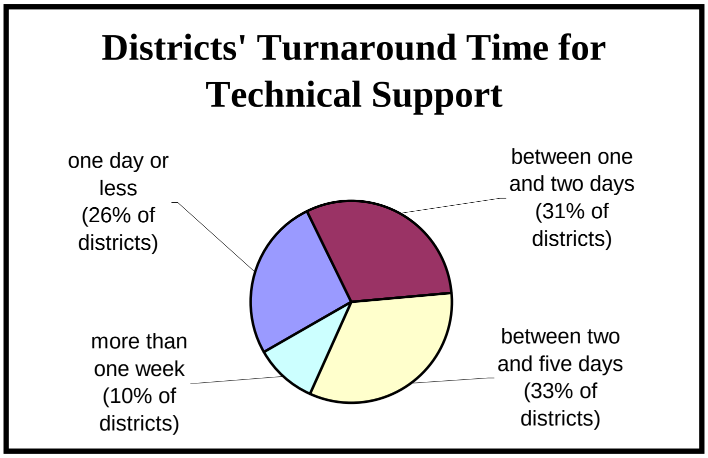
As the national technology plan points out, districts need to provide adequate technical support in order to "maximize educational uptime and plan for future needs." The STaR Chart recommends that districts have the equivalent of one full-time position (which can include contracted services) to support every 200 computers. Over the past two years, the number of districts providing this level of support has been dropping, from 35% in 2002 to 24% in 2004. This drop suggests that districts are continuing to purchase additional computers without providing additional staff or contractors to provide technical support to their users.

On average, according to district data, a technical support person maintains approximately 451 computers, up from 405 in 2003. Having an effective system for reporting, tracking, and fulfilling service requests is essential when a small staff is responsible for hundreds of computers. Districts used various methods to provide support. The most widely used method was email support, which was used in 82% of districts, followed by telephone support, used in 70% of districts. In addition, 38% of

[22] The STaR (School Technology and Readiness) Chart is available at http://www.doe.mass.edu/boe/sac/edtech/star.html .
[23] For more information on E-rate, see http://www.fcc.gov/learnnet/ .

districts used an online self-help system, which can reduce the demands on the technical staff and at the same time resolve technical problems more quickly.

According to district reports for 2003-2004, it took an average of 3.3 days to resolve a technical problem, which was slightly longer than in the previous year. However, 26% of districts estimated that they were able to resolve technical problems in one day or less, a slight increase over last year.




| Districts' Turnaround Time for Technical Support | |
|---|---|
| **Average time to resolve a problem** | **Percent of districts** |
| One day or less | 26% |
| Between one and two days | 31% |
| Between two and five days | 33% |
| More than one week | 10% |

It is possible that districts did not include user-resolved problems when they reported how long it took to resolve technical problems. If so, the average time for resolving technical problems might be much less than the reported average of 3.3 days. The Department will include additional questions in its 2005 survey to determine if this is so.

## Conclusion

Districts' 2003-2004 technology data provide reasons for optimism about technology and learning in Massachusetts schools. Most districts have a solid infrastructure in place, with nearly all their computers connected to the Internet via high-speed connections. Many schools have upgraded their equipment and already have a ratio fewer than five students per modern, Internet-connected computer. Even more important, the percentage of teachers who received technology professional development has increased since last year, and it appears that many schools will meet the federal and state guidelines. In addition, many schools are making good progress in assessing technology literacy for students and teachers.

Challenges remain, however, before many schools can fully benefit from the opportunities technology offers for improving teaching and learning. Nearly one-third of teachers use technology with their students only once a month or less, yet many districts lack the support that could help these teachers better use their school's technology resources. Less than one-third of districts have the recommended level of staffing for technology integration support, and less than one-quarter of districts have the recommended level of technical support.

The national technology plan undoubtedly strikes a chord for many educators and students in Massachusetts when it says," Technology ignites opportunities for learning, engages today’s students as active learners and participants in decision-making on their own educational futures and prepares our nation for the demands of a global society in the 21st century." The challenge now for schools is to create and maintain the conditions that will allow technology to impact teaching and learning. With the ongoing efforts on the part of districts to create these conditions, combined with effective use of technology by highly trained educators, Massachusetts students will be able to benefit from the tools that hold so much promise.

## Appendix A

# District Statistics

### *Districts Reporting*

School districts that reported on the implementation of their technology plans in 2004 are included in the following tables. Districts that did not do so are not included.

### *Student Computer Ratios*

The ratio of students per Type A/B computer is based on the number of instructional computers of these types reported on the 2004 individual school profile forms. The ratio of students per computers of any type is based on the total number of instructional computers reported in all categories: Types A, B, and C.  The enrollment figures used were those reported by the districts for the 2003-2004 school year. The ratios reported here are based on data aggregated from the school profile forms and validated by school districts. School districts should calculate a student computer ratio for each school to ensure equitable access across the entire district.

During the period that this data was collected, Type A computers were defined as "multimedia computers capable of running virtually all current software, including the latest high-end video and graphics programs" and having at least 256 RAM and a Pentium 4 processor or Macintosh G4 processor (or equivalent). Type B computers were defined as "multimedia computers capable of running most software except for the latest video and graphics programs" and having from 128 to 256 MB RAM and a Pentium 3 processor or Macintosh G3 processor (or equivalent). Type C computers were defined as multimedia computers capable of running most current productivity applications" and having less than 128 MB RAM and a Pentium 2 processor or a Macintosh PowerPC 604e processor (or equivalent).

### *Connections to the Internet*

The percentage of classrooms connected to the Internet is based on reporting by individual schools on the school profile forms. Since some districts prefer to provide more connections in computer labs, the percentage of instructional computers connected to the Internet is also reported, using data from the school profile forms. This data was validated by school districts.

### *E-Rate*

The information on which schools received E-rate discounts is based on data reported on the district profile form. This data was validated by school districts.

# District Statistics

| School district | Students per Type A/B computer | Students per computer of any type | Percent of classrooms connected to the Internet | Percent of instructional computers on Internet | Did the district receive E-rate? |
|---|---|---|---|---|---|
| Abby Kelley Foster Regional Charter | 5.0 | 4.9 | 100 | 49 | no |
| Abington | 7.6 | 5.8 | 73 | 74 | no |
| Academy Of The Pacific Rim Charter | | 6.5 | 100 | 100 | no |
| Acton | 8.0 | 5.0 | 100 | 93 | yes |
| Acton-Boxborough | 3.6 | 3.1 | 100 | 100 | yes |
| Acushnet | 2.0 | 1.9 | 100 | 100 | yes |
| Adams-Cheshire | 11.9 | 5.1 | 100 | 100 | yes |
| Agawam | 10.2 | 5.1 | 62 | 74 | yes |
| Amesbury | 8.8 | 4.3 | 100 | 85 | yes |
| Amherst | 3.6 | 3.3 | 100 | 100 | yes |
| Amherst-Pelham | 4.2 | 2.8 | 100 | 100 | yes |
| Andover | 4.7 | 2.8 | 100 | 100 | yes |
| Arlington | 5.2 | 3.9 | 100 | 100 | yes |
| Ashburnham-Westminster | 4.7 | 3.9 | 100 | 100 | yes |
| Ashland | 9.1 | 6.6 | 100 | 100 | yes |
| Assabet Valley | 2.7 | 2.2 | 27 | 95 | yes |
| Athol-Royalston | 3.8 | 2.8 | 86 | 84 | yes |
| Atlantis Charter | 4.3 | 4.3 | 100 | 100 | no |
| Attleboro | 8.0 | 5.2 | 100 | 95 | yes |
| Auburn | 4.4 | 4.4 | 100 | 100 | yes |
| Avon | 3.1 | 3.1 | 100 | 96 | yes |
| Ayer | 4.8 | 3.7 | 100 | 99 | yes |
| Barnstable | 17.9 | 4.0 | 100 | 85 | yes |
| Barnstable Hmcs | 4.6 | 2.9 | 100 | 100 | yes |
| Bedford | 2.4 | 2.3 | 100 | 100 | yes |
| Belchertown | 4.1 | 4.1 | 84 | 88 | yes |
| Bellingham | 5.7 | 4.6 | 99 | 99 | yes |
| Belmont | 6.2 | 5.4 | 100 | 100 | yes |
| Benjamin Banneker Charter | 3.1 | 3.1 | 100 | 100 | yes |
| Berkley | 7.7 | 4.6 | 100 | 86 | no |
| Berkshire Hills | 7.7 | 4.7 | 100 | 90 | yes |
| Berlin | 11.2 | 4.2 | 100 | 83 | yes |
| Berlin-Boylston | 6.2 | 4.0 | 97 | 96 | yes |
| Beverly | 5.2 | 4.0 | 98 | 100 | no |
| Billerica | 14.3 | 4.8 | 100 | 93 | yes |
| Blackstone Valley Reg | 1.9 | 1.7 | 100 | 94 | yes |
| Blackstone-Millville | 3.6 | 3.4 | 100 | 98 | yes |
| Blue Hills Voc | 2.0 | 1.8 | 100 | 100 | yes |
| Boston | 8.2 | 5.0 | 98 | 100 | no |
| Boston Renaissance Charter | 3.3 | 3.3 | 100 | 89 | yes |

# District Statistics

| School district | Students per Type A/B computer | Students per computer of any type | Percent of classrooms connected to the Internet | Percent of instructional computers on Internet | Did the district receive E-rate? |
|---|---|---|---|---|---|
| Bourne | 3.0 | 2.6 | 100 | 100 | yes |
| Boxborough | 4.1 | 3.2 | 100 | 100 | yes |
| Boxford | 4.1 | 3.7 | 100 | 96 | no |
| Boylston | 2.9 | 2.8 | 100 | 88 | yes |
| Braintree | 5.9 | 5.8 | 61 | 84 | yes |
| Brewster | 4.0 | 2.4 | 100 | 100 | no |
| Bridgewater-Raynham | 6.5 | 5.1 | 100 | 83 | no |
| Brimfield | 11.8 | 4.2 | 100 | 64 | yes |
| Bristol County Agr | 4.0 | 3.2 | 93 | 100 | no |
| Bristol-Plymouth Voc Tech | 2.2 | 1.8 | 98 | 100 | yes |
| Brockton | 7.1 | 5.9 | 82 | 72 | yes |
| Brookfield | 9.5 | 3.3 | 100 | 51 | yes |
| Brookline | 3.4 | 3.0 | 96 | 96 | yes |
| Burlington | 4.0 | 3.2 | 100 | 85 | yes |
| Cambridge | 4.2 | 3.6 | 100 | 100 | yes |
| Canton | 2.5 | 2.5 | 100 | 100 | no |
| Cape Cod Lighthouse Charter | 3.6 | 3.4 | 92 | 94 | no |
| Cape Cod Region Voc Tech | 2.7 | 2.7 | 100 | 97 | yes |
| Carlisle | 7.9 | 4.1 | 100 | 56 | yes |
| Carver | 5.5 | 4.0 | 100 | 100 | yes |
| Central Berkshire | 4.7 | 3.9 | 100 | 88 | yes |
| Champion Hmcs | 14.5 | 4.8 | 100 | 67 | no |
| Chatham | 2.4 | 2.4 | 100 | 100 | no |
| Chelmsford | 4.4 | 4.1 | 100 | 99 | yes |
| Chelsea | 4.1 | 3.5 | 100 | 100 | yes |
| Chesterfield-Goshen | 4.7 | 4.7 | 100 | 100 | yes |
| Chicopee | 5.8 | 4.6 | 100 | 100 | yes |
| City On A Hill Charter | 2.5 | 2.5 | 100 | 100 | no |
| Clarksburg | 4.5 | 4.5 | 100 | 100 | yes |
| Clinton | 4.4 | 2.4 | 100 | 99 | yes |
| Codman Academy Charter | 1.8 | 1.8 | 100 | 100 | no |
| Cohasset | 2.1 | 2.1 | 100 | 87 | yes |
| Community Day Charter | 5.0 | 5.0 | 100 | 100 | no |
| Concord | 3.5 | 3.5 | 100 | 100 | yes |
| Concord-Carlisle | 3.0 | 3.0 | 100 | 100 | yes |
| Conway | 4.6 | 4.2 | 100 | 100 | yes |
| Danvers | 10.5 | 5.7 | 100 | 98 | yes |
| Dartmouth | 4.1 | 3.1 | 100 | 100 | yes |
| Dedham | 3.2 | 3.2 | 100 | 100 | yes |
| Deerfield | 4.9 | 4.7 | 100 | 100 | yes |

# District Statistics

| School district | Students per Type A/B computer | Students per computer of any type | Percent of classrooms connected to the Internet | Percent of instructional computers on Internet | Did the district receive E-rate? |
|---|---|---|---|---|---|
| Dennis-Yarmouth | 6.6 | 4.2 | 100 | 100 | yes |
| Dighton-Rehoboth | 8.9 | 7.4 | 75 | 96 | no |
| Douglas | 3.0 | 2.6 | 100 | 100 | yes |
| Dover | 2.4 | 2.4 | 100 | 100 | yes |
| Dover-Sherborn | 2.4 | 2.3 | 100 | 100 | yes |
| Dracut | 6.0 | 4.2 | 99 | 100 | yes |
| Dudley-Charlton Reg | 4.3 | 3.2 | 100 | 100 | yes |
| Duxbury | 4.2 | 3.8 | 100 | 100 | yes |
| East Bridgewater | 12.2 | 4.5 | 100 | 80 | yes |
| East Longmeadow | 2.7 | 2.7 | 100 | 100 | yes |
| Eastham | 3.0 | 3.0 | 100 | 100 | no |
| Easthampton | 6.8 | 4.5 | 78 | 67 | yes |
| Easton | 5.3 | 5.0 | 100 | 100 | yes |
| Edgartown | 3.2 | 2.4 | 100 | 74 | yes |
| Edward Brooke Charter | 8.3 | 8.3 | 100 | 100 | no |
| Erving | 1.9 | 1.9 | 100 | 100 | yes |
| Essex Agr Tech | 5.1 | 2.9 | 97 | 100 | yes |
| Everett | 3.6 | 3.4 | 77 | 97 | yes |
| Fall River | 7.9 | 4.6 | 79 | 71 | yes |
| Falmouth | 6.9 | 4.9 | 100 | 90 | yes |
| Farmington River Reg | | 3.2 | 100 | 100 | yes |
| Fitchburg | 9.5 | 6.6 | 98 | 93 | yes |
| Florida | | 4.6 | 100 | 100 | yes |
| Four Rivers Charter | 2.4 | 2.4 | 100 | 100 | no |
| Foxboro Regional Charter | 17.9 | 17.9 | 11 | 100 | yes |
| Foxborough | 2.9 | 2.6 | 100 | 100 | yes |
| Framingham | 4.0 | 3.4 | 100 | 100 | yes |
| Framingham Community Charter | 15.3 | 5.6 | 100 | 100 | no |
| Francis W. Parker Charter | 12.3 | 5.2 | 100 | 100 | yes |
| Franklin | 3.9 | 3.4 | 100 | 100 | yes |
| Franklin County | 2.1 | 1.2 | 100 | 100 | yes |
| Freetown | 2.5 | 2.5 | 100 | 100 | yes |
| Freetown-Lakeville | 2.1 | 2.1 | 100 | 100 | yes |
| Frontier | 1.9 | 1.9 | 100 | 100 | yes |
| Gardner | 6.7 | 5.0 | 100 | 100 | no |
| Gateway | 2.2 | 2.0 | 100 | 100 | yes |
| Georgetown | 35.2 | 4.5 | 100 | 97 | yes |
| Gill-Montague | 3.2 | 3.1 | 100 | 100 | yes |
| Gloucester | 6.6 | 3.6 | 100 | 73 | yes |
| Gosnold | 0.7 | 0.7 | 100 | 33 | no |

# District Statistics

| School district | Students per Type A/B computer | Students per computer of any type | Percent of classrooms connected to the Internet | Percent of instructional computers on Internet | Did the district receive E-rate? |
|---|---|---|---|---|---|
| Grafton | 3.3 | 3.1 | 100 | 100 | yes |
| Granby | 12.7 | 6.1 | 100 | 98 | no |
| Granville | 3.1 | 3.1 | 100 | 100 | yes |
| Greater Fall River | 3.4 | 2.1 | 100 | 94 | no |
| Greater Lawrence Rvt | 3.3 | 2.4 | 100 | 100 | yes |
| Greater Lowell Voc Tec | 8.3 | 3.0 | 100 | 95 | yes |
| Greater New Bedford | 2.4 | 2.4 | 100 | 100 | no |
| Greenfield | 5.4 | 4.0 | 97 | 78 | yes |
| Groton-Dunstable | 4.3 | 4.1 | 100 | 100 | yes |
| Hadley | 5.6 | 3.6 | 100 | 100 | yes |
| Halifax | 6.6 | 5.5 | 100 | 53 | no |
| Hamilton-Wenham | 7.0 | 4.1 | 98 | 94 | yes |
| Hampden-Wilbraham | 10.4 | 3.9 | 100 | 100 | yes |
| Hampshire | 1.9 | 1.9 | 100 | 100 | yes |
| Hancock | 2.6 | 2.6 | 100 | 89 | no |
| Hanover | 4.8 | 3.2 | 100 | 95 | yes |
| Harvard | 7.5 | 6.8 | 100 | 84 | yes |
| Harwich | 4.5 | 3.5 | 100 | 86 | yes |
| Hatfield | 3.4 | 3.3 | 100 | 100 | no |
| Haverhill | 12.5 | 5.6 | 80 | 70 | no |
| Hawlemont | 2.7 | 2.4 | 100 | 100 | yes |
| Health Careers Academy Hmcs | 6.5 | 5.2 | 64 | 100 | no |
| Hilltown Cooperative Charter | 5.0 | 4.1 | 100 | 100 | no |
| Hingham | 5.5 | 4.2 | 100 | 89 | yes |
| Holbrook | 5.8 | 4.9 | 100 | 96 | yes |
| Holland | 7.4 | 3.0 | 100 | 94 | yes |
| Holliston | 3.3 | 2.3 | 100 | 100 | yes |
| Holyoke | 6.5 | 3.6 | 100 | 100 | yes |
| Hopedale | 3.0 | 3.0 | 100 | 100 | yes |
| Hopkinton | 3.6 | 3.2 | 100 | 99 | yes |
| Hudson | 3.1 | 2.8 | 100 | 100 | yes |
| Hull | 3.6 | 3.3 | 100 | 100 | no |
| Ipswich | 6.8 | 2.9 | 100 | 100 | no |
| King Philip | 3.9 | 3.0 | 100 | 93 | yes |
| Kingston | 4.3 | 3.7 | 100 | 48 | yes |
| Lakeville | 10.2 | 6.4 | 100 | 92 | yes |
| Lanesborough | 4.8 | 4.8 | 100 | 100 | no |
| Lawrence | 4.2 | 4.2 | 75 | 99 | yes |
| Lee | 1.9 | 1.9 | 100 | 100 | yes |
| Leicester | 5.0 | 4.2 | 100 | 100 | no |

# District Statistics

| School district | Students per Type A/B computer | Students per computer of any type | Percent of classrooms connected to the Internet | Percent of instructional computers on Internet | Did the district receive E-rate? |
|---|---|---|---|---|---|
| Lenox | 4.4 | 3.4 | 100 | 81 | yes |
| Leominster | 4.7 | 3.5 | 99 | 100 | yes |
| Leverett | 2.4 | 2.1 | 100 | 100 | yes |
| Lexington | 5.5 | 4.4 | 99 | 100 | yes |
| Lincoln-Sudbury | 4.6 | 4.1 | 10 | 100 | yes |
| Littleton | 4.0 | 2.6 | 98 | 63 | yes |
| Longmeadow | 4.9 | 4.3 | 100 | 97 | yes |
| Lowell | 11.0 | 4.1 | 92 | 64 | yes |
| Lowell Community Charter | 4.5 | 4.2 | 100 | 100 | yes |
| Ludlow | 6.4 | 4.8 | 100 | 85 | yes |
| Lunenburg | 34.5 | 5.6 | 100 | 100 | no |
| Lynn | 57.3 | 4.3 | 87 | 83 | yes |
| Lynnfield | 2.1 | 2.1 | 100 | 100 | no |
| Malden | 3.1 | 2.6 | 100 | 97 | yes |
| Manchester Essex Regional | 3.0 | 2.9 | 100 | 100 | yes |
| Mansfield | 12.3 | 7.0 | 100 | 100 | yes |
| Marblehead | 6.1 | 3.5 | 100 | 100 | yes |
| Marion | 2.9 | 2.9 | 100 | 100 | yes |
| Marlborough | 7.5 | 5.1 | 100 | 100 | yes |
| Marshfield | 5.2 | 5.1 | 100 | 63 | yes |
| Marthas Vineyard | 2.4 | 1.8 | 100 | 89 | yes |
| Masconomet | 2.2 | 2.2 | 100 | 89 | yes |
| Mattapoisett | 2.2 | 1.8 | 100 | 100 | yes |
| Maynard | 9.8 | 3.2 | 100 | 96 | yes |
| Medford | 2.0 | 1.9 | 98 | 99 | yes |
| Media And Technology Charter | 2.4 | 2.4 | 100 | 100 | yes |
| Medway | 9.1 | 4.2 | 100 | 94 | yes |
| Mendon-Upton | 6.6 | 4.0 | 100 | 100 | yes |
| Methuen | 12.3 | 3.4 | 100 | 99 | yes |
| Middleborough | 4.1 | 2.9 | 100 | 100 | yes |
| Middleton | 11.8 | 5.1 | 98 | 62 | no |
| Milford | 8.7 | 6.3 | 83 | 76 | yes |
| Millbury | 6.3 | 5.0 | 78 | 100 | yes |
| Millis | 5.7 | 4.6 | 100 | 100 | yes |
| Milton | 3.5 | 3.5 | 100 | 100 | yes |
| Minuteman Voc Tech | 1.7 | 1.2 | 100 | 87 | yes |
| Mohawk Trail | 7.2 | 3.9 | 100 | 98 | yes |
| Monson | 2.9 | 2.8 | 100 | 96 | yes |
| Montachusett Voc Tech Reg | 2.5 | 2.2 | 100 | 100 | yes |
| Murdoch Middle Public Charter | 2.7 | 2.3 | 100 | 96 | no |

# District Statistics

| School district | Students per Type A/B computer | Students per computer of any type | Percent of classrooms connected to the Internet | Percent of instructional computers on Internet | Did the district receive E-rate? |
|---|---|---|---|---|---|
| Nahant | 4.3 | 2.6 | 100 | 82 | no |
| Nantucket | 1.8 | 1.6 | 100 | 92 | no |
| Narragansett | 22.4 | 4.9 | 84 | 95 | yes |
| Nashoba | 4.0 | 2.6 | 100 | 94 | yes |
| Nashoba Valley Tech | 4.3 | 1.9 | 100 | 96 | yes |
| Natick | 3.6 | 3.3 | 100 | 99 | yes |
| Nauset | 9.8 | 3.6 | 99 | 100 | no |
| Needham | 3.7 | 3.5 | 100 | 100 | yes |
| Neighborhood House Charter | 4.4 | 4.4 | 100 | 100 | yes |
| New Bedford | 3.6 | 3.4 | 86 | 91 | yes |
| New Bedford Global Hmcs | 1.2 | 1.2 | 100 | 100 | no |
| New Salem-Wendell | 4.4 | 4.0 | 100 | 85 | yes |
| Newburyport | 3.7 | 2.6 | 99 | 100 | yes |
| Newton | 5.1 | 3.6 | 97 | 84 | yes |
| Norfolk | 4.0 | 3.6 | 100 | 100 | yes |
| Norfolk County Agr | 2.6 | 2.6 | 95 | 100 | yes |
| North Adams | 3.9 | 2.8 | 100 | 100 | no |
| North Andover | 3.1 | 2.4 | 100 | 100 | yes |
| North Attleborough | 7.3 | 3.5 | 100 | 100 | yes |
| North Brookfield | 13.1 | 3.3 | 100 | 100 | yes |
| North Central Charter Essential School | 3.9 | 3.9 | 100 | 100 | no |
| North Middlesex | 5.9 | 4.5 | 100 | 87 | yes |
| North Reading | 5.6 | 4.4 | 79 | 96 | yes |
| North Shore Reg Voc | 1.7 | 1.7 | 100 | 95 | yes |
| Northampton | 10.0 | 4.9 | 100 | 100 | yes |
| Northampton-Smith | 3.7 | 3.0 | 100 | 100 | yes |
| Northboro-Southboro | 7.2 | 3.7 | 100 | 100 | yes |
| Northborough | 6.8 | 3.2 | 100 | 99 | yes |
| Northbridge | 3.7 | 2.9 | 98 | 99 | yes |
| Northern Berkshire Voc | 1.5 | 1.5 | 100 | 99 | yes |
| Norton | 10.2 | 3.8 | 100 | 100 | yes |
| Norwell | 2.6 | 2.0 | 100 | 100 | yes |
| Oak Bluffs | 4.4 | 3.4 | 100 | 100 | yes |
| Old Colony Reg Voc Tech | 7.2 | 2.8 | 100 | 100 | no |
| Old Rochester | 2.1 | 2.0 | 100 | 100 | yes |
| Orange | 2.0 | 1.8 | 100 | 100 | yes |
| Orleans | 3.4 | 3.3 | 100 | 100 | no |
| Oxford | 5.6 | 5.6 | 100 | 98 | yes |
| Palmer | 4.5 | 4.5 | 100 | 100 | yes |
| Pathfinder Voc Tech | 2.2 | 2.2 | 100 | 98 | yes |

# District Statistics

| School district | Students per Type A/B computer | Students per computer of any type | Percent of classrooms connected to the Internet | Percent of instructional computers on Internet | Did the district receive E-rate? |
|---|---|---|---|---|---|
| Peabody | 8.5 | 4.6 | 94 | 100 | yes |
| Pembroke | 5.6 | 4.5 | 100 | 80 | yes |
| Pentucket | 8.1 | 5.0 | 100 | 97 | yes |
| Petersham | 3.0 | 2.8 | 86 | 93 | no |
| Pioneer Valley | 2.6 | 2.6 | 94 | 100 | yes |
| Pioneer Valley Performing Arts Charter | 8.2 | 8.2 | 85 | 95 | no |
| Pittsfield | 5.0 | 4.8 | 100 | 97 | yes |
| Plainville | 2.1 | 2.0 | 100 | 95 | yes |
| Plymouth | 6.4 | 2.5 | 100 | 100 | yes |
| Plympton | 3.0 | 3.0 | 100 | 100 | yes |
| Prospect Hill Academy Charter | 7.1 | 7.1 | 100 | 91 | no |
| Provincetown | 1.9 | 1.2 | 100 | 100 | yes |
| Quabbin | 9.2 | 6.7 | 100 | 100 | yes |
| Quaboag Regional | 3.3 | 3.0 | 100 | 100 | yes |
| Quincy | 5.4 | 3.7 | 100 | 95 | yes |
| Ralph C Mahar | 3.0 | 3.0 | 100 | 92 | yes |
| Randolph | 6.0 | 4.1 | 100 | 83 | yes |
| Reading | 9.8 | 7.0 | 100 | 88 | yes |
| Revere | 3.7 | 3.7 | 100 | 100 | yes |
| Rising Tide Charter | 3.6 | 3.0 | 100 | 100 | yes |
| River Valley Charter | 5.5 | 5.5 | 100 | 73 | no |
| Rochester | 4.9 | 4.0 | 100 | 88 | yes |
| Rockland | 8.0 | 3.4 | 100 | 100 | yes |
| Rockport | 4.1 | 3.3 | 100 | 85 | yes |
| Rowe | 5.6 | 1.9 | 100 | 100 | yes |
| Roxbury Preparatory Charter | 4.4 | 4.4 | 100 | 100 | yes |
| Sabis International Charter | 20.0 | 16.8 | 14 | 99 | no |
| Salem | 4.0 | 2.7 | 80 | 66 | yes |
| Sandwich | 5.0 | 4.4 | 100 | 100 | yes |
| Saugus | 9.1 | 4.7 | 82 | 77 | yes |
| Savoy | 5.1 | 5.1 | 100 | 73 | yes |
| Scituate | 4.5 | 3.7 | 100 | 100 | yes |
| Seekonk | 3.3 | 2.5 | 100 | 100 | yes |
| Seven Hills Charter | 3.8 | 3.8 | 100 | 100 | yes |
| Sharon | 5.1 | 4.9 | 100 | 100 | yes |
| Shawsheen Valley Voc Tech | 2.7 | 2.0 | 100 | 100 | no |
| Sherborn | 3.8 | 3.8 | 100 | 100 | yes |
| Shirley | 4.7 | 3.2 | 97 | 92 | yes |
| Shrewsbury | 4.5 | 3.9 | 100 | 100 | no |
| Shutesbury | 4.0 | 3.6 | 100 | 98 | yes |

# District Statistics

| School district | Students per Type A/B computer | Students per computer of any type | Percent of classrooms connected to the Internet | Percent of instructional computers on Internet | Did the district receive E-rate? |
|---|---|---|---|---|---|
| Silver Lake | 32.1 | 6.3 | 100 | 78 | yes |
| So Middlesex Voc Tech Reg | 2.0 | 1.9 | 98 | 91 | yes |
| So.Boston Harbor Academy Charter | 4.5 | 4.5 | 12 | 57 | yes |
| Somerset | 4.8 | 3.9 | 100 | 100 | yes |
| Somerville | 3.6 | 2.7 | 99 | 100 | yes |
| South Hadley | 4.3 | 4.1 | 86 | 91 | no |
| South Shore Charter | 6.8 | 3.5 | 100 | 100 | no |
| South Shore Reg Voc Tech | 3.5 | 3.5 | 100 | 63 | yes |
| Southampton | 10.9 | 9.1 | 100 | 100 | yes |
| Southborough | 4.9 | 2.9 | 100 | 98 | yes |
| Southbridge | 8.3 | 4.1 | 98 | 66 | yes |
| Southeastern Reg Voc Tech | 1.2 | 1.2 | 100 | 96 | yes |
| Southern Berkshire | 2.2 | 2.2 | 100 | 100 | yes |
| Southern Worcester Cty Vt | 3.7 | 2.6 | 100 | 99 | yes |
| Southwick-Tolland | 12.8 | 5.7 | 92 | 90 | yes |
| Spencer-E Brookfield | 8.0 | 3.5 | 97 | 98 | yes |
| Springfield | 5.0 | 3.0 | 63 | 84 | yes |
| Stoneham | 3.9 | 3.9 | 100 | 100 | yes |
| Stoughton | 2.8 | 2.8 | 100 | 100 | yes |
| Sturbridge | 6.8 | 5.6 | 100 | 100 | yes |
| Sudbury | 3.3 | 3.2 | 100 | 100 | yes |
| Sunderland | 4.6 | 4.6 | 100 | 100 | yes |
| Sutton | 2.2 | 1.7 | 100 | 100 | yes |
| Swampscott | 3.8 | 3.5 | 100 | 86 | yes |
| Swansea | 6.3 | 5.4 | 100 | 100 | yes |
| Tantasqua | 3.6 | 3.0 | 92 | 96 | yes |
| Taunton | 3.1 | 2.7 | 100 | 99 | yes |
| Tewksbury | 9.7 | 3.9 | 99 | 100 | yes |
| Tisbury | 2.9 | 2.2 | 100 | 100 | yes |
| Topsfield | 5.7 | 3.6 | 100 | 89 | no |
| Tri County | 5.3 | 1.9 | 100 | 100 | yes |
| Triton | 5.8 | 3.9 | 100 | 98 | yes |
| Truro | 2.2 | 2.2 | 100 | 91 | no |
| Tyngsborough | 4.0 | 3.1 | 100 | 97 | yes |
| Up-Island Regional | 1.8 | 1.8 | 100 | 100 | yes |
| Upper Cape Cod Voc Tech | 1.9 | 1.8 | 100 | 99 | yes |
| Uxbridge | 5.9 | 4.6 | 100 | 86 | yes |
| Wachusett | 4.2 | 2.9 | 100 | 73 | yes |
| Wakefield | 27.4 | 6.3 | 100 | 100 | yes |
| Wales | 4.8 | 3.6 | 100 | 100 | yes |

# District Statistics

| School district | Students per Type A/B computer | Students per computer of any type | Percent of classrooms connected to the Internet | Percent of instructional computers on Internet | Did the district receive E-rate? |
|---|---|---|---|---|---|
| Walpole | 4.5 | 3.3 | 64 | 83 | yes |
| Waltham | 4.8 | 3.6 | 78 | 92 | yes |
| Ware | 6.4 | 3.1 | 100 | 100 | yes |
| Wareham | 6.8 | 3.6 | 100 | 100 | yes |
| Watertown | 4.2 | 2.7 | 100 | 96 | no |
| Wayland | 4.3 | 3.5 | 92 | 88 | yes |
| Webster | 9.5 | 6.1 | 81 | 84 | yes |
| Wellesley | 3.3 | 3.2 | 100 | 100 | yes |
| Wellfleet | 3.3 | 2.2 | 100 | 100 | no |
| West Boylston | 3.7 | 2.1 | 100 | 100 | yes |
| West Bridgewater | 4.1 | 3.8 | 100 | 94 | no |
| West Springfield | 4.0 | 3.1 | 100 | 67 | no |
| Westborough | 4.5 | 3.0 | 100 | 100 | yes |
| Westfield | 5.5 | 3.0 | 99 | 99 | yes |
| Westford | 3.9 | 3.4 | 99 | 93 | yes |
| Westhampton | 4.2 | 4.1 | 100 | 97 | yes |
| Weston | 2.7 | 2.3 | 100 | 63 | yes |
| Westport | 4.6 | 3.9 | 100 | 100 | yes |
| Westwood | 4.1 | 4.0 | 100 | 100 | yes |
| Weymouth | 7.6 | 6.6 | 99 | 98 | no |
| Whately | 2.4 | 2.4 | 100 | 100 | yes |
| Whitman-Hanson | 7.5 | 4.0 | 100 | 96 | yes |
| Whittier Voc | 2.3 | 2.2 | 100 | 100 | yes |
| Williamsburg | 2.8 | 2.6 | 100 | 90 | yes |
| Williamstown | 4.0 | 3.6 | 100 | 100 | no |
| Wilmington | 4.8 | 4.2 | 100 | 100 | yes |
| Winchendon | 64.7 | 4.5 | 100 | 99 | yes |
| Winchester | 6.5 | 5.4 | 93 | 100 | yes |
| Winthrop | 5.3 | 5.1 | 100 | 100 | yes |
| Woburn | 3.3 | 3.2 | 98 | 98 | yes |
| Worcester | 3.5 | 3.5 | 100 | 99 | yes |
| Wrentham | 2.2 | 2.1 | 100 | 100 | yes |

## Appendix B

# Local Technology Plan Guidelines
## *(School Year 2004-2005 through 2006-2007)*

In order to be eligible for E-Rate discounts, as well as federal and state technology funding, every school district is required to have a long-range strategic technology plan approved by the Department of Education. School districts must have their plans on file locally, including a full description of their implementation strategies. Each year, to approve school districts' technology plans, the Department asks districts to report on the progress they have made in implementing their plans through the Department's secure web portal.

In 2000, to help districts develop purposeful plans, the Department worked with technology stakeholders across the state to develop a set of recommended guidelines called "Local Technology Benchmark Standards for 2003." These guidelines represent recommended conditions for the effective integration of technology into instruction.

In 2001, the Board of Education established the Educational Technology Advisory Council (ETAC) to advise the Department on issues relating to the use of technology in schools. ETAC developed the School Technology and Readiness (STaR) Chart (http://www.doe.mass.edu/boe/sac/edtech/star.html) to illustrate the "complex set of interactions of people, materials and dimensions" that are involved in using technology effectively in schools. ETAC believes that the STaR Chart represents "the beginning of a new strategic plan for Massachusetts to improve student learning with the use of technology." Based on the recommendations of the STaR Chart and advice from stakeholders across the Commonwealth, the Department has developed this new set of guidelines for schools to use in technology planning. These guidelines are not *mandated* but rather recommended benchmarks[1] for districts to meet by the end of the school year 2006 to 2007. The Department will use these guidelines to gauge the progress of districts' implementation in order to approve their technology plans annually.

**Recommended Benchmark 1**
**Commitment to a Clear Vision and Mission Statement**

A. The district's technology plan contains a realistic and clearly stated set of goals and strategies that align with the district-wide school improvement plan. It is committed to achieving its vision by the end of the school year 2006-2007.

B. The district has a technology team with representatives from a variety of stakeholder groups. The technology team has the support of the district leadership team.

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[1] The word benchmark in this document is defined as a reference point in the implementation of the local technology plan.

C. Budget

1. The district has a budget for its local technology plan with line items for technology in its operational budget.

2. The budget includes staffing, hardware, software, professional development, support, and contracted services.

3. The district leverages the use of federal, state, and private resources.

D. Evaluation

1. The district evaluates the effectiveness of technology resources toward attainment of educational goals on a regular basis. Prior to purchasing the district assesses the products and services that are needed to improve teaching and learning.

2. The district's technology plan includes an evaluation process that enables the district to monitor its progress in achieving its technology goals and to make mid-course corrections in response to new developments and opportunities as they arise.

**Recommended Benchmark 2**
**Technology Integration**

A. Teacher and Student Use of Technology

1. (a) Outside the Classroom
At least 85% of teachers use technology everyday, including some of the following areas: lesson planning, administrative tasks, communications, and collaboration. Teachers share information about technology uses with their colleagues.
(b) Within the Classroom
At least 85% of teachers use technology appropriately with students each week, including some of the following areas: research, multimedia, simulations, data interpretation, communications, and collaboration.

2. At least 85% of students from grades 5 to 8 show proficiency in all the Massachusetts Recommended PreK-12 Instructional Technology Standards for Grades 5 to 8.

3. At least 90% of teachers are working to meet the proficiency level in technology, and by the school year 2006-2007, 60% of teachers will have reached the proficiency level as defined by the Massachusetts Technology Self-Assessment Tool (TSAT).[2]

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[2] TSAT is based on "Educational Technology Standards and Performance Indicators for All Teachers" (http://cnets.iste.org/teachers/t_stands.html) developed by National Educational Technology Standards (NETS), as well as the STaR Chart (http://www.doe.mass.edu/boe/sac/edtech/star.html) developed by the Educational Technology Advisory Council (ETAC).

4. The district has a CIPA-compliant Acceptable Use Policy (AUP) regarding Internet use.

B. Staffing

1. The district has a full-time equivalent (FTE) district-level technology director/coordinator.

2. The district provides one FTE instructional technology teacher per 40-80 instructional staff.

3. The district has one FTE person dedicated to data management and assessment.

**Recommended Benchmark 3**
**Technology Professional Development**

A. By the end of the school year 2006-2007, at least 85% of district staff will have participated in 45 hours of high-quality technology professional development covering technology skills and the integration of technology into instruction.

B. Technology professional development is sustained and ongoing and includes coaching, modeling best practices, district-based mentoring, and study groups. The professional development includes concepts of universal design and scientifically based, researched models.

C. Professional development planning includes an assessment of district and teachers' needs. The assessment is based on the competencies listed in the Massachusetts Technology Self-Assessment Tool.[3] The Department, the Educational Technology Advisory Council and stakeholders will review the levels of competencies in the Massachusetts Technology Self-Assessment Tool on an annual basis.

**Recommended Benchmark 4**
**Accessibility of Technology**

A. Students per Instructional Computer

1. The district has an average ratio of fewer than five students per high-capacity, Internet-connected computer. The Department will work with stakeholders to review the capacity of the computer on an annual basis. (The ultimate goal is to have a one-to-one, high-capacity, Internet-connected computer ratio.)

2. The district considers students' access to portable and/or handheld electronic devices appropriate to their grade level.

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[3] Districts and teachers may use the TSAT online interactive application available on VES (Virtual Education Space) or a locally developed application.

3. The district has established a computer replacement cycle of six years or less.

B. Technical Support

1. The district makes a commitment to provide timely in-classroom technical support with clear information on how to access the support, so that technical problems will not cause major disruptions to curriculum delivery.

2. The district provides a FTE network administrator.

3. The district provides at least one FTE person to support 100-200 computers. Technical support can be provided by dedicated staff or contracted services.

**Recommended Benchmark 5**
**Infrastructure for Connectivity**

A. Internet Access

1. The district provides connectivity to the Internet in all classrooms in all schools, including wireless connectivity, if appropriate.

2. The district provides bandwidth of at least 10/100 MB to each classroom.

B. Networking (LAN/WAN)

1. The district provides a minimum 10/100 MB Cat 5 switched network and/or 802.11b/g wireless network.

2. The district provides services for secure file sharing, backups, scheduling, email, and web publishing, either internally or through contracted services.

C. E-Learning Environments

1. The district encourages the development and use of innovative strategies for delivering specialized courses through the use of technology.

2. The district deploys IP-based and/or ISDN-based connections for access to web-based and/or interactive video learning on the local, state, regional, national, and international level.

3. Classroom applications of e-learning include courses, cultural projects, virtual field trips, etc.

**Recommended Benchmark 6**
**Access to the Internet outside the School Day**

A. The district maintains an up-to-date web site that includes information for parents.

B. The district works with community groups to ensure that students and staff have access to the Internet outside of the school day.

C. The district web site includes an up-to-date list of places where students and staff can access the Internet after school hours.

## Appendix C

# No Child Left Behind Title IID
# Technology Entitlement Grants (Fund Code 160)

### *Final Report for the 2003-2004 School Year*

The No Child Left Behind, Title IID Program provides funds to schools to meet three major goals:

1. Improving student academic achievement through the effective use of technology in K-12 schools

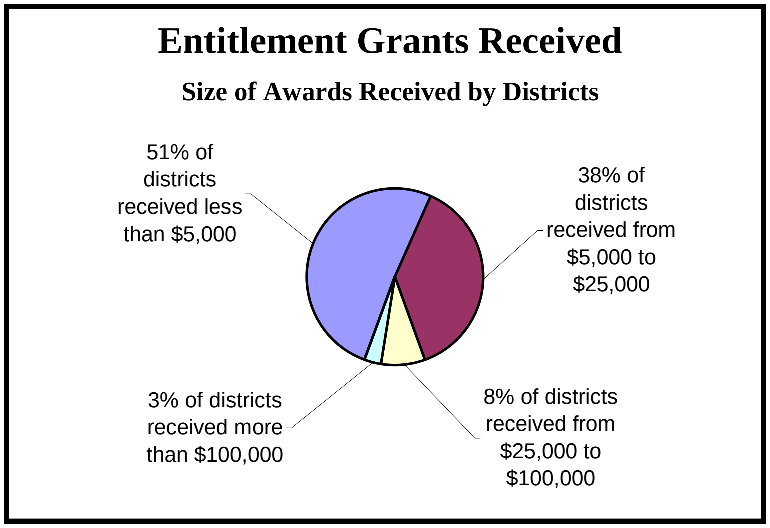
2. Assisting every student to achieve the technology competency requirement by eighth grade

3. Encouraging high quality professional development through the effective use of technology resources and systems in order to establish research-based methods that can be incorporated into daily classroom instruction

Fifty percent of the grant funds ($6,689,701) were available to be distributed as entitlement grants to 373 eligible school districts during the 2003-2004 school year. Grant size is based on each district's proportional share of funds under Part A of Title I. The smallest grant award was $38 and the largest grant award was  $991,147. These grants were used for professional development, hardware, software, Internet connections, and staffing for special projects.

In 2003-2004, 102 of the eligible districts applied for Title IID funds by participating in the "consolidated" grant process, which encourages districts to use a data-driven, results-oriented, strategic planning process to meet the goals of the No Child Left Behind Act (NCLB). The remaining 271 districts applied for Title IID funds independently from other NCLB grant titles by completing a "standalone" grant application.

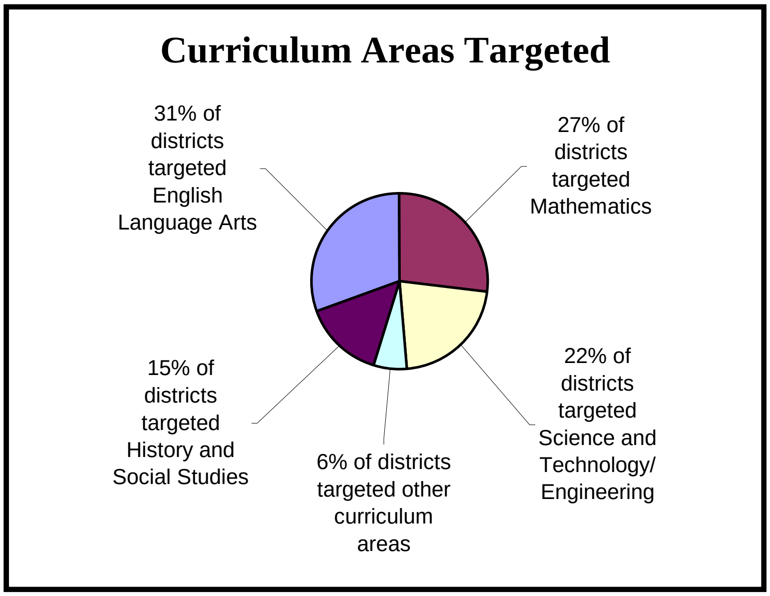
Of the districts eligible for funding, 189 districts were awarded less than $5,000; 143 districts were awarded between $5,000 and $25,000; 31 districts were awarded between $25,000 and $100,00; and 10 districts were awarded more than $100,000.




| Entitlement Grants Received<br>*Size of Awards Received by Districts* | |
|---|---|
| **Size of award** | **Percent of districts** |
| Less than $5,000 | 51% |
| From $5,000 to $25,000 | 38% |
| From $25,000 to $100,000 | 8% |
| More than $100,000 | 3% |

Title IID requires that applicants spend at least 25% of their funds on high quality professional development. In Massachusetts, approximately 66% of the districts used 100% of their funds for professional development, while the other 34% of districts used at least 25% of their funds for professional development. The remaining grant funds were used by districts for the following priorities: software applications, hardware, distance learning and assistive technologies.

In reporting how they planned to use their funds, 31% of districts planned to target the funds for English Language Arts, 27% targeted the funds for Mathematics, 22% for Science, 15% for History/Social Studies, and the remaining 6% for other content areas.




| Curriculum Areas Targeted | |
|---|---|
| **Curriculum area** | **Percent of districts targeting this area** |
| English Language Arts | 31% |
| Mathematics | 27% |
| Science and Technology/Engineering | 22% |
| History and Social Studies | 15% |
| Other curriculum areas | 6% |

## Appendix D

# No Child Left Behind Title IID
# Model Technology Integration Grants (Fund Code 165)

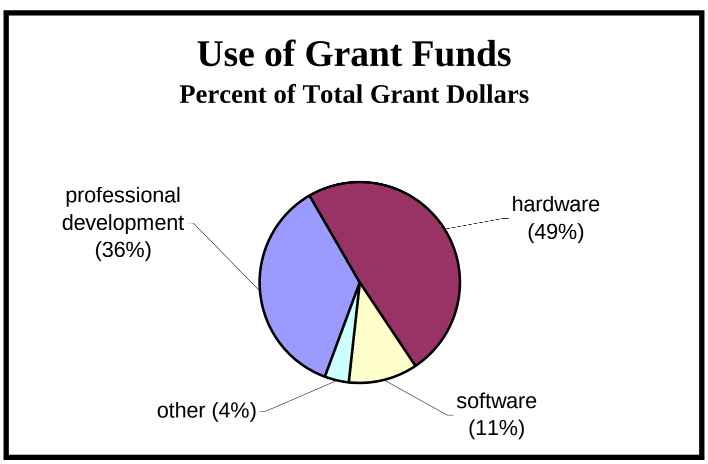
### *Final Report for the 2003-2004 School Year*

The purpose of the No Child Left Behind Title II D Model Technology Integration Grants (Fund Code 165) was to enable teachers to disseminate exemplary curriculum projects that use advanced technology to support student learning of content aligned with the Massachusetts Curriculum Frameworks. A secondary goal was for teachers to learn how to integrate classroom instruction with the Massachusetts Recommended PreK-12 Instructional Technology Standards to increase technology and content literacy in students.

During the 2003-04 school year, a total of $839,705 was awarded for this competitive technology grant program. This funding came from the United States Department of Education through Title IID: Enhancing Education Through Technology. Through this grant, 28 projects were funded, and 31 districts (including 23 high need districts) benefited from the grant. Approximately 3,342 students were impacted overall, or approximately 119 students per project. This document provides a summary and examples of how the funds were used. More detailed descriptions of each project can be found at [http://www.doe.mass.edu/edtech/grants/fy04/fc_165.html](http://www.doe.mass.edu/edtech/grants/fy04/fc_165.html)

## Use of Grant Funds

During the 2003-04 school year, $302,745 was spent on professional development. This is approximately 36% of the total grant funds. No Child Left Behind requires at least 25% of Title II D funds be spent on professional development. The use of these grant funds is shown graphically below.



| Use of Grant Funds<br>*Percent of Total Grant Dollars* | | | |
|---|---|---|---|
| **Hardware** | **Professional Development** | **Software** | **Other** |
| 49% | 36% | 11% | 4% |

The breakdown of the funds spent on professional development was as follows:

- $134,376, or approximately 44% of professional development funds were spent on instructors.
- $105,129 or approximately 35% of the professional development funds were spent on stipends for participants and substitute teachers **(**so that teachers could attend professional development).
- $63,240 or approximately 21% of the professional development funds were used for other expenditures, such as instructional materials, administrative costs, and travel.

The 49% spent on hardware included items such as computers (both desktop and laptop), monitors, wireless routers and wireless cards, projectors, CD and DVD burners, scanners, handhelds, probeware, portable word processors, interactive whiteboards, digital cameras, and camcorders. The 11% spent on software included applications such as productivity software, desktop publishing software, graphics software, and software for teaching reading. Software purchases also included a variety of universally designed products that help make the curriculum accessible to all students.

## Impact of Grant Funds

### Professional Development

A variety of professional development opportunities were provided through these grants. There were approximately 870 participants for all the projects and an average of 76 hours of professional development per project. Most districts conducted workshops, but other types of professional development were also used, as shown below.

<u>Types of Professional Development Used</u> (Some districts used more than one type.)

- Workshop (20 districts used)
- Study group (9 districts used)

- Mentoring (8 districts used)
- Institute (1 district used)
- Course or mini-course (2 districts used)
- Online course (1 district used)
- Other (6 districts used)

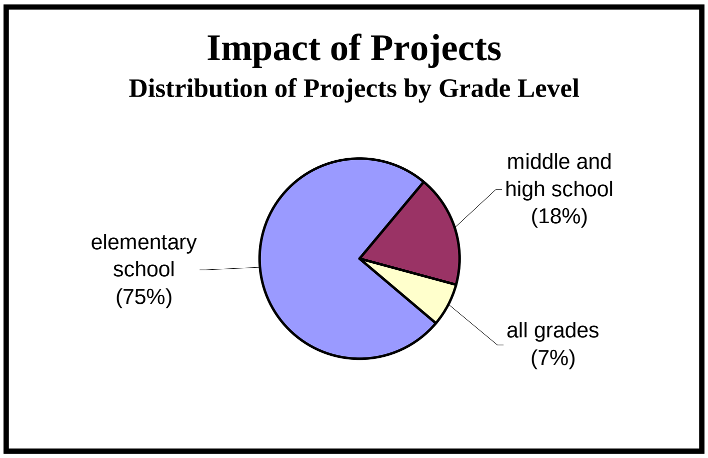
Although all of the professional development activities focused on the use of technology for instruction, there was tremendous variety in the content of the professional development. For example:

- Plymouth Public School's project involved Virtual High School training for teachers.
- Framingham Public Schools provided after-school workshops to help teachers learn computer applications and also used a web site to help teachers learn about technology. See http://www.framingham.k12.ma.us/k5/ and Framingham instructional technology page http://www.framingham.k12.ma.us/InTech/
- Ipswich Public Schools provided professional development to teachers to help them create their own web sites that students could access. Go to http://www.ipswichschools.org/ihsweb/hshome/tsites.html to view some examples.
- Pioneer Valley provided professional development on a variety of software packages so that teachers could use the software with their students to do research projects. See http://www.doe.mass.edu/edtech/toolkit/practices/pve/intro.htm .

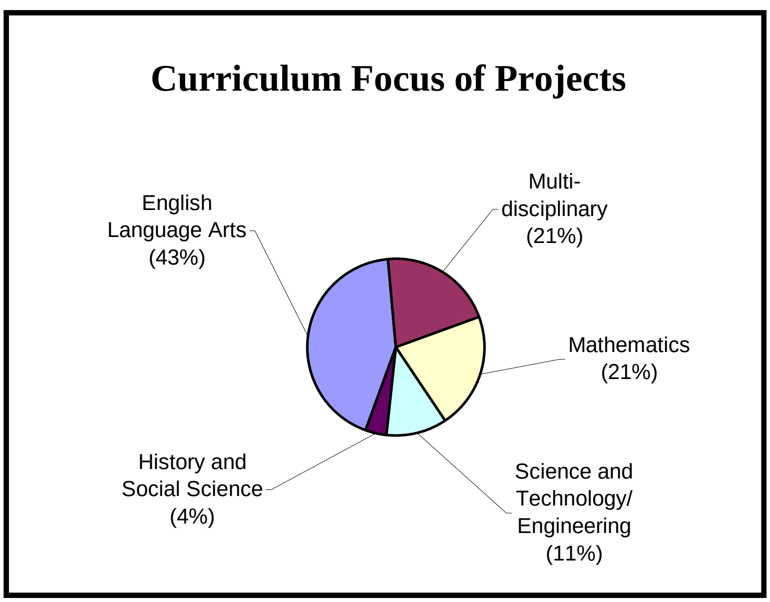
Over half of the participants in professional development (446 educators) used the state's Technology Self Assessment Tool, or TSAT (http://www.doe.mass.edu/edtech/standards/sa_tool.html), to determine their level of technology expertise. This was the first year that the grant recipients used this tool for pre- and post-testing. Although they were not required to report their results, some grant recipients did report them and showed improvement in teachers' technology skills. For example, Gloucester Public Schools' project reported an increase from 9% to 27% in the number of educators at the Proficient level and a decrease from 34% to 20% in number at the Early Technology level (the lowest level). Similarly, in Westfield's Abner Gibbs Elementary School Project, half of the faculty rated themselves at the Early Technology level before the workshops, but none did so after the workshops.

### Focusing on Curriculum and Technology Standards for Students

No Child Left Behind emphasizes the importance of using technology to improve students' learning of the curriculum, as well to help students develop technology literacy. In these grant projects, students learned the content of the curriculum at the same time they developed technology skills. The following charts and statistics are breakdowns of grade levels and subject areas represented in the grant projects.




| Impact of Projects<br>*Distribution of Projects by Grade Level* | | |
|---|---|---|
| **All Grades** | **Elementary/Middle** | **Middle/High** |
| 2 projects<br>7% of the total | 21 projects<br>75% of the total | 5 projects<br>18% of the total |



| Curriculum Focus of Projects | | | | |
|---|---|---|---|---|
| **English Language Arts** | **Multidisciplinary** | **Mathematics** | **Science** | **History** |
| 12 projects<br><br>43% of the total | 6 projects<br><br>21% of the total | 6 projects<br><br>21% of the total | 3 projects<br><br>11% of the total | 1 project<br><br>4% of the total |

Of the 28 grant projects, 20 included instruction addressing all three of the *Recommended PreK-12 Instructional Technology Standards*. (See http://www.doe.mass.edu/edtech/standards/itstand.pdf for the full text of the standards.)

> **Standard 1:** *Demonstrate proficiency in the use of computers and applications as well as an understanding of concepts underlying hardware, software, and connectivity*. (Twenty-four grant projects included this standard.)
>
> **Standard 2:** *Demonstrate responsible use of technology and an understanding of ethics and safety issues in using electronic media*. (Twenty grant projects included this standard.)
>
> **Standard 3:** *Demonstrate ability to use technology for research, problem-solving, and communication. Students locate, evaluate, collect, and process information from a variety of electronic sources. Students use telecommunications and other media to interact or collaborate with peers, experts, and other audiences.* (Twenty-three grant projects included this standard.)

Grant projects helped students acquire technology skills while they master the standards of the curriculum frameworks. The projects assessed student technology literacy using a variety of methods, including:

- **Surveys** - Districts such as Greenfield, Hudson, Pelham, Plymouth, Westfield, and Worcester Public Schools (Norrback Avenue School, Burncoat Middle School, and Roosevelt School) created their own surveys to measure student technology literacy. Some of these surveys were similar to the Teacher Self-Assessment Tool or TSAT.

- **Rubrics** - Mendon-Upton Regional, Ipswich, and Methuen Public Schools developed rubrics, some of which included a point system to rate students' presentations or projects that involved technology.

- **Computer-generated reports** –Lowell Public Schools (Pawtucketville Memorial School) used reports generated by curriculum software, which were based on student performance on tutorials and activities performed on computers in the classroom.

- **Online assignment tracking** - New Bedford Public Schools used a web-based portal to track the number of logins as well as the online assignments completed
- **Final projects** - Pioneer Valley Regional, Quincy, and Worcester Public Schools (McGrath Elementary School) had students create final projects, which included research projects, math analysis projects, and books or multimedia projects.

## Appendix E

# No Child Left Behind Title IID
# Technology Enhancement Grants (Fund Code 170)

### *Final Report for the School Years 2002-2004*

The No Child Left Behind Title IID Technology Enhancement Competitive grant program supports school districts in the development of two-year, sustainable projects that use technology to improve student academic achievement. To meet this end, these grants:

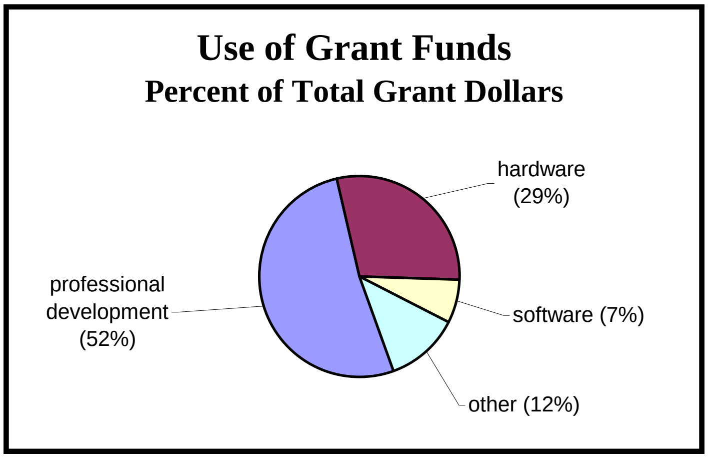
- Assist every student in becoming technologically literate;
- Provide high quality professional development that uses research-based, instructional strategies to integrate technology effectively into instruction;
- Use appropriate technology to collect, manage, and analyze data in order to inform and enhance teaching and school improvement efforts;
- Use innovative strategies for the delivery of specialized or rigorous courses and curricula through the use of online distance learning technologies.

From 2002 to 2004, a total of $5,036,199 was awarded for this competitive grant program with 23 projects receiving funding. Over the two-year period, 54 districts benefited from the program. Among these were 28 high need districts working in partnership with other districts to implement the goals of their individual projects. Summary descriptions of these grant projects as well as contact information for each can be found at http://www.doe.mass.edu/edtech/grants/fy03/te.pdf .

## Use of Grant Funds

During the two years of the grant, $2,618,256 was spent on professional development. This is over half (51.9%) of the total grant funds, and it is more than twice as much as the 25% required by NCLB. The use of these grant funds is shown in the table and graph below.

| Use of Grant Funds | | | |
|---|---|---|---|
| **Professional Dev.** | **Hardware** | **Software** | **Other** |
| 52% | 29% | 7% | 12% |

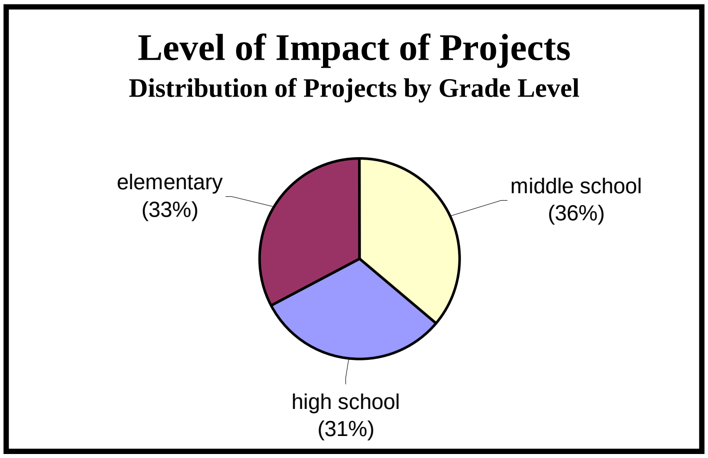



Twenty-two of the twenty-three districts used their grant money to purchase hardware, for a total for all grants of $1,433,233, or 28.5%. These purchases included mobile wireless laptops, desktop computers to upgrade and establish new labs, projection and digital video equipment, and interactive whiteboard technology for classroom use. Some grant recipients purchased more specialized equipment, such as assistive technology devices (two grants), handheld devices for assessment and for data gathering (three grants), sophisticated recording and synthesizing equipment for music, and digital microscopes and probes for science.

The $331,269 spent on software covered a wide range of products to meet the diverse objectives in the 23 grants. Specifically, funds were spent on four instructional software system packages, four graphic organizer products, ten integration software products for specific subject areas, seven productivity software licenses (e.g., MS Office), one presentation software product, five online resource subscriptions, five assistive technology software packages, and three server/operating system software licenses. In addition, many of the grants met e-learning goals using resources such as the state's Virtual Education Space (VES) and interactive applets with no associated costs to the districts.

## Impact of these grant funds

The central goal of all 23 grant projects was to improve student academic achievement through the use of technology. The impact of these projects spanned all grade levels (K-12) and was approximately equal for elementary, middle, and high school, as shown in the chart below. Some projects overlapped (included both middle and high school or impacted K through 12); these have been counted at both (or all three) levels.




| Level of Impact of Projects | | |
|---|---|---|
| **Elementary** | **Middle school** | **High school** |
| 16 | 17 | 15 |
| 33% | 36% | 31% |

Eight projects focused primarily on the development and implementation of integrated technology courses and curricula that align with the Massachusetts Curriculum Frameworks. The curriculum areas addressed depended on the needs of specific districts. For example, four grants targeted improvement in mathematics. Other grants used technology for enhancing student learning in English language arts, history, science, and music. In all of these projects the technology skills were infused in curriculum units; technology literacy was not taught in isolation.

Three of the funded projects focused primarily on the use of technology to collect, manage, and analyze data to inform and enhance school improvement efforts. Two of these projects used TestWiz to evaluate MCAS data at the district, school, classroom, and individual levels, and then to design technology-infused curriculum units to address areas in need of improvement. In another project, a charter school developed a data analysis model that employs technology to integrate the state curriculum standards with assessment results to pinpoint individual, classroom, and grade-level performance. An important aspect of this model was a user-friendly format that allowed teachers to use the data to guide their instruction. This model was used in two summer institutes that included teachers from eleven school districts, four charter schools and six high need districts. During these institutes, teachers first analyzed the assessment data, then developed lesson units to address students' weaknesses, and finally implemented the lessons in their classrooms to improve student learning. These grant projects reflect a trend to use technology as a strategy to fill teachers' instructional needs, rather than use the technology to drive the instruction.

## Impact on Professional Development

The technology professional development funded by this grant included educators in 54 districts across the state, totaling more than 94,000 staff hours.[1] Ten of the projects focused primarily on professional development. These grants provided teachers with the skills, resources, and knowledge to effectively use technology for productivity, assessment, and instruction.

Projects incorporated several professional development strategies: face-to-face (formal courses, study groups, and workshops) as well as embedded professional development (mentoring, co-teaching, etc.), and online, web-based professional development. Two of these projects focused specifically on training staff to develop and facilitate online courses for professional development. In addition, six projects used online distance learning to deliver at least 20% of their professional development. Most projects incorporated online resources and tools on a smaller scale, including: (1) use of the Internet as a resource for content, lesson plans, and research; and (2) use of Massachusetts' Virtual Education Space (VES). The Springfield project used VES for study groups, and VES has become an important tool for communications in their Foreign Language Department. Rockland and Pembroke used VES to share lessons and WebQuests they developed during the project. These grant funds have provided the opportunity for many Massachusetts educators to realize the potential for e-learning both for professional development and classroom instruction.

With the introduction of the state's Technology Self Assessment Tool, or TSAT (http://www.doe.mass.edu/edtech/standards/sa_tool.html), in early 2004, districts had a consistent measure for evaluating the impact of professional development. Several districts used the TSAT before and after their professional development activities. They reported an overall increase in teacher technology skills, as well as teachers' ability to use these skills for classroom instruction. One project showed an average 17% improvement for participating teachers (Abby Kelley Foster and Holliston). In another project, 68% of participating teachers initially rated themselves as beginners (at the Early Technology level), while after the professional development only 23% of them did so (Westfield).

As teachers improved their level of comfort with technology, they reported an increase in their use of it for instruction. Some teachers who had never used technology began using it on a regular basis in their classrooms as a result of the professional development they received. In one project, 82% of the participants said they would continue integrating technology into their teaching after the culmination of the grant. In another project, all of the teachers stated that they noticed an improvement in students' targeted curriculum skills. One teacher summed it up as follows: "I think it [integration of technology] worked out so well. We can really see the difference in our students. They were at least trying to attack the problem while before [technology] they didn't even try." (Methuen)

[1] Staff hours are determined by multiplying the length of a professional development session by the number of participants. For example, a 5-hour session with 20 participants is counted as 100 staff hours.

## Appendix F

# No Child Left Behind Title IID
# Content Institutes (Fund Codes 137/141/151/171)

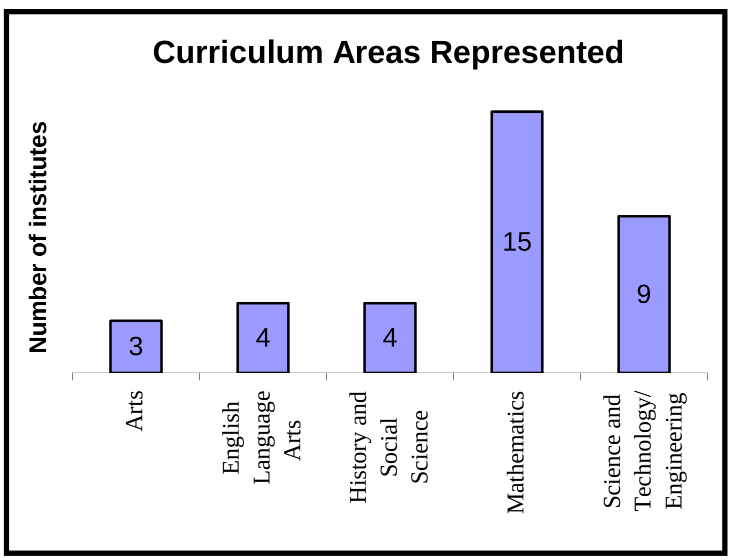
### *Final Report for the 2003-2004 School Year*

The Content Institutes grant program is a collaboration of various Department programs working together to meet the goals of No Child Left Behind. NCLB Title IID contributed funds to integrate technology into the institutes.

The overall purpose of the grant program is to support schools' and districts' implementation of the Massachusetts Curriculum Frameworks in their efforts to raise the achievement of students. The Content Institutes are discipline specific and strengthen the knowledge educators need to teach the content of the standards in the frameworks.

The Content Institutes focus on increasing the number of highly qualified teachers in the subject areas that they teach. The institutes are taught by partnerships of faculty and educators from Massachusetts' colleges, universities, and/or cultural institutions, and PreK-12 schools. Each institute was required to partner with at least one high need district.

In 2004, the Department distributed $877,419 to support 35 Content Institutes with nearly 700 participants. The institutes included topics in Mathematics, English Language Arts, History and Social Science, Science and Technology/Engineering, and the Arts Most of the institutes were held during the summer, with follow-up sessions in the fall to support teachers' implementation of what they learned.



| Curriculum Areas Represented | |
|---|---|
| **Curriculum area** | **Number of institutes** |
| Arts | 3 |
| English Language Arts | 4 |
| History and Social Science | 4 |
| Mathematics | 15 |
| Science and Technology/Engineering | 9 |

All of the institutes used instructional technology to enhance teachers' learning of the content. Virtual Education Space (VES), the Commonwealth's set of free web-based applications, resources, and tools, was used in 16 of the institutes. Participants used the online threaded discussion forums for follow-up conversations on a variety of topics related to the institute and their classrooms. For example, in a literature institute, participants used the forums to discuss books, authors, literary genres, concepts, and interpretation. Participants in a mathematics institute used the forums to post problems to get feedback from others on how to solve them.

Participants also used VES's Virtual Hard Drive, an online file system in which documents can be stored or downloaded in private or public folders. The Virtual Hard Drive was used to store instructors' materials, participants' lesson plans, links to web sites, and other electronic files pertinent to the institute. For example, in a mathematics institute, the instructor created folders in the Virtual Hard Drive where participants published their lesson plan projects. In an art institute, participants used the Virtual Hard Drive to publish portfolios of their electronic artwork as well as samples of artwork from their classroom students.

Many of the institutes used online resources to present the content, and 30% of participants stated that they would use such resources in the future, either for lesson planning or in their classes. A number of institutes used other technologies. Participants in the humanities institutes reported more use of technologies such as VES, online resources, databases, presentation software. Participants in the mathematics and science institutes reported more use of spreadsheets, graphing calculators, handhelds, probes, and specialized mathematics software.

## Appendix G

# No Child Left Behind Title II D
# Assistive Technology Summer Institutes (Fund Code 171)

### *Final Report for the 2003-2004 School Year*

The purpose of this program is to support districts' efforts to raise the achievement of all students. Specifically, the program funds professional development institutes to enhance educators' knowledge of universal design and assistive technologies so that they can better serve students with disabilities.

Six graduate-level institutes focusing on assistive technology were offered in locations throughout Massachusetts during the summer of 2004. The institutes included a minimum of 45 hours of instruction, with follow-up sessions in the fall to support implementation in the classroom. All of the institutes focused on ways that technology can improve learning for students with disabilities. There were 109 participants, more than one-third of whom were from high-needs school districts.

Most of the institutes provided a general introduction to the concept of universal design and the use of assistive technologies to help students access the curriculum. Although many different technologies were presented, the following were covered in most of the institutes: text-to-speech software, word prediction software, talking word processors, multimedia software, and low-tech tools. Two of the institutes had a more specific purpose, with one focusing on universal design strategies for teaching middle school mathematics and one focusing on the use of software tools to provide visual and auditory learning support in all curriculum areas for children in grades PreK-4.

In all, $179,914 was distributed to six local education agencies for the institutes, with approximately $30,000 going to each agency:

- Dudley-Charlton Regional School District
- SEEM Collaborative (Reading)
- Hampshire Educational Collaborative (Northampton)
- Cape Cod Collaborative (Otis Air National Guard Base)
- Marlborough Public Schools with the MESPA Education and Technology Center
- The Education Cooperative (Dedham)

Nearly half of the funds were used to purchase assistive technology materials, such as software presented in the institute, that participants could use for individual projects with students in their schools.